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An even higher global inequality than previously thought:
A note on global inequality calculations using the 2005 ICP results

Branko Milanovic[1]

Introduction

The results of the most recent 2005 round of International Comparison Program (ICP), published in the December 2007 Report, allow us to obtain a much more precise estimates of global poverty and inequality than it was ever possible.[2] The new estimates of purchasing power parity (PPP) exchange rates for 146 countries, and hence of their GDP per capita in PPP terms, are not only the most recent and best estimates that we have, and the survey, "the most comprehensive survey of prices ever undertaken" (as The Report states, p.6), but for a number of countries they are the first such estimates obtained from direct price comparisons.[3] China has for the first time participated in the ICP project. Previous estimates of Chinese PPP exchange rates were based on a 1986 research study. Similarly, India has participated for the first time since 1985. Up to now, the PPP estimates for India were based on extrapolations of the 1985 results. The price comparisons now include 48 African countries, more than ever before. This round is also the first global round in twelve years: the last one having been conducted in 1993.[4]

[1] World Bank, Development Research. The views expressed are my own and should not be attributed to the World Bank and its affiliated organizations. All calculations are preliminary.

[2] *2005 International Comparison Program*: Preliminary Results, 17 December 2007. Available at http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/ICPEXT/0,,menuPK:1973757~pagePK:62002243~piPK:62002387~theSitePK:270065,00.html.

[3] The number of participating countries has increased from 118 in the previous round (1993) to 146 now.

[4] One can consider the first global ICP to be the one conducted in 1980 (see Ahmad, no date). The earlier, much smaller rounds, limited to developed economies, were done in 1970, 1973 and 1975.

The results of the current round of ICP do not differ from the past only in terms of better country coverage but also in methodology, and the scope of direct price comparisons.[5] Prices of more than 1000 goods and services were compared across countries, using the assistance of national statistical offices and regional statistical organizations (Asian Development Bank, Eurostat, Statistics Canada, Economic Commission for Latin America etc.). The project was organized around six regions (Africa, Asia/Pacific, CIS, South America, OECD/Eurostat, and Western Asia). The methodological innovation introduced in this round of ICP was the concept of "ring" countries. These are countries (ranging between 2 and 6 from each region) with developed market economies and wide range of goods and services such that direct price comparisons (using the same basket of goods and services) can be made between them. Prices of about 1200 goods and services were directly compared for the ring countries (see The Report, p. 53). Using the results from the ring countries' price comparisons, the price levels for other countries belonging to a given region were linked to the rest of the world.[6]

The results have received wide attention both because of the importance of the countries that for the first (or almost first) time participated in the project, and the extent of revisions of the previous GDPPPP per capita estimates for China and India. As the price levels of India and China are now estimated much higher than previously, the GDPs per capita of these two countries were revised downward by about 40 percent (Table 1).[7] But while these downward revisions are among the largest, that are not the only ones.

[5] "[The 2005 round] is the most comprehensive and firmly-based ICP round to date" (Australian Bureau of Statistics, 2006, p. 13).

[6] In the past, the "linkage" was done using the individual "bridge" countries that would belong to both regions. This, for example, in the 1993 round, Austria was used to link OECD countries' prices with those of transition economies. In this round of ICP, two countries continued to serve as "bridges": Egypt (between West Asia and Africa), and Russia (between OECD/Eurostat and CIS). The ring approach is much more data intensive because it requires direct price comparison of the same bundle of goods and services to be conducted in all "ring" countries (18 in total). One of ICP requirements ("fixity") is that the relative price level of a country or its relative GDP per capita (that is, compared to other countries in the region) does not change when the region is "broadened", that is, when countries in the region are included in comparison with the rest of the world.

[7] In the rest of the text, and unless specifically stated otherwise, all references to GDP or GDP per capita are references to these aggregates estimated in international dollars.

