

**Data Appendix for a Space-Time System of National Accounts:  
Penn World Table 6.1 (PWT 6.1)**

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## I Introduction

This is an Update of what appeared with PWT 5.6 which in turn was based upon Appendix B of "The Penn World Table (Mark 5): An Expanded Set of International Comparisons, 1950- 1988," The Quarterly Journal of Economics, May, 1991. This appendix is intended to be self-contained with respect to PWT 6.0, but does not contain documentation specific to PWT 5.6 or earlier.

NOTE BENE: Some column numbers have been changed from earlier versions and some changes in definitions of variables and variable designations have been made. In previous versions of PWT the data table has been referred to as a System of Real National Accounts or SRNA, following the United Nations System of National Accounts. Subsequent to using the term SRNA a revised SNA has been adopted by the United Nations that explicitly deals with place-to-place comparisons both nationally and internationally. Because the revised SNA explicitly endorses purchasing power parity (PPP) based conversions across space, we have adopted Space-Time System of National Accounts as a preferred description of our table.

## II Description of Entries in PWT

### A General Variables

1. Population: **Pop** [1]

Population is from the World Bank World Development Indicators 2001, and United Nations Development Centre sources prior to 1960

2. Exchange rate: **XRAT** [2]

Prior to 1960 exchange rates are UN Development Centre Sources; From 1960-1988 from UN and World Bank sources, usually the same as the IMF annual rate. Taiwan's exchange rate is from national sources after 1975.

3. Purchasing power parity: **PPP** [3]

Purchasing power parity is the number of currency units required to buy goods equivalent to what can be bought with one unit of the base country. We calculated our PPP over GDP. That is, our PPP is the national currency value of GDP divided by the real value of GDP in international dollars. International dollar has the same purchasing power over total U.S. GDP as the U.S. dollar in a given base year (1996 in PWT 6.1).

### B Current Price Entries

**1996**

## 1. Real gross domestic product per capita: **CGDP** [4]

Real Gross Domestic Product per capita and components for 1996 are obtained from an aggregation using price parities and domestic currency expenditures for consumption, investment and government of August 2001 vintage. For countries that were not in the 1996 benchmark study, the price parities are estimated using either a short-cut method or extrapolated from previous benchmarks as discussed in [Section B 3](#) below.

### a. Benchmark countries

The use of benchmark data through 1990 has been discussed in the appendix to PWT 5.6. PWT 6.0 uses a substantially larger and more recent, but not necessarily better quality, data benchmark that relates to 1996. The data set consisted of 32 heading parities and expenditure shares that were put together by the World Bank for 115 countries from various regional UN ICP comparisons. The underlying data set combined the benchmark comparisons of the EU, OECD, and other European and former Soviet Union countries for 1996, a total of 52 countries; the World Bank then updated the 1993 benchmark ICP comparisons for 14 ESCAP countries, 22 African countries, 12 Caribbean countries and 8 ECWA countries to 1996 and combined these with the results for 9 South American countries for 1996. (The total of 117 double counts Japan in the OECD and ESCAP and Egypt in Africa and ECWA). The data then combine International Comparison Programme benchmark comparisons in different regions for either 1993 or 1996, with the former being brought forward to 1996. The linking of the various regions was done in different ways, usually with a link country like Japan for ESCAP, and the United States for Africa, and South America and the Caribbean.

Many scholars are seeking better ways to aggregate the basic ICP inputs for the estimation of real product across countries. Interested users are referred to the papers posted by the OECD (<http://www.oecd.org/std/ppp/MTG2001/index.html>) from the Joint World Bank-OECD Seminar on Purchasing Power Parities, 2001, and from the World Bank Conference on the ICP (<http://www.worldbank.org/data/icp/>), 2002. These provide a flavor of some of the issues involved in constructing benchmark comparisons or extensions like PWT. While it is probable that some of the methods may be changed in the next round of PWT, at least for PWT 6.0 the basic methods of estimation are similar to earlier rounds.

### b. Non-Benchmark countries

In earlier versions of PWT, regression equations to estimate purchasing power parities (PPP<sup>1</sup>s) for non-benchmark countries used variables that could be obtained for both benchmark and non-benchmark countries. These were called short-cut estimates. The approach used an estimating equation where the left hand side variable was the per capita domestic currency (DA) converted to international dollars expressed relative to the United States. The right hand side variables were alternative estimates of the left hand side, where national currency DA was converted to dollars using PPPs approximated from indexes developed for setting post-allowances for international employees working abroad. The price information underlying the post-allowances is far from a national average, since the outlet sample typically has an upward bias and expenditure weights are for the relatively affluent. However, the price level in Lagos, Dubai, or Tokyo relative to New York, as

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<sup>1</sup> PPPs are expressed in price level form (divided by the exchange rate relative to the U.S.) to keep the number of decimal places presented in the data table consistent across countries and over time.

measured by post-adjustment surveys, may still contain considerable information that can be used to complement the basic relationship between price levels and per capita real income. However, there have been systematic factors affecting the post-adjustment indices compared to PPPs for DA for countries in Africa in estimating equations underlying earlier versions of PWT. In the estimating equations for PWT with a 1996 base we have also included a dummy variable for Central Asian as well as Southern African countries.

