

World Bank's Poverty Enumeration

A Critical Examination of the Process, Methodology, and Numbers

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The end of the period set out to achieve the United Nations Millennium Development Goals triggered off numerous studies on global poverty. Most notable was the paper by Ferreira et al (2015), which can be considered as the (unofficial) view of the World Bank. We subject this particular paper to critical scrutiny and find that the Bank's poverty enumeration exercise fails to satisfy the requirements of transparency, denies researchers access to data, and hinders replicability of the poverty numbers produced by the Bank. We have provided evidence of non-robustness of the poverty estimates by using different purchasing power parities. A simpler method for estimating PPPs that avoids the complex and expensive procedure adopted by the World Bank-led International Comparison Program has also been proposed.

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One of the key aims of the United Nations (UN) Millennium Development Goals (MDG), a series of time-bound targets, with a deadline of 2015, was to eradicate "extreme poverty and hunger." The Sustainable Development Goals (SDG) which replaced the MDG in September 2015, also targeted to "end poverty in all its forms everywhere" by 2030. The 2014 UN MDG report speaks of impressive reduction of poverty between 1990 and 2015.¹ The prominence accorded to poverty reduction in both the MDG and SDG called for a global monitoring of poverty.

Given the scale of exercise involved, such global monitoring of poverty could only be done under the umbrella of the World Bank. While the counting and production of the poverty numbers is carried out directly by the staff of the World Bank, the estimation of the purchasing power parity (PPP) between currencies that is required to convert the international poverty line (IPL) into national poverty lines in the respective countries' currencies is carried out by the International Comparison Program (ICP), "a worldwide statistical initiative led by the World Bank under the auspices of the United Nations Statistical Commission."

The PPP concept owes its origins to early work by Balassa (1964) and Samuelson (1964). PPP is regarded as a better indicator of the strength of a country's currency than exchange rates, both expressed in terms of a numeraire, typically, the US dollar. The PPPs, calculated from information on prices supplied by member countries, are based on a wider basket of items than exchange rates, covering both tradable and non-tradable items. The accuracy of the PPPs used in the currency conversions in converting the IPL into national currencies is an essential ingredient in the production of reliable global poverty numbers.

Some of the doubts over the reliability of the poverty numbers stem from the wild gyrations in the PPPs between successive ICPs. From 1993 to 2005, PPPs moved sharply upwards, leading to headlines such as "The Developing World is Poorer Than We Thought ..." (Chen and Ravallion 2010). These were subsequently revised sharply downwards from 2005 to 2011. Commenting on this downward revision, Dykstra et al (2014b) published a paper titled "Global Poverty Fell by Almost Half on Tuesday." With such wild gyrations in the PPPs between successive ICP rounds, how much confidence can one have in the poverty numbers published by the World Bank that uses these PPPs?

Though technically the ICP is not an arm of the World Bank and maintains a degree of independence with its own

Technical Advisory Committee (TAC), in practice it works in tandem with the poverty enumerators in the Bank. The importance of the PPPs stems from the crucial role they play in converting the IPL into national poverty line required in counting the poor in the individual countries. PPPs are required in a host of applications other than poverty calculations such as comparing living standards and inequality between countries and in ranking economies based on the size of their gross domestic product (GDP).

PPPs have, therefore, acquired a degree of political importance, and large economies such as China and India are quite sensitive to the PPP estimates of their currencies. The ICP has an enormous budget, requires a high degree of cooperation from the participating countries, is very expensive to conduct, and, not surprisingly, is not carried out every year. The last three ICPs were carried out in 1993, 2005, and 2011, with the PPP estimates from the last two rounds published in 2008 and 2015 respectively (World Bank 2008, 2015)

We propose in this paper an alternative methodology for calculating PPPs that does away with the need for price information from the participating countries. The quality of the price information has provoked furious debate in the previous rounds. Besides sidestepping the controversy over prices, the proposed procedure is much simpler and more economical than ICP exercises. The fact that the proposed alternative procedure can be applied to publicly available data with nothing more than a simple laptop in contrast to the hugely complex multinational ICP operations is of significance. As we mention later, the alternative procedure generates PPPs that are quite comparable to the ICP PPPs in terms of the high correlation between alternative sets of PPPs. Simultaneously, they provide a benchmark for evaluating the robustness of the ICP PPPs and their implied global poverty rates.

In October 2015, some economists working with the World Bank published a paper titled “A Global Count of the Extreme Poor in 2012: Data Issues, Methodology and Initial Results” (Ferreira et al 2015) that received extensive media attention, most notably, in the *Economist* [See Reddy and Pogge (2010) and Subramanian (2015) for a discussion on the methodological flaws in the manner the World Bank counts the global poor and estimates the poverty rates]. Though Ferreira et al (2015) were careful to insert the disclaimer, “our views should not be attributed to the World Bank,” in practice, the paper does represent the position of the Bank since not only all its authors are prominent members of the World Bank’s poverty enumeration team but the paper credits the chief economist and senior vice president of the World Bank for his “guidance” of the project.

The motivation of our study is to subject the World Bank’s poverty measurement exercise and its latest poverty estimates to critical scrutiny by examining the robustness of the ICP PPPs that have been used in the poverty calculations and the World Bank’s poverty numbers themselves, compared to alternative, that is, non ICP methodologies. The paper reports evidence of considerable non-robustness of the ICP PPPs and the poverty rates based on them, thus raising serious doubts on the credibility of the World Bank’s numbers and the attendant claim of

significant global poverty reduction between 2000 and 2015. As we argue below, the validity of the poverty estimates and, more significantly, the poverty trend reported in Ferreira et al (2015) are conditional on the PPPs and the IPL assumed by them.

Before we present the counterfactual evidence on the ICP PPPs and the World Bank’s poverty estimates, let us lay out some basic principles that one expects the World Bank’s exercise to satisfy. These are—transparency in the World Bank’s poverty enumeration exercise; independent researchers outside the World Bank having open access to the information used by the Bank; and easy replicability of the numbers produced by the World Bank. As our experience showed, none of these three reasonable principles is satisfied by the World Bank’s poverty enumeration exercise and its production of poverty statistics.

The violation of the first two principles stems from the fact that the household surveys from the various countries in unit record form that provide the basis for the PPPs estimated by the ICP are not made available to non-World Bank researchers, unless one works with World Bank staff, and the data is not allowed to leave the World Bank premises. This was made clear in a personal communication by a World Bank economist,² who co-authored the paper “Purchasing Power Parity Exchange Rates for the Global Poor” (Deaton and Dupriez 2011), to one of the authors (Ray) of this study. In other words, the journal where that paper appeared waived the reader’s right to access the data to replicate the results in deference to the World Bank’s practice.