Indonesia's GDP per capita was revised downward by 17 percent, Philippines's by 41 percent, Ghana's by 50 percent, Argentina's by 24 percent, South Africa's by 32 percent. The upward revisions were less frequent and more modest: Russia's GDP per capita turned out to be 7 percent higher than previously thought, Mexico's about 9 percent, and Nigeria's GDP per capita (the largest upward revision among the populous countries) is now estimated to be almost 58 percent higher. For the advanced economies, the differences between the direct price comparison from this round of ICP, and the previously-used extrapolations from the 1993 round, are relatively small ranging around 3 and 4 percent. For the US, UK and Japan, the revisions are 2 to 3 percent down, for Germany 4 percent up. By region, the largest population-weighted revisions were for Asia/Pacific, where GDP per capita was revised 33 percent downward, followed by Africa (about 4 percent down). For other regions, the revisions were, on average, small (around 1 percent). [8]

Table 1. New GDPPPP values compared to the earlier WDI data
(the most populous countries only; year 2005)

	GDP per capita in WDI dataset	GDP per capita in ICP dataset	Revision (in percent)
Vietnam	3106	2142	-31.0
Philippines	4991	2932	-41.3
Mexico	10356	11317	+9.3
Japan	31262	30290	-3.1
Nigeria	1200	1892	+57.7
Bangladesh	2025	1268	-37.4
Russian Federation	11053	11861	+7.3
Pakistan	2437	2396	-1.7
Brazil	8854	8606	-2.8
Indonesia	3898	3234	-17.0
United States	42454	41674	-1.8
India	3536	2126	-39.9
China	6666	4091	-38.6

Note. The WDI 2005 GDPs per capita are expressed in 2000 international dollars. These values were converted into the 2005 international dollars (to make them comparable to the ICP results) by using the increase in the US Consumer price index between 2000 and 2005.

[8] The GDP per capita values for West Asia (Middle East) were revised upward, at times significantly. The sample size however is small and GDP data for some of countries included in the ICP are not available in the World Bank database (e.g., Iraq, Qatar, Oman), thus making the comparison incomplete.

Concept 1 and Concept 2 inequality: new estimates

The objective of this note is to present the estimates of inter-country inequality (Concept 1), population-weighted inter-country inequality (Concept 2), and global inequality between world citizens (Concept 3) using the new estimates of PPPs.

The first two concepts have generally been calculated using GDP per capita (see Milanovic 2005) because GDP per capita and population figures are easily available for most countries in the world at annual intervals. The most important part in this exercise was the conversion of GDP per capita expressed in local currency units into international dollars using PPP exchange raters.

Table 2 shows Concept 1 and Concept 2 inequality calculated using the GDP per capita in PPP dollars as given in the 2005 ICP round, and the estimates of the same two concepts of international inequality using the previously available World Bank estimates of countries' GDPPPP per capita. In both cases, the estimates are for the same year, 2005, and are expressed in 2005 international dollars. The compositions of the two samples is very similar.[9] In both cases, there are 146 countries included, and the population coverage is between 6.1 and 6.2 billion people, or about 95 percent of world population.

Both concepts of inequality are significantly higher when calculated using the new ICP data. If we take the Gini coefficient, the unweighted inter-country inequality is now seen to be 2.6 Gini points higher. The increase is even greater if we look at the population-weighted international inequality (Concept 2). This is not surprising because some of the largest changes have affected (as we have seen) the two most populous countries in the world, China and India. Concept 2 inequality is now estimated at 57.8 Gini points vs. the previous estimate of 51.5 Gini points. This is 6.3 Gini points more. If we exclude China, the increase is 3.6 Gini points, and if we exclude both China and

[9] There are some slight differences though. The WDI data do not include Taiwan (Province of China), Oman, Qatar etc which are all part of the ICP project. On the other hand, the ICP data do not include Algeria, Uzbekistan, and most of the Caribbean countries that are included in the WDI dataset.

India, the increase is 0.8 Gini points. Clearly, the new GDPPPP per capita estimates for these two countries drive the bulk of the increase in international inequality.

The results in Table 2 show that incomes of the richest countries in the two datasets are practically the same. It is the incomes of the poorest countries that are now estimated to be significantly lower than before. The ratio between the top and bottom ten percent of people (ranked by their countries' GDP per capita) goes up from 32 to 1 to almost 39 to 1. The greater change around the bottom of the income distribution can also be inferred from the fact that, for both Concept 1 and Concept 2 inequality, Theil increases in percentage terms are greater than the similar Gini increases. [10]

[10] The value of Theil is more sensitive to the extreme values than the Gini.