In the estimating equations below the same post-adjustment indexes have been used. The International Civil Service Commission (ICSC) index is published in the Monthly Bulletin of Statistics of the United Nations Statistical Division, usually in September of each year, and covers 105 of the 115 countries in the 1996 benchmark. It provides an index with New York city as a base and is denoted (UN) in the equations below. The other index has been kindly supplied to us over the years by Barry Rodin of Employment Conditions Abroad, (ECA below), an organization based in London with members including multinational firms, governments and non-profit international agencies. ECA produces a number of binary indexes and we have used that of the UK because of its broader coverage for calculations. New York city has been taken as 100 in all of the calculations for 103 countries. The third index is that of the U.S. State Department covering 103 of the 115 countries for 1996. The State Department usually provides housing or a separate housing allowance, and since most post adjustment indexes are relatively weak in this area, we decided to experiment with this index. In the equations the measure of DA derived from the ICSC index this variable is termed  $r(\text{UN})$ , for the ECA estimate,  $r(\text{ECA})$ , and for the State Department,  $r(\text{USS})$ .

Some non-benchmark countries will have only one of the indexes, some two, and many all three of the indexes. Because of this we estimate 7 equations to cover the 7 combinations of index availability in the non-benchmark countries. Below we provide one of the estimating equations for 1996: the one for all 3 indexes along with the same equation for 1985. In all the equations that the ECA index entered, it had a more significant coefficient than the other indexes.

Ln r	Ln r (USS)	Ln r (ECA)	Ln r (UN)	S Africa	C Asia	Intercept	RMSE	Adj R <sup>2</sup>
1985	0.440	0.409	-0.021	-0.197	---	0.075	0.149	0.985
N=40	(.207)	(.130)	(.193)	(.071)		(.059)		
1996	-0.091	0.596	-0.164	-0.166	0.357	0.024	0.276	0.985
N=88	(.250)	(.199)	(.188)	(.071)	(.096)	(.074)		

Clearly the relative importance that each index plays in the estimating equation is affected by the high correlation of each index with the other. However, this lack of stability in parameter estimates does not mean that the estimate for any particular non-benchmark country will lack stability. An important difference in the two equations is that in 1985 only those countries that had been in more than one benchmark country were used while in 1996 all countries in the 1996 benchmark were used. Thus the difference in MSE between the two equations does not necessarily imply that the estimate for a non-benchmark country will be more accurate coming from the 1985 equation. Also, as discussed in [Section B 3](#) below, the 1985 estimating equations do enter into the 1996 estimates for some non-benchmark countries.

The coefficients in the above equation for 1996 were used to estimate a level of DA for each non-benchmark country with all three indexes, and for countries with fewer indexes, similar estimating equations were used.

### c. Special Cases

There are a number of special cases in PWT that required individual treatment. For these countries the input data for 1996 were from other studies or it was not possible to update previous benchmark parities. They fall into four categories, as follows:

1. Countries that have or had centrally planned economies that were in earlier versions of PWT,
2. China
3. Taiwan, Laos, Malaysia and Puerto Rico
4. Countries not included in PWT6.0 for which only estimates of CGDP (but not its components) were possible.

Estimation of their price levels is taken up in [Section B 3](#) below.

## 2. Component shares of CGDP

The component shares of real GDP for 1996 are obtained directly from a multilateral Geary aggregation over all the countries. Shares will not add up to 100 because the denominator includes the net foreign balance.

- a. Consumption Share of CGDP: **CC** [5]
- b. Investment Share of CGDP: **CI** [6]
- c. Government Share of CGDP: **CG** [7]
- d. Net Foreign Balance: **CNFB**

## 3. Price levels

Price Level of GDP (P) is the PPP over GDP divided by the exchange rate times 100. The PPP of GDP or any component is the national currency value divided by the real value in international dollars. The PPP and the exchange rate are both expressed as national currency units per US dollar. The value of P for the United States is made equal to 100.

Price Levels of the components PC, PI, and PG are derived in the same way as the price level of GDP. While the US = 100 over GDP, this is not true for the component shares. The purchasing power parity in domestic currency per \$US for GDP or any component, may be obtained by dividing the price level by 100 and multiplying by the Exchange Rate.