The violation of the third principle occurs due to the fact that the PovcalNet (the online tool for poverty measurement developed by the Development Research Group of the World Bank)³ programme that calculates the poverty rates does not allow independent researchers access to the underlying country level information that it uses. This programme was written by the World Bank’s staff, and they alone are responsible for any modification to this software. Dykstra et al (2014a) describe an ingenious method for accessing the data underlying the PovcalNet software. One can use the PovcalNet software from the World Bank’s website, but there is no way of checking for its accuracy or, indeed, if the software is working correctly.

As we write this critique, it is worth reporting that the PovcalNet software that uses the ICP 2005 PPPs is not free from bugs—for example, one expects a country’s poverty rates to remain unchanged if the IPL is multiplied by k , and the country’s PPP is divided by the same number, k . That is not true in the case of several countries. Since the poverty numbers that we report later had to be based on the PovcalNet software, our results are conditional on the validity of that software. Our poverty numbers, just as the World Bank’s poverty numbers, should, therefore, be treated with caution.

The rest of the paper is organised as follows. Section 1 describes briefly the alternative procedure used to calculate the PPPs, referred to as “counterfactual PPPs,” and compares them with the ICP PPPs. This comparison is followed by evidence which suggests that the ICP 2011 PPPs overestimate the GDPs of several countries. Section 2 widens the discussion by examining the robustness of the World Bank’s poverty rate estimates and

benchmarks the ICP PPP-based poverty rates in Ferreira et al (2015) against those from a range of alternative PPP procedures besides the counterfactual PPP procedure proposed by us. Section 3 concludes the paper with a few summary remarks.

1 Counterfactual PPPs and Comparison with ICP PPPs

The proposed methodology, used earlier by Coondoo et al (2011) to estimate spatial prices in India, is based on estimation of Engel curves on a single cross section data. It uses the fact that the PPP can be viewed as a True Cost of Living Index (TCLI). The attractiveness of this procedure has been described by Coondoo et al as follows:

The novelty of the procedure is that it overcomes the problem of data inadequacy, a problem that is shared by most of the developing

countries. The procedure does not require item-specific price/unit value data and price index numbers can be calculated from consumer expenditure data grouped by per capita income/total consumer expenditure class in a situation where unit level data are not available.⁴ (2011: 138)

In the current context, this offers a significant advantage for benchmarking the PPPs estimated by the ICP, since much of the controversy over the accuracy of these has centred around questions over the accuracy of the price information used in the ICP 2005 and ICP 2011 rounds. The counterfactual PPPs presented here allow a clean comparison since the procedure does not need to use the controversial price information collected in the ICP 2011 round. Moreover, as this study illustrates, the published World Bank data does contain the disaggregated

Table 1: 2011 ICP Consumption PPPs and Counterfactual PPPs (CPPP1) Based on Data by Income Categories (Base Country: India)

Region	Country	2011 ICP Consumption PPP	Counter-factual PPP	Region	Country	2011 ICP Consumption PPP	Counter-factual PPP	
Africa	Benin	14.801	11.821	Commonwealth of Independent States	Lao PDR	181.329	222.421	
	Burkina Faso	14.552	8.171		Maldives	0.677	1.250	
	Cameroon	15.253	12.418		Mongolia	36.881	59.862	
	Chad	16.499	16.787		Nepal	1.698	2.114	
	Congo, Rep	35.145	31.664		Pakistan	1.673	2.147	
	Congo, Dem Rep	19.711	13.335		Philippines	1.261	1.552	
	Cote d'Ivoire	15.691	19.943		Sri Lanka	2.689	6.834	
	Djibouti	6.727	11.370		Thailand	0.858	3.297	
	Egypt	0.115	0.252		Vietnam	479.060	569.544	
	Ethiopia	0.352	0.397		Eurostat–OCED	Armenia	10.880	22.195
	Gabon	23.877	59.136			Azerbaijan	0.020	0.066
	Gambia (The)	0.697	0.596			Belarus	109.735	414.875
	Ghana	0.051	0.052			Kazakhstan	5.037	17.722
	Guinea	165.403	148.692			Kyrgyz Republic	1.037	1.852
	Kenya	2.365	2.164	Moldova		0.328	0.840	
	Lesotho	0.261	0.209	Tajikistan		0.106	0.215	
	Liberia	0.037	1.956	Ukraine		0.204	0.811	
	Madagascar	46.309	18.850	Albania		3.400	1.486	
	Mali	14.437	10.579	Bosnia and Herzegovina		0.055	0.398	
	Mauritania	7.395	10.857	Bulgaria	0.047	0.288		
	Mauritius	1.181	2.826	Latvia	0.025	0.127		
	Morocco	0.276	0.605	Lithuania	0.112	0.491		
	Mozambique	1.051	0.552	Macedonia (FYR)	1.392	6.807		
	Namibia	0.342	0.284	Mexico	0.549	1.126		
	Nigeria	5.184	4.483	Montenegro	0.028	0.175		
	Republic of Cabo Verde	3.164	8.940	Romania	0.120	0.458		
	Senegal	16.285	14.954	Russia	1.059	5.498		
	Sierra Leone	114.179	146.402	Serbia	2.802	13.968		
South Africa	0.340	0.571	Turkey	0.072	0.059			
Swaziland	0.273	0.169	Latin America	Bolivia	0.200	0.409		
Tanzania	38.494	21.820		Brazil	0.106	0.231		
Togo	14.966	10.190		Colombia	81.836	173.525		
Uganda	61.989	48.688		El Salvador	0.036	0.036		
Zambia	166.554	95.465		Guatemala	0.261	0.588		
Asian and the Pacific	Bangladesh	1.628		1.786	Honduras	0.706	0.767	
	Bhutan	1.119		1.906	Nicaragua	0.613	0.310	
	Cambodia	96.712	120.760	Peru	0.104	0.265		
	China	0.249	0.415	Western Asia	Iraq	35.882	41.932	
	Fiji	0.080	0.140		Jordan	0.021	0.093	
	India	1.000	1.000		Yemen	5.319	14.339	
	Indonesia	266.380	311.831	Caribbean	Jamaica	4.136	9.063	

Source: Table generated by the authors using published World Bank data on the disaggregated expenditure by items and by expenditure classes at country level (Global consumption data base, <http://datatopics.worldbank.org/consumption/home>).

expenditure information (by items and by expenditure classes) at country level required to implement the procedure to calculate the alternative set of PPPs.

