What is New in PWT 6.3?

Note of appreciation: The principal staff member responsible for preparing PWT 6.3 is Programmer Analyst Ye Wang. Her technical competence and careful checking of my instructions eliminated many potential errors in this update of PWT. From time to time, I have also been aided by student Research Assistants Sha Li, Prabesh Regmi, YinYin Yu, and Eric Fischer. I would like to thank them and especially Ye Wang for their assistance in bringing out PWT6.3. Remaining errors are mine and as always we are grateful to users for calling them to our attention. Alan Heston

PWT 6.3: Purpose and Changes from earlier versions of PWT

Purpose

The reference year for PWT 6.3 is 2005, which is also the reference year for ICP 2005, the major new benchmark comparison coordinated by the World Bank involving 146 countries.[1] With a few exceptions, PWT 6.3 does not incorporate ICP 2005; rather this will be done in PWT 7.0. The purpose of PWT 6.3 is to provide a link for users who may wish to go between the old and new versions of PWT. Any user wishing to work with what we think is the better set of PPP conversions for 2005 should use PWT 7.0, which hopefully will be available in the last quarter of 2009. Those, whose interest is in EU/OECD countries and their associates, should consult their respective websites. A principal difference between the estimates in PWT and those in the EU-OECD countries or other regions is that the latter retain the relationships within their country groups while linking to other regions; PWT does not.

Important Additions and Changes

Background

The most frequently used variables in PWT are per capita GDPs of countries converted at PPPs and growth rates of per capita GDP. PWT 6.3 presents these variables in the form they have been available in previous versions and also adds alternative series that are now thought preferable or complementary to earlier PWT estimates.

[1] The link to the World Bank report on ICP 2005 is: http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/ICPEXT; the hardcopy was published in July, 2008. In addition regional reports are available on the Bank website and on regional websites.

Growth Rates

The growth rates in previous PWTs will be provided. However, work by Simon Johnson, William Larson, Chris Papageorgiou and Arvind Subramanian (2008), "Is Newer Better? The Penn World Table Revisions and the Cross-Country Growth Literature", paper presented at the CRIW-NBER session, Cambridge, July 14-15, 2009, (hereafter JLPS), have documented some inconsistencies between versions of PWT. In particular, when the reference year in PWT is changed as between PWT 6.1 and 6.2, sizeable differences in growth rates can arise, particularly for non-OECD countries. This has led us to also introduce modifications of the growth rate of RGDPL in PWT 6.3. This new version will be labeled simply RGDPL2. It is expected that the growth rates derived from RGDPL2 will be more stable between different versions of PWT than growth rates of RGCPCH and RGDPL. The reason for this is as follows.

RGDPCH is a chain index that uses current price weights of C, I, and G. These were applied to the growth rates of these three components to derive a chain growth rate of domestic absorption (DA).[2] This growth rate was then applied to the DA of the previous year going forward from the reference year or to the current year if going backward from the reference year. The real value of the net foreign balance was then added to the constant price DA to obtain RGDPCH. One reason that this method is not as stable as anticipated is that the shares weighting the initial growth rates may change with a change in reference year, such as occurs for different versions of PWT. In order to provide more stability between benchmark comparisons, the shares of C, I and G were typically smoothed between different reference years/versions of PWT. However, the analysis of JLPS makes it clear that this was not enough to produce stability between reference years.

RGDPL2

RGDPL is a fixed base index using reference year shares. These shares are applied to growth rates of the components, C, I, and G in other years. The totals plus the net foreign balance are summed to derive RGDPL. The alternative, RGDPL2, uses the

[2] The 1993 SNA the term 'Gross Domestic Final Expenditures' and the BEA term 'Gross Domestic Purchases' are the same as Domestic Absorption.

growth rate of DA and applies it to the reference year DA to derive real DA in each year. RGDPL2 is then real DA plus the net foreign balance. It will differ from national growth rates of GDP only by the difference between the value of the net foreign balance relative to GDP in national prices and the prices used in PWT. The reference year shares of C, I, and G will not play a role in the way they do for RGDPL and RGDPCH in PWT 6.2 and earlier versions.