- a. Price Level of Gross domestic product: **P** [8]
- b. Price Level of Consumption: **PC** [9]
- c. Price Level of Government: **PG** [10]
- d. Price Level of Investment: **PI** [11]

### **Benchmark Countries**

For 1996 benchmark countries, the price levels for C, I and G are obtained directly from the aggregation of the 32 basic heading price parities and domestic currency expenditures described in *Section B 1a* above.

### Non-Benchmark Countries

For non-benchmark countries, the price levels are estimated in a two-stage process based on the relationship between nominal and real shares for the benchmark countries. The first stage consists of estimating the real DA for the non-benchmark countries described in 1b above. Once values of real domestic absorption are available for 1996, it is then possible to estimate the real shares for the almost 50 non-benchmark economies for which short cut estimates have been made. This is the second stage described below. Lastly, we obtain the price levels for C, I and G by dividing the nominal (domestic currency) shares by the estimated real shares.

We follow the same procedure used in earlier versions of PWT to estimate share equations based on shares in national currency and real domestic absorption. These equations have been estimated for the 115 benchmark countries in 1996.

Real Share (st.errors)	Nom Share C	Nom Share I	Nom Share G	Real DA	Adj R <sup>2</sup>
Consumption	0.961 (.022)	0.074 (.064)	0.608 (.108)	-0.081 (.022)	0.992
Investment	-0.040 (.019)	0.753 (.049)	-0.132 (.084)	0.176 (.017)	0.943
Government	0.079 (.018)	0.173 (.053)	0.524 (.091)	-0.095 (.018)	0.842

These equations require as input an estimate of Real DA (the real domestic absorption of a country relative to the U.S. = 100), and the shares in national currencies available from the National Accounts file.

Unfortunately, the estimated real share of investment may be negative from the above equation. For example, the estimated real share will be negative with nominal shares, such as .87 for C, .01 for I and .12 for G, with an estimated Real DA of .05. This occurs only for some of the African countries. In these cases, the average price level of the African countries in the 1996 benchmark was used instead of the negative estimate. These countries are Angola, Burundi, Burkino Faso, Central African Federation, Djibouti, Ghana, Gambia, Guinea-Bissau, Mozambique, Mauritania, Namibia, Niger, Chad, Togo and Uganda.

### Special Cases

As noted in *Section B 1c*, there are four sets of countries that were treated individually:

1. Countries that have or had centrally planned economies that were in earlier versions of PWT,
2. China
3. Taiwan, Laos, Malaysia and Puerto Rico
4. Countries not included in PWT6.0 for which only estimates of CGDP (but not its component) were possible.

Some of these estimates are subject to wide margins of error while others have a more solid statistical base. We have therefore assigned a subjective rating scale in Table A to guide the user.

### **Historically Planned Economies, excluding China**

In earlier PWTs we have included 4 countries that have at various times had significant degrees of central planning, China, Hungary, Poland and Yugoslavia. The last 3 countries had full benchmark treatments while China has had only partial study. Hungary and most of the Council of Mutual Economic Assistance countries, including the successor states of the USSR participated in the 1996 benchmark comparisons carried out through the OECD. These countries are now included in PWT 6.0. Where countries have dropped out due to dissolution or consolidation or lack of data, like Yugoslavia (and some successor states) or the former East Germany (DDR), this is noted in **Table B** and our earlier estimates of GDP are repeated.

One other former CMEA country, Vietnam, does not provide national accounts that permit non-benchmark treatment in the main table of PWT 6.0. We have therefore simply provided an estimate for it below that is derived from its relationship to the USSR in the last CMEA study for 1988.

Cuba recently provided national accounts data that allowed us to treat it as a non-benchmark country, but our short-cut estimates were considered high relative to other Caribbean countries, and have not been endorsed by the UNDP, although our estimates are similar to what the World Bank would obtain using their method.

### **China and Taiwan**

For China, the quasi benchmark estimates of price levels of components have been updated to 1996. See "**China Annex to PWT 6.0**". Taiwan has estimates of Yatopolous and Lin (Yotopoulos, Pan A. and Jenn-Yih Lin (1993), "Purchasing Power Parities for Taiwan: The Basic Data for 1985 and International Comparisons", Journal of Economic Development, Korea, No.1.), and we have updated them to 1996.

### **Puerto Rico**

For Puerto Rico, data used in connection with Federal Government COLA program have been adopted to obtain price level estimates. This is described in more detail below.