Note, however, that ideally the procedure requires wide cross-sectional variation in expenditure within each country data and needs access to the unit records of the household surveys for each country available with the World Bank. In the absence of access to that data, we had to rely on the publicly available data that contained much less cross-sectional variation. This provided a data constraint which needs to be kept in mind while assessing the plausibility of some of the counterfactual PPP estimates.

Table 1 (p 45) presents the counterfactual PPPs based on the World Bank data on broad item groups by income categories

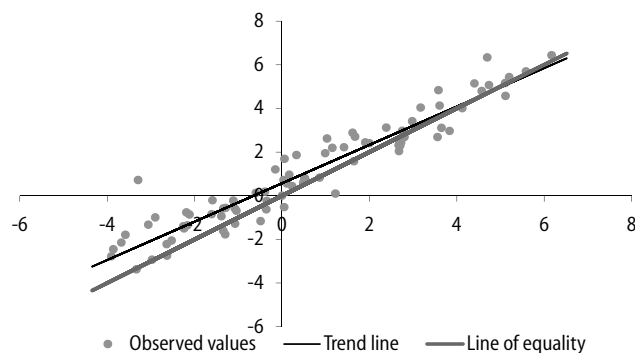
for rural and urban sectors, with India as base. The table also presents the ICP 2011 consumption PPPs, where the base country has been shifted from the United States (us) to India by dividing all the PPPs (with respect to the us dollar) by the PPP of India with the us as base. In case of a few countries—for example, Chad, Ethiopia and Ghana—the two PPPs are nearly identical, but this is not always the case. The bias in the ICP 2011 PPPs in relation to the counterfactual PPPs is not unidirectional. In general, the ICP 2011 PPPs in the African region exceed the counterfactual PPPs, and the reverse is the case in the Asia/Pacific region.

While in case of several countries—for example, South Africa, China and Indonesia—there is a large difference between the ICP 2011 PPPs and its 2011 counterfactual, overall,

Table 2a: Per Capita Annual GDP (PCGDP) in '000 Local Currencies Converted to Indian Rupees under 2011 ICP Consumption PPPs and Counterfactual PPPs of Table 1 (Base Country: India)

Region	Country	PCGDP Evaluated at		Region	Country	PCGDP Evaluated at		
		2011 ICP PPP	Counter-factual PPP			2011 ICP PPP	Counter-factual PPP	
Africa	Benin	25.54	31.98	Commonwealth of Independent States	Maldives	1.61	0.87	
	Burkina Faso	19.72	35.11		Mongolia	126.98	78.23	
	Cameroon	41.06	50.44		Nepal	32.22	25.88	
	Chad	30.11	29.59		Pakistan	64.74	50.45	
	Congo, Rep	47.99	53.27		Philippines	81.74	66.41	
	Congo, Dem Rep	17.33	25.62		Sri Lanka	116.59	45.88	
	Cote d'Ivoire	38.82	30.54		Thailand	191.63	49.90	
	Djibouti	33.70	19.94		Vietnam	66.06	55.57	
	Egypt	150.21	68.24		Armenia	115.15	56.44	
	Ethiopia	16.96	15.05		Azerbaijan	285.56	86.62	
	Gabon	219.64	88.68		Belarus	285.86	75.61	
	Gambia (The)	21.48	25.13		Kazakhstan	330.60	93.97	
	Ghana	46.93	46.32		Kyrgyz Republic	52.44	29.35	
	Guinea	19.59	21.80		Moldova	70.45	27.54	
	Kenya	30.99	33.86		Tajikistan	36.82	18.11	
	Lesotho	32.05	39.92		Ukraine	139.91	35.11	
	Liberia	7.50	0.14		Albania	133.19	394.24	
	Madagascar	20.54	50.46		Bosnia and Herzegovina	126.93	17.52	
	Mali	21.97	29.99		Bulgaria	218.56	35.57	
	Mauritania	50.00	34.05		Latvia	274.49	54.54	
	Mauritius	209.38	87.45		Lithuania	314.48	71.87	
	Morocco	90.26	41.10		Macedonia (FYR)	160.43	32.82	
	Mozambique	14.51	27.63		Eurostat–OCED	Mexico	228.81	111.60
	Namibia	114.08	137.15		Montenegro	187.72	29.74	
	Nigeria	45.14	52.19		Romania	216.86	56.95	
	Republic of Cabo Verde	94.07	33.29		Russia	368.47	70.99	
	Senegal	32.55	35.44		Serbia	157.75	31.65	
	Sierra Leone	18.63	14.53		Turkey	244.05	299.56	
	South Africa	169.82	101.19		Latin America	Bolivia	81.86	40.04
	Swaziland	90.49	146.00		Brazil	202.89	93.42	
Tanzania	21.10	37.22	Colombia	161.30	76.07			
Togo	18.88	27.73	El Salvador	103.63	102.10			
Uganda	21.48	27.34	Guatemala	96.84	43.00			
Zambia	45.05	78.60	Honduras	61.09	56.19			
Asian and the Pacific	Bangladesh	39.81	36.30	Nicaragua	59.84	118.22		
	Bhutan	108.43	63.68	Peru	160.15	62.99		
	Cambodia	37.85	30.31	Western Asia	Iraq	160.21	137.09	
	China	141.35	84.93	Jordan	155.73	35.15		
	Fiji	98.58	56.35	Yemen	52.97	19.65		
	India	71.54	71.54	Caribbean	Jamaica	109.00	49.74	
	Indonesia	115.61	98.76	Mean	104.66	59.77		
	Lao PDR	55.91	45.58	Median	81.80	46.10		

Source: Table generated by the authors using price and expenditure information supplied to them by the ICP group in the World Bank.

Figure 1: Counterfactual PPP (in logs) against ICP Consumption PPP (in logs) for 2011

Source: Majumder, et al (2015).