Table 2. Calculation of international inequality using the two sets of GDP per capita data

	With World Bank previous GDP per capita estimates	With new ICP 2005 estimates of GDP per capita	Change in Gini/Theil points	Change in Gini/Theil (percent)
Concept 1 inequality				
Gini	55.0	57.6	+2.6	+4.7
	(2.0)	(2.1)		
Theil	51.4	56.6	+5.2	+10.1
	(4.3)	(4.8)		
Concept 2 inequality				
Gini	51.6	57.8	+6.3	+12.2
	(5.1)	(3.9)		
Theil	47.7	60.5	+12.8	+26.8
	(7.9)	(8.1)		
Gini without China	55.6	59.2	+3.6	+6.5
	(3.1)	(3.5)		
Gini without China and India	54.2	55.0	+0.8	+1.5
	(3.2)	(3.6)		
Average income of top 10 percent of population (in 2005 $PPP)*	1155	967		
Average income of bottom 10 percent of population (in 2005 $PPP)*	37343	37492		
Top-to-bottom ratio	32.3	38.7		
Inclusion				
Number of countries included	146	146		
Population included (in million)	6202	6127		

Note: Standard error of estimates given between brackets. The number of countries in the two datasets is the same but the countries included are not identical (see footnote above). World Bank previous GDP per capita estimates (given in World Bank Indicators) were based on 2000 international dollars; they are converted here into 2005 international dollars using the US Consumer index increase between the two years (13.4 percent).

* This is population ranked by GDP per capita of own country.

New estimate of global inequality

The calculation of Concept 3 (global) inequality is much more difficult because it requites information from household surveys, that is, information on national income distributions. The most recent update of global inequality, using household survey data from 120 countries, is available for the benchmark year 2002 (Milanovic, 2007). Household per capita incomes, expressed in local currency, were converted into 2002 international dollars using the then available PPP exchange rates provided by the World Bank.

We can make some estimates of how much the level of global inequality might change with the new, more accurate, PPPs. This is done as follows: we assume that in 2002, the difference between the then used PPP exchange rates and the "correct" PPP exchange rates was exactly the same as in 2005. Accordingly, we increase the price levels of China and India, reduce that of Russia etc.[11] With these newly estimated PPP exchange rates, we calculate global inequality in 2002 using (as before) individual-level data from household surveys.[12] The results in Table 3 show that the new global Gini is now estimated to be around 70 Gini points, that is 4.2 Gini points higher than the one calculated using the "old" PPPs. [13] The increase in the Theil index is even greater. This new result, shown together with the "old PPP" based estimates of global inequality spanning the period 1988-2002, is displayed in Figure 1. Obviously, we could do the same adjustment (as just explained) for the earlier years (1988, 1993 and 1998), but the further we go into the past, the less reliable it is to use the relative price levels as obtained from the 2005 ICP. In order to redo the past calculations with the "correct" PPPs, we need to wait for the new retrospective set of annual PPPs to be produced.

[11] For example, Chinese price level which was estimated before to be around 25 percent of world price level is now estimated to be 42 percent.

[12] The number of countries included now drops from 120 to 101 because some of the countries for which we have household survey data (e.g. the Caribbean countries) are not included in the ICP. However, since all of these are small countries, the population coverage does not decrease by much, going from 5.8 billion to 5.67 billion people (see Table 3).

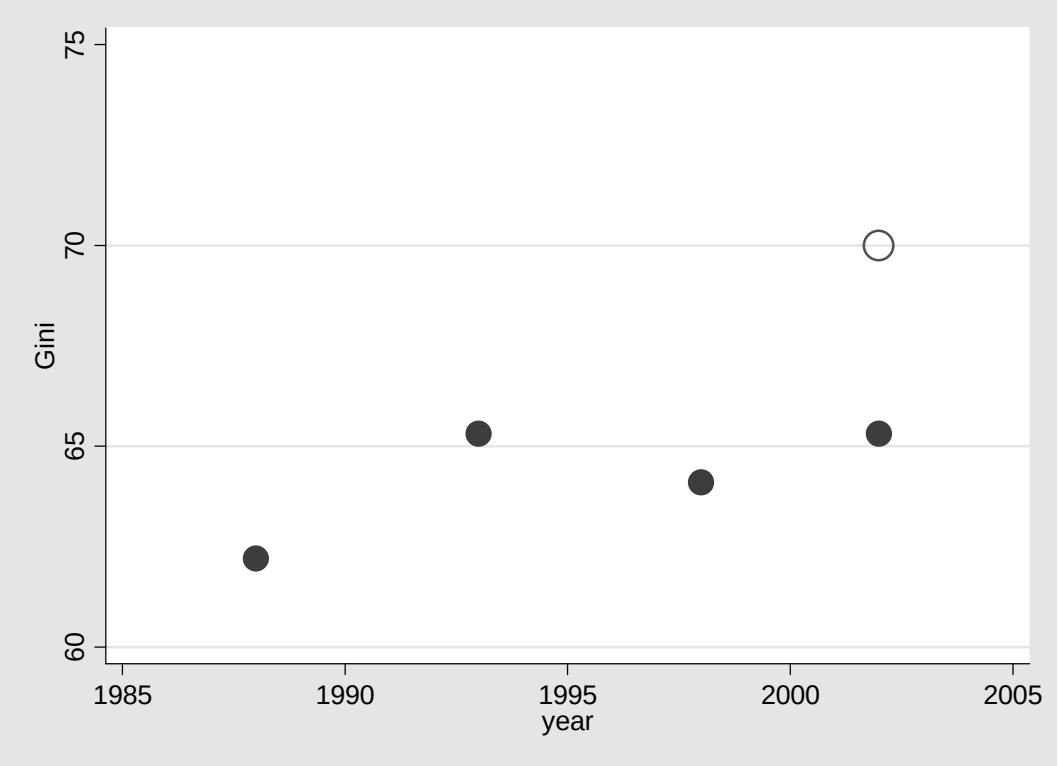
[13] The average income of the top decile is now 91 times greater than the average income of the bottom decile (the ratio was 52 to 1 with the "old" PPPs).