Puerto Rico has a statistical office that maintains a standard set of national accounts and was included in PWT 5.6. The source of price level data is twofold, neither of which was used in earlier versions. First, the US government pays Federal employees in the continental United States on the basis of locality pay. A base pay schedule is adopted for the continental United States and differentials are estimated based upon surveys of pay in the private sector for comparable occupations in the Federal government. Puerto Rico is not covered by locality pay at present, but by a Cost of Living Allowance (COLA) system administered by the Office of Personnel Management (OPM). However, a survey was carried out for San Juan of occupations by BLS and the results reported by Hilery Z. Simpson ("How do Wages in San Juan compare to wages in the Mainland?" Compensation and Working Conditions, Winter 1998, BLS). The average of 7 blue-collar occupations put wages in Puerto Rico at 56% of the mainland, and for 31 white-collar occupations, 74%. An average based roughly on occupational distribution in Puerto Rico would weight blue collar 1/3 and white-collar 2/3, and would give an average of 68%. To the extent that cost of living is reflected in compensation, then 68 may be taken as the price level for consumption in 1996. However, the COLA estimate based on price surveys, with some special allowances that raise certain categories like transport and housing, puts Puerto

Rico as 105% of Washington D.C. A guess as to the appropriate average of these alternative estimates is 80% of the mainland price level for consumption.

For government it would also seem appropriate to use the compensation survey of 68%. Capital formation is less clear-cut. While wages are lower in construction, construction materials and construction equipment are largely imported, so construction costs are likely to be similar to the mainland. Most capital equipment is imported. From OPM consumption surveys we know that the cost of transport equipment is about 20% higher in Puerto Rico than on the mainland. On net we put the average price level for capital formation at 110% of the mainland.

### **Laos and Malaysia**

Laos and Malaysia both took part in the 1993 ESCAP benchmark in an abbreviated format with the assistance of the World Bank. It was possible to update these estimates to 1996 for Malaysia but not with enough detail to include in the 1996 benchmark. Malaysia had been in an earlier benchmark for 1975 that was the basis for its inclusion in PWT 5.6, and it was also possible to update that estimate to 1996. In addition, it was possible to obtain a short-cut estimate for 1996. These three estimates were combined in the ratio 3/8, 3/8, and 1/4 to arrive at the base estimates for 1996. Laos had been in no previous benchmarks nor did it have national accounts to provide an extrapolation to 1996. It was possible to make a short-cut estimate for 1996. For Laos, price levels of C, I and G for 1996 were taken as 1/2 the 1993 estimates extrapolated to 1996 and 1/2 the 1996 short-cut estimate.

### **Additional countries not in PWT 6.0**

The estimating equation described in *Section B 1a* requires a price index based on post adjustments, and a national currency GDP estimate. These data are available for a number of countries not included in PWT 6.0. Usually these countries do not have an extended time series, even of current price national accounts, and usually no constant price series.

However, as some interest may attach to estimates for these countries, even if only for one year, they are included in Table B. We have also included estimates of even a more casual nature for two CPEs, Viet Nam, and North Korea. These estimates are based on the work of Donald Roy ("Real Product and Income in China, Cuba, North Korea and Vietnam", Development Policy Review, SAGE, London, Vol. 8, 1990, pp. 77-81). Another source for recent price level estimates for Vietnam and North Korea is The World Factbook of the CIA. The spirit of these additions is to stimulate work that may allow reasonable estimates for these countries to be developed in the near future.

### **Reconciliation of Multiple Price Level Estimates for 1996**

In earlier versions of PWT the procedure of "consistentization" was used to account for the fact that benchmark estimates of price levels for countries participating in several rounds will not necessarily be consistent with national accounts constant price series. These issues are more fully set out in Summers and Heston (*Review of Income and Wealth*, 1988) in the references in connection with PWT 4. The notes to PWT 5.0 and 5.6 also set out procedures of previous rounds. In PWT 6.0 there has been no attempt to evaluate the consistency of the 1996 benchmark estimates with previous benchmarks. However, we have in principle taken this into account in that we have integrated the 1985 inputs to PWT 5.6 into our estimates of the inputs of PWT 6.0 as described below.

The reconciliation process carried out for 1985 may be thought of as an averaging of 5 estimates from the extrapolations of the 1970, 1975, 1980, and 1990 benchmarks to 1985, and the 1985 benchmark. Separate averages were calculated for consumption, investment and government.

What has been done for 1996 is similar. One difference is that in 1996 there was only one extrapolation to 1996, namely the 1985 inputs into PWT 5.6 for both benchmark and non-benchmark countries. There were two other indexes that could be available for countries, one the 1996 benchmark estimate for 115 countries, and two the 1996 short-cut estimate. The following sets out the possible situations for any particular country and how the resulting price level for C, I and G was averaged.