Table 2b: Per Capita Annual Aggregate Consumption (PCAgC) in '000 Local Currencies Converted to Indian Rupees under 2011 ICP Consumption PPPs and Counterfactual PPPs of Table 1 (Base Country: India)

Region	Country	PCAgC Evaluated at		Region	Country	PCAgC Evaluated at		
		2011 ICP PPP	Counter-factual PPP			2011 ICP PPP	Counter-factual PPP	
Africa	Benin	20.63	25.83	Eurostat–OCED	Maldives	0.61	0.33	
	Burkina Faso	13.34	23.76		Mongolia	77.05	47.47	
	Cameroon	32.17	39.52		Nepal	25.88	20.79	
	Chad	20.68	20.32		Pakistan	54.99	42.85	
	Congo, Rep	11.89	13.19		Philippines	62.89	51.09	
	Congo, Dem Rep	11.15	16.49		Sri Lanka	89.55	35.24	
	Cote d'Ivoire	27.72	21.81		Thailand	118.73	30.92	
	Djibouti	24.08	14.25		Vietnam	41.89	35.24	
	Egypt	119.46	54.28		Commonwealth of Independent States	Armenia	102.30	50.15
	Ethiopia	13.71	12.17			Azerbaijan	117.17	35.54
	Gabon	83.71	33.80			Belarus	162.14	42.89
	Gambia (The)	17.10	20.00			Kazakhstan	159.83	45.43
	Ghana	31.40	30.99			Kyrgyz Rep	49.10	27.48
	Guinea	11.04	12.29			Moldova	79.18	30.95
	Kenya	27.13	29.65			Tajikistan	42.37	20.84
	Lesotho	35.36	44.04			Ukraine	110.74	27.79
	Liberia	8.48	0.16			Albania	113.67	336.47
	Madagascar	18.65	45.82			Bosnia and Herzegovina	118.60	16.37
	Mali	14.66	20.01		Bulgaria	153.65	25.01	
	Mauritania	29.26	19.93		Latvia	192.37	38.22	
Mauritius	165.44	69.10	Lithuania	231.62	52.94			
Morocco	60.35	27.48	Macedonia (FYR)	132.81	27.17			
Mozambique	12.46	23.73	Latin America	Mexico	165.88	80.91		
Namibia	81.61	98.12		Montenegro	172.48	27.33		
Nigeria	29.06	33.60		Romania	156.64	41.14		
Republic of Cabo Verde	66.49	23.54		Russia	212.55	40.95		
Senegal	26.94	29.34		Serbia	141.57	28.40		
Sierra Leone	16.72	13.04		Turkey	192.33	236.08		
South Africa	115.97	69.10		Western Asia	Bolivia	51.27	25.08	
Swaziland	81.54	131.56			Brazil	138.75	63.88	
Tanzania	14.42	25.43			Colombia	109.75	51.76	
Togo	16.71	24.55			El Salvador	102.04	100.54	
Uganda	19.47	24.79	Guatemala		87.15	38.70		
Zambia	24.91	43.45	Honduras		52.50	48.29		
Asian and the Pacific	Bangladesh	29.95	27.31		Nicaragua	50.23	99.24	
	Bhutan	56.00	32.89		Peru	100.11	39.38	
	Cambodia	31.89	25.54		Caribbean	Iraq	75.36	64.49
	China	60.66	36.45			Jordan	124.21	28.03
	Fiji	75.60	43.22	Yemen		38.69	14.35	
	India	42.34	42.34	Jamaica		101.42	46.28	
	Indonesia	67.31	57.50	Mean		73.30	43.21	
	Lao PDR	32.79	26.73	Median		58.17	31.94	

Source: Table generated by the authors using price and expenditure information supplied to them by the ICP group in the World Bank.

counterfactual PPPs. From the table, it is evident that almost the entire non-African region and some African countries constitute this part, with the ICP's PPPs lower than the corresponding counterfactuals.

Table 2a (p 46) presents the per capita annual GDP evaluated at ICP 2011 consumption PPP and at counterfactual PPP with India as base, and Table 2b (p 47) presents the corresponding values for per capita aggregate consumption. The qualitative pictures portrayed by these tables are quite similar and mirror the comparative PPP estimates reported in Table 1. The revisions to the ICP 2011 PPP deflated GDP and consumption figures implied by the corresponding counterfactual PPP deflated estimates are not unidirectional and vary across regions and between countries. However, the steep downward revisions from ICP 2011 PPP deflated to the counterfactual PPPs deflated GDP

and consumption figures occur more frequently than the reverse, especially in the larger and more populated countries such as South Africa, China, Mexico and Russia.

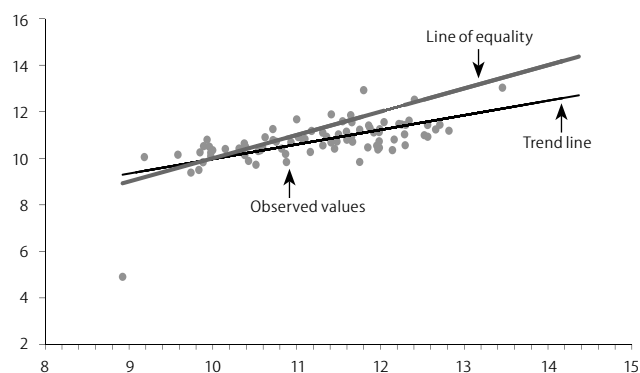
The ratios of per capita annual GDP of different countries to the per capita annual GDP of India, evaluated at the alternative PPPs, are presented in Table 3a, and the corresponding ratios for per capita annual aggregate consumption are given in Table 3b (p 49). These tables mirror Tables 2a and 2b in showing that in most cases, the dominance over India in the per capita GDP and consumption figures shrinks, and in few cases even gets reversed, when we use the counterfactual PPP in place of the ICP 2011 PPP. The widely made claim that the ICP 2011 made the poorer countries look lot "less poor" vis-à-vis the US can be extended to the result that India looks "far poorer" on the ICP PPP than on the counterfactual PPP.

Table 3a: Ratio of per Capita Annual GDP Evaluated at Different PPPs to per Capita Annual GDP of India Evaluated at the Corresponding PPP