Reference Year Levels of GDP at PPPs

Current year levels of GDP in PWT are labeled CGDP. In each year the expenditures in national currencies and PPPs of C, I, and G are aggregated to estimate the value of DA for each country in current international reference prices. The Geary-Khamis (G-K) aggregation method, which was used in the early benchmark ICPs, has been used in PWT, and is also provided in PWT 6.3. When expressed as a percent of the US per capita GDP, this index is labeled 'y' in all versions of PWT. It is a method analogous to national income accounts in that it weights each country by its economic size. Because G-K uses common reference prices for C, I, and G for all countries, it is additive; however, it also does not permit the quantities of countries to adjust to these prices, so it is not a superlative index. (For details, see the ICP manual on the Bank website). The most commonly used superlative index is EKS, and there are others.[3] These indexes weight each country like the United Nations General Assembly, one country, one vote. All of these methods are much closer to each other than they are to exchange rate conversions of national currency expenditures.

The user is provided two other aggregations in addition to 'y' derived from G-K, 'yEKS' derived from the EKS aggregation technique and 'yCPDW', the weighted CPD, or Rao method (CPDW). Rao has shown that CPDW is equivalent to a geometric form of G-K. Both the EKS and CPDW are superlative methods and are non-additive. Typically EKS aggregations are done at each published level, for example food, household consumption or GDP. Adding all the component EKS values of GDP for a

[3] In addition to the indexes introduced in PWT 6.3, in PWT 7.0, the use of the GAIA (Geary-Allen International Accounts) method developed by J. Peter Neary (*Rationalizing the Penn World Table: True Multilateral Indices for International Comparisons of Real Income*, American Economic Review, Dec. 2004) will be used.

country will not produce the EKS values for GDP, which is the meaning of non-additivity. In PWT, these aggregations are only carried out over the 3 components, C, I, and G, whereas in benchmark comparisons there will be 130 basic headings. The various methods will tend to produce much closer results when there are fewer components; as a consequence, 'y', 'yEKS', and 'yCPDW' do not show large differences.

The inputs for all of these methods are basic heading parities and national currency expenditures on GDP. The EKS method uses Fisher indexes between all possible pairs of countries, over 16,000 in PWT 6.3. Gini initially dealt with the problem that direct and indirect estimates of the Fisher between a pair of countries were not equal by using least squares to make the results transitive over all pairs of countries. Later Elteto, Koves and Szulc (hence EKS) formalized Gini's method [See a more complete treatment in Deaton and Heston (2008: in the Papers section) where the G-K method is also discussed].

The model underlying the traditional CPD of Robert Summers provides estimates of the price parity at the basic heading level based upon the individual item prices. A weighted version of PWT is given in (1) below. p_n designates the price parity of basic heading c in country n, expressed relative to the exchange rate to, say US dollars. In (1) α_c is the price level for basic heading, c;

$$(1)\ \ln \mathrm{p}_{\mathrm{n}}^{\mathrm{c}} = \alpha_{\mathrm{c}} + \beta_{\mathrm{n}} + \upsilon_{\mathrm{n}}^{\mathrm{c}}$$

and β_n is the log of the average price level for country n. u_n is the error term weighted by the expenditure shares of country n. β_n is the key variable and in arithmetic form is the basis for the entries 'yCPDW' in the data table. The two indexes are expressed as percentages of the US like the variable 'y', and are termed 'yEKS' and 'yCPDW'. They are both computed over DA and the net foreign balance is treated in the same manner as with the G-K aggregation.