### **I. The 115 countries in the 1996 benchmark.**

1. Country had PWT 5.6 1985 estimate based upon benchmarks and was included in the 1996 benchmark. The short-cut estimate for 1996 would not be considered, only the extrapolated and benchmark 1996 estimate.
  - a. If 1985 estimates were based upon more than one benchmark, then 1985 extrapolation was weighted 1/3 and 1996 benchmark 2/3.
  - b. If 1985 estimates were based upon only one benchmark, then 1985 extrapolation was weighted 1/4 and 1996 benchmark 3/4.
2. Country had PWT 5.6 1985 estimate based upon short-cuts, and was a 1996 benchmark. This would include countries like Oman. In this case only the 1996 benchmark estimates were used.
3. Country had PWT 5.6 1985 estimate based upon benchmark estimates, and was a 1996 benchmark. However, the 1985 estimate could not be extrapolated to 1996. This would include countries like the Bahamas. In this case only the 1996 benchmark estimates were used.
4. Country was not included in PWT 5.6 but was a 1996 benchmark. This would include countries like Tajikistan. In this case only the 1996 benchmark estimates were used.

### **II. The remaining countries not in the 1996 benchmark. (non-benchmark and special cases)**

1. Country had PWT 5.6 1985 estimate based upon benchmarks, and it was possible to extrapolate to 1996 and there was a basis for a 1996 short-cut.
  - a. If 1985 estimates were based upon more than one benchmark, then 1985 extrapolation was weighted 3/4 and 1996 short-cut 1/4.
  - b. If 1985 estimates were based upon only one benchmark, then 1985 extrapolation was weighted 2/3 and 1996 short-cut 1/3.
2. Country had PWT 5.6 1985 estimate based upon previous benchmarks, but there was no basis to extrapolate to 1996, nor a basis for a 1996 short-cut estimate. This would include countries not in PWT6.0, like Yugoslavia. Such countries are listed in **Table B.**
3. Country had PWT 5.6 1985 estimate based upon short-cuts. Its 1985 short-cut estimate could be extrapolated to 1996, and there was also a 1996 short-cut estimate available. The 1996 short-cut receives 2/3 and the extrapolation 1/3 weight.
4. Country had PWT 5.6 1985 estimate based upon short-cuts. The 1985 estimate could not be extrapolated forward and there was a 1996 short cut estimate. In this case only the 1996 short-cut estimate is used.
5. Country had PWT 5.6 1985 estimate based upon short-cuts. The 1985 estimate could not be extrapolated forward and there was no 1996 short cut estimate. This is a country like Myanmar.

6. Country was not in PWT 5.6 in 1985. However, it was possible to make a 1996 short-cut estimate for the country. In this case only the 1996 benchmark estimates were used.
7. Country was not in PWT 5.6 in 1985, and it was not possible to make a 1996 short-cut estimate for the country. If an estimate of real GDP can be made for 1985 or 1996, these countries are listed in **Table B**.

As discussed in the *Note on Grading* to **Table A** a measure of variance of estimates was obtained from this averaging process. Where possible the variance of the estimates used in estimating the input price levels for 1996 were computed. The variance calculation would involve either 2 or 3 observations. Where countries had benchmark inputs to both 1985 and 1996, the short-cut estimates were not used in the variance calculation, since it seemed inappropriate to count short-cut estimates against a country if the estimates were not required to obtain the 1996 base price level estimate. For some countries it was not possible to estimate a variance since there was only one set of 1996 estimates. This was appropriately counted against the grade of the country since it typically indicated that its national accounts were weak because there was no basis for extrapolation.

#### 4. Openness: **OPENC** [12]

Exports plus Imports divided by GDP is the total trade as a percentage of GDP. The export and import figures are in national currencies from the World Bank and United Nations data archives. Note that when the export and import figures and GDP are expressed in real values, the value of OPENC will be the same because the price level (conversion factor) for DA and exports and imports is the same.

#### 5. Gross National Product: **CGNP** [13]

From the World Bank and UN data archives the percentage of GNP to GDP has been provided. The user may interpret this percentage as national prices. If one has no information on why the price level of GNP would be different from the price level of GDP (the position of the authors), CGNP can also be treated as though it were in international prices.

#### 6. Current Savings: **CSAVE** [14]

This variable is defined as the percentage share of current savings to GDP and is derived by subtracting CC and CG from 100. Users should note that this measure may substantially differ from the same percentage in national currencies. See *Section B 2 a, c* above.

#### 7. CGDP relative to the United States: **Y** [15]

This is the current per capita GDP expressed relative to the United State (US=100) in each year..

### Other Years

CGDP estimates in current year international prices are derived in all years from Geary aggregations involving all available countries in each year. (In 1996 the total includes all 168 PWT countries while in 1950 it is less than 70 countries). The inputs are the national expenditures on consumption, investment and government and the corresponding price levels. The latter are extrapolated from 1996 by the change in the component deflator relative to the US change. The result of this aggregation is an estimate of the price level for Domestic Absorption (DA). The net foreign balance (NFB) in each year is valued separately at the price level for DA of each country. CGDP is equal to

NFB + DA. In this treatment the price level for CGDP is identical to that for DA. This treatment began with PWT 5.6. The advantage of the approach of PWT 5.6 and 6.0 is that the results are invariant as to which country is taken as *numeraire*, which was not the case in previous versions where the NFB was valued at the exchange rate.