Region	Country	PCGDP Evaluated at			Region	Country	PCGDP Evaluated at			
		2011 ICP GDP PPP	2011 ICP Consumption PPP*	Counter-factual PPP*			2011 ICP GDP PPP	2011 ICP Consumption PPP*	Counter-factual PPP*	
Africa	Benin	0.373	0.357	0.447		Lao PDR	0.868	0.781	0.637	
	Burkina Faso	0.284	0.276	0.491		Maldives	2.406	2.006	1.087	
	Cameroon	0.582	0.574	0.705		Mongolia	1.841	1.775	1.093	
	Chad	0.419	0.421	0.414		Nepal	0.469	0.450	0.362	
	Congo, Rep	0.138	0.136	0.358		Pakistan	0.940	0.905	0.705	
	Congo, Dem Rep	1.231	1.196	0.745		Philippines	1.219	1.143	0.928	
	Cote d'Ivoire	0.564	0.543	0.427		Sri Lanka	1.713	1.630	0.641	
	Djibouti	0.509	0.471	0.279		Thailand	2.809	2.679	0.697	
	Egypt	2.238	2.100	0.954		Vietnam	0.996	0.923	0.777	
	Ethiopia	0.256	0.237	0.210	Commonwealth of Independent States	Armenia	1.414	1.609	0.789	
	Gabon	3.481	3.070	1.240		Azerbaijan	3.371	3.991	1.211	
	Gambia (The)	0.318	0.300	0.351		Belarus	3.506	3.996	1.057	
	Ghana	0.723	0.656	0.647		Kazakhstan	4.387	4.621	1.313	
	Guinea	0.272	0.274	0.305		Kyrgyz Rep	0.647	0.733	0.410	
	Kenya	0.451	0.433	0.473		Moldova	0.883	0.985	0.385	
	Lesotho	0.450	0.448	0.558		Tajikistan	0.474	0.515	0.253	
	Liberia	0.114	0.105	0.002		Ukraine	1.752	1.956	0.491	
	Madagascar	0.298	0.287	0.705		Eurostat-OECD	Albania	2.104	1.862	5.511
	Mali	0.319	0.307	0.419			Bosnia and H	2.034	1.774	0.245
	Mauritania	0.674	0.699	0.476	Bulgaria		3.278	3.055	0.497	
	Mauritius	3.275	2.927	1.222	Latvia		4.223	3.837	0.762	
	Morocco	1.428	1.262	0.574	Lithuania		4.756	4.396	1.005	
	Mozambique	0.201	0.203	0.386	Macedonia (FYR)		2.525	2.242	0.459	
	Namibia	1.766	1.595	1.917	Mexico		3.459	3.198	1.560	
	Nigeria	0.664	0.631	0.730	Montenegro		2.984	2.624	0.416	
	Republic of Cabo Verde	1.294	1.315	0.465	Romania		3.410	3.031	0.796	
Senegal	0.474	0.455	0.495	Russia	4.752		5.150	0.992		
Sierra Leone	0.289	0.260	0.203	Serbia	2.504	2.205	0.442			
South Africa	2.558	2.374	1.414	Turkey	3.755	3.411	4.187			
Swaziland	1.336	1.265	2.041	Latin America	Bolivia	1.174	1.144	0.560		
Tanzania	0.328	0.295	0.520		Brazil	3.092	2.836	1.306		
Togo	0.277	0.264	0.388		Colombia	2.399	2.255	1.063		
Uganda	0.337	0.300	0.382		El Salvador	1.554	1.449	1.427		
Zambia	0.666	0.630	1.099		Guatemala	1.472	1.354	0.601		
Asian and the Pacific	Bangladesh	0.591	0.556		0.507	Honduras	0.919	0.854	0.785	
	Bhutan	1.520	1.516		0.890	Nicaragua	0.868	0.836	1.652	
	Cambodia	0.574	0.529		0.424	Peru	2.319	2.239	0.880	
	China	2.124	1.976		1.187	Western Asia	Iraq	2.350	2.239	1.916
	Fiji	1.596	1.378		0.788		Jordan	2.359	2.177	0.491
	India	1.000	1.000	1.000	Yemen	0.785	0.740	0.275		
	Indonesia	1.803	1.616	1.380	Caribbean	Jamaica	1.759	1.524	0.695	

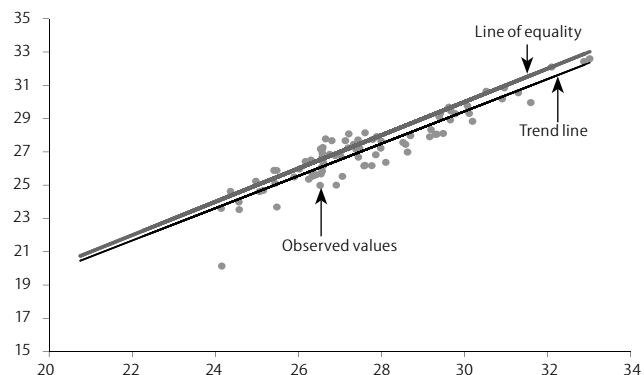
*These columns are derived from Table 2a.

Figure 2: Per Capita GDP (in logs) Evaluated at Counterfactual PPP against That Evaluated at ICP Consumption PPP for 2011



Source: Majumder et al (2015).

Figure 3: GDP (in logs) Evaluated at Counterfactual PPP against That Evaluated at ICP Consumption PPP for 2011



Source: Majumder et al (2015).

Table 3b: Ratio of per Capita Annual Consumption Evaluated at Different PPPs to per Capita Annual Consumption of India Evaluated at the Corresponding PPP

Region	Country	PCAgC Evaluated at		Region	Country	PCAgC Evaluated at		
		2011 ICP Consumption PPP*	Counter-factual PPP*			2011 ICP Consumption PPP*	Counter-factual PPP*	
Africa	Benin	0.487	0.610	Eurostat–OCED	Lao PDR	0.774	0.631	
	Burkina Faso	0.315	0.561		Maldives	1.285	0.696	
	Cameroon	0.760	0.933		Mongolia	1.820	1.121	
	Chad	0.488	0.480		Nepal	0.611	0.491	
	Congo, Rep	0.148	0.389		Pakistan	1.299	1.012	
	Congo, Dem Rep	0.501	0.312		Philippines	1.486	1.207	
	Cote d'Ivoire	0.655	0.515		Sri Lanka	2.115	0.832	
	Djibouti	0.569	0.337		Thailand	2.805	0.730	
	Egypt	2.822	1.282		Vietnam	0.990	0.832	
	Ethiopia	0.324	0.287		Commonwealth of Independent States	Armenia	2.416	1.184
	Gabon	1.977	0.798			Azerbaijan	2.768	0.840
	Gambia (The)	0.404	0.472			Belarus	3.830	1.013
	Ghana	0.742	0.732			Kazakhstan	3.775	1.073
	Guinea	0.261	0.290			Kyrgyz Rep	1.160	0.649
	Kenya	0.641	0.700			Moldova	1.870	0.731
	Lesotho	0.835	1.040			Tajikistan	1.001	0.492
	Liberia	0.200	0.004			Ukraine	2.616	0.656
	Madagascar	0.441	1.082			Albania	2.685	7.947
	Mali	0.346	0.473			Bosnia and H	2.801	0.387
	Mauritania	0.691	0.471		Bulgaria	3.629	0.591	
	Mauritius	3.908	1.632		Latvia	4.544	0.903	
	Morocco	1.425	0.649		Lithuania	5.471	1.250	
	Mozambique	0.294	0.560		Macedonia (FYR)	3.137	0.642	
	Namibia	1.928	2.318		Latin America	Mexico	3.918	1.911
Nigeria	0.686	0.794	Montenegro	4.074		0.645		
Republic of Cabo Verde	1.571	0.556	Romania	3.700		0.972		
Senegal	0.636	0.693	Russia	5.020		0.967		
Sierra Leone	0.395	0.308	Serbia	3.344		0.671		
South Africa	2.739	1.632	Turkey	4.543		5.576		
Swaziland	1.926	3.107	Western Asia	Bolivia		1.211	0.592	
Tanzania	0.341	0.601		Brazil		3.277	1.509	
Togo	0.395	0.580		Colombia		2.592	1.223	
Uganda	0.460	0.586		El Salvador		2.410	2.375	
Zambia	0.588	1.026		Guatemala	2.058	0.914		
Asian and the Pacific	Bangladesh	0.707		0.645	Honduras	1.240	1.141	
	Bhutan	1.323		0.777	Nicaragua	1.187	2.344	
	Cambodia	0.753	0.603	Peru	2.365	0.930		
	China	1.433	0.861	Caribbean	Iraq	1.780	1.523	
	Fiji	1.786	1.021		Jordan	2.934	0.662	
	India	1.000	1.000		Yemen	0.914	0.339	
	Indonesia	1.590	1.358		Jamaica	2.396	1.093	