Table 3. Global inequality calculated from household surveys
(year 2002)

	Calculations based on 2002 WYD dataset and "old" 2002 PPPs	Calculations based on 2002 WYD dataset and new PPPs	Change in Gini/Theil points	Change in Gini/Theil (percent)
Gini	65.7	69.9	+4.2	+6.3
	(1.3)	(1.5)		
Theil	83..4	96.6	+13.2	+15.8
	(5.4)	(6.2)		
Number of countries included	120	101		
Population included (in million)	5802	5675		

Note: WYD is World Income Distribution database composed of household surveys data for a number of countries. It is available at http://econ.worldbank.org/projects/inequality. Standard errors shown between brackets.

Figure 1. Global inequality estimates, 1988-2002



Note: Full-dot estimates for years 1988, 1993 and 1993 from Milanovic (2005, p. 108); full-dot estimate for 2002 from Milanovic (2007). Hollow-dot estimate for 2002 based on the assumptions explained in the text.

The new results validate the position of those researchers (Dowrick and Akmal, 2002; Pogge and Reddy 2003; Deaton 2001) who have argued that, among many other uncertainties which bedevil the calculations of global inequality and poverty, one possibly crucial and yet not a very firm building block, is the estimates of PPP exchange rates.[14] This argument, based originally partly on the general problem of index numbers calculations, and partly on some limited empirical evidence, seems to me to have received full vindications in the results of the 2005 International Comparison Program.

Conclusions

The latest round of ICP results has shown that global inequalities are greater than earlier thought. These inequalities are greater in all three aspects: mean countries' incomes (GDPs per capita) are further apart and more unequal, population-weighted mean countries' incomes are significantly more unequal, and so is inequality between world citizens. For the first two inequalities, we can show the exact extent by which the new numbers raise the previously-estimated inequality. Concept 1 inequality is 2.6 points higher, Concept 2 inequality 6.3 Gini points higher. Most of the increase in the latter is due to the new PPP estimates for China and India. Notice however that even after we drop China and India, the increase does not evaporate: it is still present although it is of course much smaller. The conclusion is that the earlier overestimate of poor countries' incomes expressed in international dollars (and based on the extrapolations of the 1993 ICP results) was more systematic in nature, and not confined to China and India alone.

We can also make an estimate of how much greater is global inequality than previously thought. Since the latest benchmark year for which we have detailed household survey data is 2002, we assume that the then used ("old") PPPs were as much misaligned from the "correct" PPPs as in the year 2005. By adjusting household survey incomes (or expenditures) accordingly, we find out that inequality between world citizens amounts to about 70 Gini points, rather than 65-66 points as previously calculated. This means that global inequality is significantly greater than inequality found in any

[14] I have to admit that I did not think that PPPs were the "weakest link".

individual country in the world: it is some 10 Gini points greater than inequality in Brazil or South Africa. As for its trend, we cannot say much until the new retrospective estimates of PPPs, based on this round's results, are produced for earlier years. This would allow us to link the new results presented here to the past.

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