There are also some countries that have current but not constant series and where price levels could not be estimated. We have simply provided non-benchmark estimates for these countries for a given year. In PWT 6.0 we have also make CGDP estimates for these countries for 1996 as described in [Section B 3](#) above.

The reason that we cannot have all countries in all years is that current and constant price national accounts are not available. The constant price are necessary for both the 1996 price estimates as well as to extrapolate the price levels to obtain the inputs for the current price estimates in other years. To take account of the fact that not all countries are available in all years, we have used a weighting system. (While we do not have all countries in the world in 1996, for practical purposes it is the world). The procedure is as follows. Countries in 1996 were divided into 7 groups based upon per capita GDP (CGDP) in a preliminary run for 1996. Countries in 1996 remain in the same group for every other year. The sum of the total real GDP of each group in 1996 is then used to calculate the share of each country in that group. In years other than 1996, the weights of those countries that drop out of a group are allocated among the remaining countries in proportion to the 1996 share within their group. The weights are shown in the [Technical Notes](#) documentation.

## C Constant Price Entries

### 1. Real GDP per capita (Laspeyres): **RGDPL** [16]

RGDPL is obtained by adding up consumption, investment, government and exports, and subtracting imports in any given year. The given year components are obtained by extrapolating the 1996 values in international dollars from the Geary aggregation using national growth rates (see [Section C 6](#) below). It is a fixed base index where the reference year is 1996, hence the designation "L" for Laspeyres.

### 2. Real GDP per capita (Chain): **RGDPCH** [17]

RGDPCH is a chain index obtained by first applying the component growth rates between each pair of consecutive years,  $t-1$  and  $t$  ( $t=1951$  to  $2000$ ), to the current price component shares in year  $t-1$  to obtain the DA growth rate for each year. This DA growth rate for each year  $t$  is then applied backwards and forwards from 1996, and summed to the constant price net foreign balance to obtain the Chain GDP series.

### 3. Real GDP chain per equivalent adult: **RGDPEQA** [18]

The equivalent measure used here assigns a weight of 1.0 to all persons over 15, and 0.5 for those under age 15. See footnote 12 of QJE text for additional information.

### 4. Real GDP chain per worker: **RGDPWOK** [19]

Worker for this variable is usually a census definition based of economically active population. The underlying data are from the International Labour Organization, and have been interpolated for other years.

5. Adjustment for Changes in the Terms of Trade: **RGDPTT** [20]

The RGDPTT variable is Gross Domestic Income and follows the recommended method in the UN System of National Accounts. This revised procedure is also consistent with the current and past treatment of the net foreign balance in PWT. RGDPTT is the 1996 international price value of domestic absorption of a country in a given year plus current exports minus current imports deflated by the deflator and the 1996 PPP of domestic absorption.

6. Openness: **OPENK** [21]

Exports plus Imports divided by RGDPL. This is the constant price equivalent of the OPENC variable and is the total trade as a percentage of GDP.

7. Component shares of RGDPL

- a. Consumption Share of RGDPL: **KC** (formerly c) [22]
- b. Government Share of RGDPL: **KG** (formerly g) [23]
- c. Investment Share of RGDPL: **KI** (formerly i) [24]
- d. Net Foreign Balance: **KNFB**

For 1996 an aggregation is performed over all the benchmark and non-benchmark countries in PWT 6.0. See [Section B 1 and B 2](#) above. This generates a set of current real shares of CGDP (CC, CI, and CG) for 1996. Since 1996 has been taken as the reference year for PWT 6.0, the real shares in constant prices, KC, KI, and KG are the same as the current shares in 1996.

Each component in international dollars is moved to another year by the national accounts growth rate for that component between 1996 and the given year. This includes exports and imports. KC, KI, and KG are obtained by dividing each component by the RGDPL (the sum of the above 3 components) plus exports and minus imports in 1996 prices.

- 8. Capital Stock per Worker: **KapW\*** (*Variables marked with an \* are not yet available*)
- 9. Producers Durables: % of Capital Stock: **KapD\***
- 10. Non Residential Construction: % of Capital Stock: **KapNR\***
- 11. Other Construction: % of Capital Stock: **KapO\***
- 12. Residential Construction: % of Capital Stock: **KapR\***
- 13. Transport Equipment: % of Capital Stock: **KapT\***
- 14. Standard of Living: **STLIV\***
- 15. Net Domestic Product: **KNDP\***
- 16. Growth Rate of RGDPCH: **GRGDPCH** [25]

## III Table A

The list of countries in order of appearance in PWT 6.0, including quality grades, benchmark history and geographical code, are provided in Table A and accompanying notes.