*These columns are derived from Table 2b.

These features translate into the PPP deflated GDP values, presented in Figures 2 and 3 (p 49). While Figure 2 plots the per capita GDP values using counterfactual PPP deflator against those using the ICP 2011 PPP deflator, Figure 3 plots the corresponding aggregate GDP values. On superimposition of the line of equality between the two axes, Figure 2 shows that for most part the per capita GDPs deflated by ICP 2011 PPPs lie above those deflated by the counterfactual PPPs. Figure 3 shows the overstatement of GDP by the ICP 2011 PPP in relation to the counterfactual PPP more clearly since the line of equality between the two GDP values lies uniformly above the fitted line. We thus have robust evidence of understatement of the PPPs and overstatement of the PPP deflated GDP values in the ICP 2011.

2 Robustness of Global Poverty Rates to PPPs

Do the above results regarding the non-robustness of the ICP PPPs to changes in procedure translate to non-robustness of the ICP PPPs-based global poverty rates and their trend as reported in Ferreira et al (2015)? To provide evidence in regard to this, we experiment with three other PPP estimation procedures, all of which use the price and quantity information collected by the ICP, unlike the counterfactual PPP procedure. These three additional PPP estimation procedures are—the Fisher price index, Tornqvist price index, and the Country Product Dummy (CPD) procedure. The CPD method was originally proposed by Summers (1973) in the context of missing price information on cross country data and has been used in the ICP rounds. The procedures are described in detail in many subsequent papers (for example, Rao 1995 and Diewert 2005).

The IPL used by the World Bank is the mean of the national poverty lines of the 15 poorest countries, nearly all of which are in Africa, converted to US dollars at the PPPs relevant to that year. As explained in Ferreira et al (2015), the poverty line is temporally updated to maintain the purchasing power of the IPL through time. Note that, not being one of the 15 poorest countries, neither the Indian nor the Chinese poverty lines figure in the determination of the IPL. This raises the possibility that the poverty rates in these large countries will move up or down with a change in the poverty lines in these much smaller countries.

The other criticism of the IPL specification is that it opens up divergence between the IPL converted to a national currency and that country’s national poverty line since the former is adjusted over time depending on PPP movements based on quite a different basket of items or on items with different

Table 4: Regional* Poverty Rates (%) under Alternative PPPs—2005 and 2011

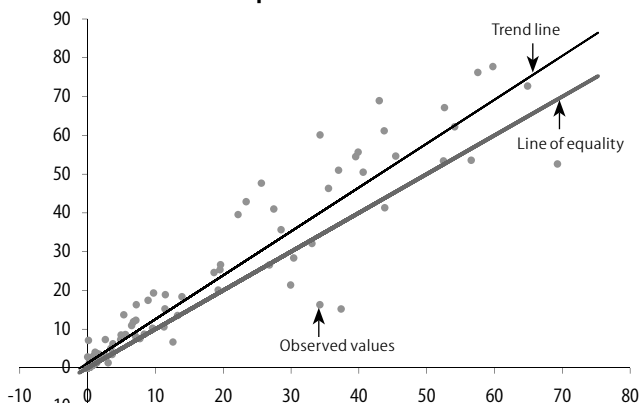
Region	2005 PPPs					2011 PPPs				
	ICP	Counter-factual	Tornqvist	Fisher	CPD	ICP	Counter-factual	Tornqvist	Fisher	CPD
East Asia and the Pacific	7.34	22.05	5.41	7.12	14.57	8.82	22.99	7.80	9.46	8.29
Europe and Central Asia	1.07	16.73	0.99	1.04	2.08	1.36	14.60	1.23	1.25	1.26
Latin America and The Caribbean	6.09	20.89	5.88	6.81	9.25	6.87	16.64	7.04	7.95	6.61
Middle East and North Africa	1.60	15.41	1.42	1.80	3.72	1.70	24.83	3.85	4.48	2.92
South Asia	25.81	16.22	10.40	13.41	31.42	14.66	19.86	13.07	17.12	17.68
Sub-Saharan Africa	30.71	23.85	22.69	24.21	35.78	37.26	36.50	35.70	37.74	35.61
World	12.46	18.66	7.40	8.91	17.20	11.62	21.38	10.84	12.64	12.07

*These regions are based on Ferreira et al (2015).

The regional figures are based on available PPPs within regions.

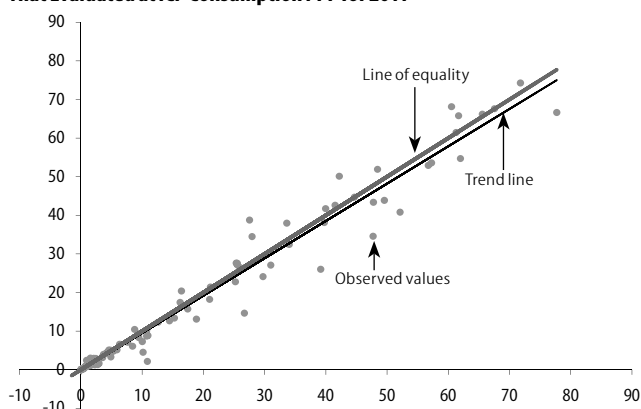
Source: Table generated by the authors using price and expenditure information supplied to them by the ICP group in the World Bank.