Neither EKS nor CPDW provide a breakdown of the components of DA into C, I and G. An implication is that there is no way to derive a chain constant price measure over time for either of these two aggregation techniques in the PWT framework. However, the inputs in each method are available in each year used for the G-K aggregation that produces CGDP and its components. We have used these inputs to obtain yEKS and yCPDW in each year. The relationships between y, yEKS and yCPDW

in each year may vary. However, the growth rates of RGDPL and RGDPL2 will be the same for y, yEKS and yCPDW, only the levels may differ.

The Special Case of China

In the 2005 ICP benchmark comparison, China provided detailed expenditures and urban prices from 11 major cities and their immediate hinterlands. The Asian Development Bank moved these urban prices on a national basis in their Asia/Pacific region and they were linked by the World Bank to other world regions; the result was that in per capita GDP terms China is 40% lower in 2005 than earlier estimates of the World Bank or PWT. As will be discussed in the documentation of PWT 7.0, it seems likely that the ICP estimate for China in 2005 is too low and PWT too high. However, the purpose of PWT 6.3 is to provide a link to previous versions of PWT, so China's GDP is maintained at a starting level similar to PWT 6.1 and 6.2.

Further we offer one version of China that mirrors the official growth rate of GDP, which was the rate of growth used in PWT 6.2. However, a number of observers (including the producers of PWT) have noted that official growth rates do suggest improbably low levels of per capita GDP going backwards to 1970, and the situation is, if anything worse, before 1970. A more detailed discussion is in Heston (2008 in the Papers section of the PWT site).

Users are offered a choice of 2 Chinas in PWT6.3: 'China Version 1' uses the official growth rates for the whole period as in PWT 6.2; in 'China Version 2', PWT 6.3 uses the recent modifications of official Chinese growth rates contained in Maddison and Wu (2007 in the Papers section of the PWT site) for the period before 1990, and apply the modification of the official rate from 1995-2000 to the official rate after 2000. It is our view that 'China Version 2' provides a more consistent recent economic history of China relative to other countries.

Output per Worker Measures

Previous versions of PWT provided a variable termed output per worker (RGDPWOK). It was the ratio of RGDPCH to a census labor force estimate from surveys of the International Labour Office (ILO). This was the most widely available

measure available when it was introduced into PWT, and it undoubtedly was an improvement over RGDPCH that some users had employed as a productivity measure. But it is not a satisfactory measure of labor productivity. Better measures would be output per fully employed worker, or output per hour. Still better would be output per hour employed by industry, such as is produced by the Groningen Growth and Development Center (GGDC) for many OECD countries. The GGDC also has developed estimates of employment for a number of important developing countries that are used in PWT 6.3. Marcel Timmer and Abdul Erumban have assisted us into incorporating these estimates for which we are most grateful.

The old measure is retained but the source is now the US Census and we use as the numerator RGDPL2*POP. RGDPL2WOK then is RGDPL2*POP/Workers, where the definition of the denominator that in practice may vary by country is roughly:

Workers includes all status categories of persons in employment, not only employees--including paid family workers but also employers, own-account workers, members of producers cooperatives, contributing family workers and workers not classifiable by status.

One can easily construct other current or constant price numerators as their values, along with RL2 are provided in the table.

Some countries supply additional estimates of output per worker for one to three more meaningful concepts of labor force participation. The most readily available is Persons Engaged and the associated variable RGDPL2PE, which is RGDPL2*POP/Persons Engaged. A definition of the denominator, again with country variability is:

Persons aged 15 years and over, who during the reference week performed work, even just for one hour a week, or were not at work but had a job or business from which they were temporarily absent. Includes self-employed.

The variable RGDPL2TE uses as its numerator RGDPL2*POP and its denominator Total Employment. An approximate definition of Total Employment is:

Total Employment includes: 1) civilian employment includes all those employed above a specified age who do during a specified brief period, either one week or one day, were in the following categories: Paid employment, Employers and self-employed, and Unpaid family workers, and 2) members of the armed forces.

Typically Total Employment is less than Persons Engaged.

The final concept is RGDPL2TH, where the numerator is again RGDPL2*POP and the denominator is total hours worked by employees, which is mainly available for OECD countries.