PWT6.0 Order	PWT5.6 Order	Code (ISO)	Country	Benchmark Participation (yes=1)						Region Code	Variance Scale 0-5	Bench- mark Scale 0-2	Data Rank Scale 1-6	Grade A-D
				1996 (1)	1990 (2)	1985 (3)	1980 (4)	1975 (5)	1970 (6)					
1	2	AGO	Angola						4	0	0	1	D	
2	0	ALB	Albania	1					14	5	1	2	C	
3	73	ARG	Argentina	1			1		7	5	2	3	B	
4	0	ARM	Armenia	1					9	5	1	1	C	
5	0	ATG	Antigua	1					8	0	1	3	C	
6	145	AUS	Australia	1	1	1			15	5	2	5	A	
7	116	AUT	Austria	1	1	1	1	1	14	5	2	5	A	
8	0	AZE	Azerbaijan	1					9	5	1	1	C	
9	6	BDI	Burundi						2	4	0	1	C	
10	117	BEL	Belgium	1	1	1	1	1	14	5	2	5	A	
11	3	BEN	Benin	1		1			1	4	2	1	C	
12	5	BFA	Burkina Faso						1	4	0	1	C	
13	86	BGD	Bangladesh	1		1			12	3	2	1	C	
14	118	BGR	Bulgaria	1					14	3	1	2	C	
15	85	BHR	Bahrain	1					5	3	1	3	C	
16	51	BHS	Bahamas	1		1			8	0	2	4	C	
17	0	BLR	Belarus	1					13	0	1	2	D	
18	53	BLZ	Belize	1					8	4	1	2	C	
19	0	BMU	Bermuda	1					8	0	1	6	C	
20	74	BOL	Bolivia	1			1		7	4	2	1	C	
21	75	BRA	Brazil	1			1	1	7	4	2	3	C	
22	52	BRB	Barbados	1		1			8	0	2	5	C	
23	87	BTN	Bhutan						12	0	0	1	D	
24	4	BWA	Botswana	1		1	1		4	1	2	2	C	
25	9	CAF	Central African Republic						2	3	0	1	D	
26	54	CAN	Canada	1	1	1	1		6	5	2	5	A	
27	140	CHE	Switzerland	1	1				14	5	2	6	A	
28	76	CHL	Chile	1			1		7	5	2	3	B	
29	88	CHN	China						10	3	1	2	C	
30	21	CIV	Cote d'Ivoire	1		1	1		1	3	2	1	C	
31	7	CMR	Cameroon	1		1	1		1	3	2	1	C	
32	12	COG	Congo, Republic of	1		1			2	1	2	1	C	
33	77	COL	Colombia				1	1	7	5	2	2	C	
34	11	COM	Comoros						3	0	0	1	D	
35	8	CPV	Cape Verde						1	0	0	2	D	
36	55	CRI	Costa Rica				1		6	4	1	2	C	
37	0	CUB	Cuba						8	0	0	2	D	
38	119	CYP	Cyprus						13	0	0	4	D	
39	0	CZE	Czech Republic	1					14	4	1	4	C	
40	13	DJI	Djibouti						3	0	0	1	D	