Figure 4: Headcount Ratios (in Percentages) Evaluated at CPD PPP against That Evaluated at ICP Consumption PPP for 2005



Source: Computed by the authors from "PovcalNet: The Online Tool for Poverty Measurement Developed by the Development Research Group of the World Bank" at <http://iresearch.worldbank.org/PovcalNet>.

Figure 5: Headcount Ratios (in percentages) Evaluated at CPD PPP against That Evaluated at ICP Consumption PPP for 2011



Source: Authors' computation from "PovcalNet: The Online Tool for Poverty Measurement Developed by the Development Research Group of the World Bank," <http://iresearch.worldbank.org/PovcalNet>.

weights, than those used in updating the national poverty lines. Majumder et al 2016, Table 2) provide evidence which suggests that this discrepancy can be considerable and varies between alternative sets of PPPs.

Table 4 presents the regional poverty rates under the alternative sets of PPPs in 2005 and 2011, where the regions are defined as those in Ferreira et al (2015). The regional figures are based on available PPPs within regions. This table allows a direct comparison with the figures for 2011 at \$1.90 IPL in Table 8 of Ferreira et al (2015). Note that the figures for PPPs estimated by ICP will not be identical with those in Ferreira et al (2015) since the poverty rates in Table 4 are based on the poverty lines derived in this study and the list of countries is close but not identical between the two studies. The two sets of ICP poverty rates compare reasonably well with one another, especially for East Asia and Pacific, and Latin America and the Caribbean.

Table 4 shows that the decline in poverty rates in South Asia based on ICP PPPs between 2005 and 2011 contrasts with an increase in poverty based on the counterfactual, Fisher, and Tornqvist PPPs, but there is close agreement between the trend in ICP and CPD-based poverty rates in South Asia. Note, however, that in the most populous South Asia region, the ICP poverty rates understate the magnitude of poverty in relation to the CPD poverty rates. Note, also, that the increase in poverty rate in Sub-Saharan Africa between the two ICP rounds was much larger in three of the non-ICP PPPs than the ICP PPPs. In contrast, the CPD poverty rate in Sub-Saharan Africa hardly moved between the two ICP rounds in contrast to the other PPP-based poverty rates. Majumder et al (2016) present the poverty rates for individual countries that show similar non-robustness of the country poverty rates and their changes between 2005 and 2011 to departures from use of the ICP PPPs.

Further evidence on the sensitivity of poverty rates to PPP is contained in Figures 4 and 5 (p 50) which contain the plot of country poverty rates (%) between ICP PPP (x-axis) and CPD PPP (y-axis) in 2005 and 2011 respectively. Location of the country plots in relation to the line of equality shows departure from invariance to the PPP. There is a wide measure of disagreement on poverty rates between the CPD and ICP PPPs in 2005, with the ICP PPPs underestimating poverty in relation to the CPD poverty rates in 2005, but this had narrowed down in 2011. Note, however, that even in 2011, for several of the poorer countries with high poverty rates, the ICP and CPD poverty rates differ markedly unlike in the richer countries.

3 Concluding Remarks

This study takes place against the background of the publication of the ICP 2011 PPPs and their use in calculating global poverty rates in several recent studies. There is a close connection between PPPs and poverty rate estimation, since PPPs allow the conversion of the IPL denominated in a numeraire currency into local currency-denominated national poverty lines of the various countries. Hence, accurate estimates of the former (that is PPPs) are required to produce reliable estimates of the latter (global poverty rate). With poverty reduction figuring prominently in both MDG and SDG sets of goals, the topic of global poverty and the estimation of poverty rates has taken on an importance of its own. The recommendation of the “Commission of Global Poverty” set up by the World Bank in April 2016 underlines this importance.

The immediate trigger for this paper is the need to provide a critique of the study by Ferreira et al (2015) that provides global poverty rates. Enjoying the patronage and platform of the World Bank, since all the authors are members of the “Poverty Global Practice and the Development Data and Research Groups of the World Bank,” the paper by Ferreira et al (2015) has received considerable media attention and is regarded as the (unofficial) view of the World Bank. This paper reports the sensitivity of poverty rates to PPPs, not just ICP PPPs, at the global and regional levels. Since lack of public access to the expenditure and price information collected by the ICPS prevents the construction of non-ICP PPPs as a counterfactual, all

the poverty studies have used the ICP PPPs from either the 2005 or the 2011 rounds or both.

With the ICP allowing us access to limited information, this study presents global and regional poverty rates using both ICP and non-ICP PPPs that either do not use the price information at all or they do use the price information but adopt a different methodology to the “ring country” approach of the ICP. The high degree of sensitivity of PPPs to the procedure used to calculate them, and the poverty rates to the PPPs used, suggest that the Ferreira et al (2015) results are unlikely to be robust and should not be used to derive policy conclusions on the magnitude and trends in world poverty. More generally, the results reported in this paper show that one does not have to work with the ICP PPPs as most poverty enumerators have done, but we need to go outside the ICP framework to provide a range of poverty estimates that allow the policymaker to try to come to robust judgments on the state of world poverty today. This paper proposes a novel methodology for PPP estimation that does not require the price information that most researchers, outside the World Bank, do not have access to.

This study also draws attention to a serious methodological flaw in Ferreira et al (2015) that follows from the way they define an IPL and temporally update that line based on PPP revisions alone without regard to the cost of living based revision of the national poverty lines. Consequently, a large divergence opens up between the IPL converted to a country’s national currency at the updated PPP and the temporally adjusted national poverty line, in line with local inflation. Since the items that enter the PPP calculations are quite different (or have different weights) from the ones that enter the CPI calculations in individual countries, large differences open up between the two sets of local currency denominated poverty lines.

While this study is not the first to draw attention to the mismatch between IPL and national poverty lines, it draws attention to empirical evidence produced by the authors in a background paper on the magnitude of the divergence that seriously influences the IPL-based poverty rates. The paper also argues that the choice of “15 poorest countries” to determine the IPL is ad hoc and leads to the absurd implication that the world’s poverty rates, notably those in the two most populous countries, China and India, can change sharply if the national poverty line in any of these “15 poorest countries” changes significantly.

The interest of this paper is wider than just poverty estimation. It also deals with the issue of PPPs that have become quite a sensitive topic, especially with the governments of large economies such as those of China and India, in view of the role they play in living standards comparisons and in the global ranking of the economies based on the size of their GDP. The methodological contribution of this paper is to open up the subject of PPP estimation and their use in poverty enumeration to a wider group of researchers than has been the case before. The aim of this paper is not to establish the pre-eminence of the alternative counterfactual PPP procedure offered here but to demonstrate the need for further research on other non-ICP PPP’s. The World Bank, which is the custodian of global poverty

statistics, should reciprocate by allowing public access to the unit record household survey data from different countries to allow researchers to estimate their own PPPs and open up the PovcalNet software and its data base to non-World Bank users for scrutiny, modification, and improvement.

The TCLI index, proposed and used here for the first time in estimating worldwide PPPs, referred to as “counterfactual PPPs” in this study, provides an alternative set of PPPs for benchmarking the ICP PPPs. However, for its proper implementation,

it required the detailed household budget surveys for each country in unit record form that we were denied access to by the World Bank. Until the World Bank reviews its policy of not allowing full data access to independent (that is non-World Bank) researchers to construct their own set of PPPs required in estimates of global poverty, the validity of global poverty estimates provided in World Bank studies such as Ferreira et al (2015) will always be subject to doubt.

NOTES

- 1 See <http://www.un.org/millenniumgoals/2014%20MDG%20report/MDG%202014%20English%20web.pdf>.
- 2 The economist contacted by Ray during his visit to the World Bank in June 2015 was Olivier Dupriez, who is with the Development Economics Data Group, World Bank.
- 3 <http://iresearch.worldbank.org/PovcalNet>.
- 4 It, however, calculates the TCLI for a given reference level of utility, which in our case is taken to be the one corresponding to the median level income of the base country, India. For more details on the counterfactual PPP estimation procedure in the cross country context, please see Majumder et al (2015).

REFERENCES

Balassa, B (1964): “The Purchasing Power Parity Doctrine: A Reappraisal,” *Journal of Political Economy*, Vol 72, No 6, pp 584–96.

Chen, S and M Ravallion (2010): “The Developing World Is Poorer Than We Thought, but No Less Successful in the Fight against Poverty,” *Quarterly Journal of Economics*, Vol 125, No 4, pp 1577–1625.

Coondoo, D, A Majumder and S Chattopadhyay (2011): “Estimating Spatial Consumer Price Indices through Engel Curve Analysis,” *Review*

of Income and Wealth, Vol 57, No 1, pp 138–55.

Deaton, A and O Dupriez (2011): “Purchasing Power Parity Exchange Rates for the Global Poor,” *American Economic Journal: Applied Economics*, Vol 3, pp 137–66.

Diewert, E W (2005): “Weighted Country Product Dummy Variable Regressions and Index Number Formulae,” *Review of Income and Wealth*, Vol 51, No 4, pp 561–70.

Dykstra, S, B Dykstra and J Sandefur (2014a): “We Just Ran Twenty-three Million Queries of the World Bank’s Website,” Working Paper 362, Centre for Global Development.

— (2014b): “Global Absolute Poverty Fell by Almost, Half on Tuesday,” Centre for Global Development, <http://www.cgdev.org/blog/global-absolute-poverty-fell-almost-half-tuesday>.

Ferreira, F, S Chen, A Dabalén, Y Dikhanov, N Hamadeh, D Jolliffe, A Narayan, E Prydz, A Revença, P Sangraula, U Serajuddin and N Yoshida (2015): “A Global Count of the Extreme Poor in 2012: Data Issues, Methodology and Initial Results,” Policy Research Working Paper 7432, Washington DC: World Bank Group.

Majumder, A, R Ray and S Santra (2015): “Preferences, Purchasing Power Parity, and Inequality: Analytical Framework, Propositions, and Empirical Evidence,” Policy Research Working Paper 7395, World Bank.

— (2016): “Global and Country Poverty Rates, Welfare Rankings of the Regions and Purchasing

Power Parities: How Robust Are the Results,” Monash University Economics Discussion Paper.

Rao, D S Prasad (1995): “On the Equivalence of the Generalized Country-Product-Dummy (CPD) Method and the Rao-System for Multilateral Comparisons,” Working Paper No 5, Centre for International Comparisons, University of Pennsylvania, Philadelphia.

Reddy, S and T Pogge (2007): “How Not to Count the Poor,” *Measuring Global Poverty*, S Anand and J Stiglitz (eds), Oxford University Press: Oxford.

Samuelson, P (1964): “Theoretical Notes on Trade Problems,” *Review of Economics and Statistics*, Vol 46, No 2, pp 145–54.

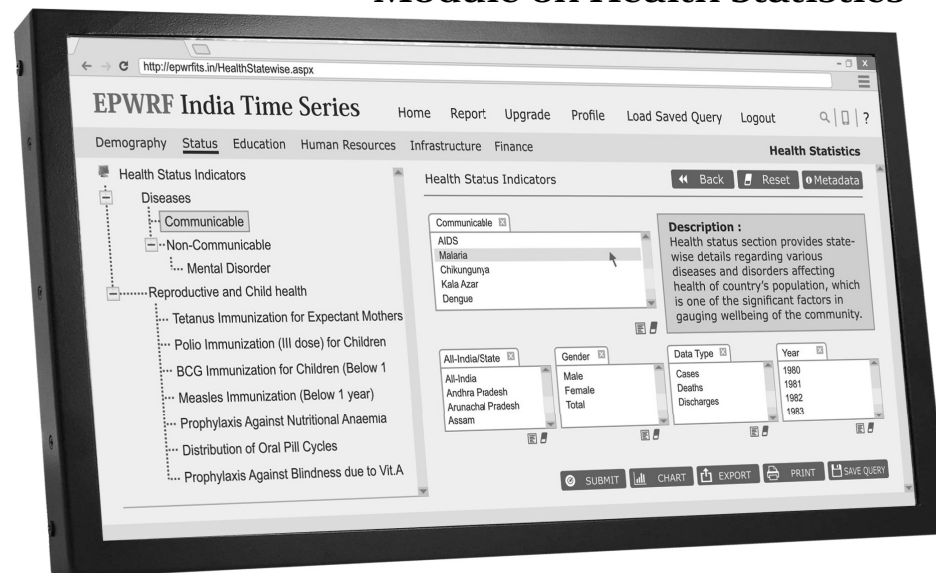
Subramanian, S (2015): “Once More unto the Breach... The World Bank’s Latest ‘Assault’ on Global Poverty,” *Economic & Political Weekly*, Vol 45, No 1, pp 35–40.

Summers, R (1973): “International Price Comparisons Based Upon Incomplete Data,” *Review of Income and Wealth*, Vol 19, No 1, pp 1–16.

World Bank (2008): “Global Purchasing Power Parities and Real Expenditures: 2005 International Comparison Program,” World Bank, Washington DC.

— (2015): “Purchasing Power Parities and the Real Size of World Economies: A Comprehensive Report of the 2011 International Comparison Program,” World Bank, Washington DC.

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