PWT6.0 Order	PWT5.6 Order	Code (ISO)	Country	Benchmark Participation (yes=1)						Region Code	Variance Scale 0-5	Bench- mark Scale 0-2	Data Rank Scale 1-6	Grade A-D
				1996 (1)	1990 (2)	1985 (3)	1980 (4)	1975 (5)	1970 (6)					
41	56	DMA	Dominica	1						8	5	1	2	C
42	121	DNK	Denmark	1	1	1	1	1		14	5	2	6	A
43	57	DOM	Dominican Republic				1			8	5	1	2	C
44	1	DZA	Algeria							5	0	1	2	D
45	78	ECU	Ecuador	1			1			7	2	2	2	C
46	14	EGY	Egypt	1		1				5	4	2	2	C
47	0	ERI	Eritrea							3	0	0	1	D
48	138	ESP	Spain	1	1	1	1	1		14	5	2	4	B
49	0	EST	Estonia	1						14	4	1	2	C
50	15	ETH	Ethiopia			1	1			3	4	2	1	C
51	122	FIN	Finland	1	1	1	1			14	5	2	5	A
52	146	FJI	Fiji	1						15	4	1	2	C
53	123	FRA	France	1	1	1	1	1	1	14	5	2	5	A
54	16	GAB	Gabon	1						1	0	1	3	C
55	142	GBR	United Kingdom	1	1	1	1	1	1	14	5	2	5	A
56	0	GEO	Georgia	1						9	5	1	2	C
57	0	GER	Germany	1						14	4	2	5	B
58	18	GHA	Ghana							1	5	0	1	C
59	19	GIN	Guinea	1						1	1	1	2	C
60	17	GMB	Gambia, The							1	4	0	1	C
61	20	GNB	Guinea- Bissau							1	3	0	1	D
62	0	GNQ	Equatorial Guinea							1	0	0	1	D
63	126	GRC	Greece	1	1	1	1			14	5	2	4	B
64	59	GRD	Grenada	1		1				8	4	2	2	C
65	60	GTM	Guatemala				1			6	5	1	2	C
66	79	GUY	Guyana							7	1	0	2	D
67	89	HKG	Hong Kong	1		1	1			10	5	2	6	A
68	62	HND	Honduras				1			6	5	1	1	C
69	0	HRV	Croatia	1						14	2	1	2	C
70	61	HTI	Haiti							8	0	0	1	D
71	127	HUN	Hungary	1		1	1	1	1	14	2	2	3	C
72	91	IDN	Indonesia	1			1			11	5	2	2	C
73	90	IND	India			1	1	1	1	12	5	2	1	C
74	129	IRL	Ireland	1	1	1	1	1		14	5	2	5	A
75	92	IRN	Iran	1		1		1	1	12	5	2	2	C
76	128	ISL	Iceland	1	1					14	4	2	5	B
77	94	ISR	Israel	1			1			5	5	2	4	B
78	130	ITA	Italy	1	1	1	1	1	1	14	5	2	5	A
79	63	JAM	Jamaica	1		1		1		8	3	2	2	C
80	96	JOR	Jordan	1						5	4	1	2	C
81	95	JPN	Japan	1	1	1	1	1	1	10	5	2	6	A
82	0	KAZ	Kazakhstan	1						9	5	1	2	C
83	22	KEN	Kenya	1		1	1	1	1	3	4	2	1	C
84	0	KGZ	Kyrgyzstan	1						9	4	1	1	C
85	0	KHM	Cambodia							11	0	0	1	D
86	68	KNA	St. Kitts & Nevis	1						8	5	1	3	C

PWT6.0 Order	PWT5.6 Order	Code (ISO)	Country	Benchmark Participation (yes=1)						Region Code	Variance Scale 0-5	Bench- mark Scale 0-2	Data Rank Scale 1-6	Grade A-D
				1996 (1)	1990 (2)	1985 (3)	1980 (4)	1975 (5)	1970 (6)					
87	97	KOR	Korea, Republic of	1		1	1	1	1	10	5	2	4	B
88	98	KWT	Kuwait							5	0	0	5	C
89	99	LAO	Laos							11	0	0	1	D
90	0	LBN	Lebanon	1						5	5	1	2	C
91	69	LCA	St. Lucia	1		1				8	4	2	2	C
92	110	LKA	Sri Lanka	1		1	1	1		12	4	2	2	C
93	23	LSO	Lesotho							4	2	0	1	D
94	0	LTU	Lithuania	1						14	4	1	2	C
95	131	LUX	Luxembourg	1	1	1	1	1		14	4	2	6	A
96	0	LVA	Latvia	1						14	4	1	2	C
97	0	MAC	Macao							10	0	0	5	C
98	30	MAR	Morocco	1		1	1			5	3	2	2	C
99	0	MDA	Moldova	1						14	4	1	1	C
100	25	MDG	Madagascar	1		1	1			3	5	2	1	C
101	64	MEX	Mexico	1			1	1		6	4	2	3	C
102	0	MKD	Macedonia	1						14	2	1	2	C
103	27	MLI	Mali	1		1	1			1	4	2	1	C
104	132	MLT	Malta							14	0	0	4	D
105	101	MNG	Mongolia	1						10	1	1	1	D
106	31	MOZ	Mozambique							4	1	0	1	D
107	28	MRT	Mauritania							1	4	0	1	C
108	29	MUS	Mauritius	1		1				3	4	1	4	C
109	26	MWI	Malawi	1		1	1	1		2	4	2	1	C
110	100	MYS	Malaysia					1	1	11	4	2	3	C
111	32	NAM	Namibia							4	2	0	2	D
112	33	NER	Niger							1	3	0	1	D
113	34	NGA	Nigeria	1		1	1			1	5	2	1	C
114	65	NIC	Nicaragua							6	4	0	1	C
115	133	NLD	Netherlands	1	1	1	1	1	1	14	5	2	5	A
116	134	NOR	Norway	1	1	1	1			14	5	2	6	A
117	103	NPL	Nepal	1		1				12	4	2	1	C
118	147	NZL	New Zealand	1	1	1				15	5	2	4	B
119	104	OMN	Oman	1						5	0	1	4	C
120	105	PAK	Pakistan	1		1	1	1		12	4	2	1	C
121	66	PAN	Panama	1			1			6	4	2	2	C
122	81	PER	Peru	1			1			7	3	2	2	C
123	106	PHL	Philippines	1		1	1	1	1	11	3	2	2	C
124	148	PNG	Papua New Guinea							15	3	0	1	D
125	135	POL	Poland	1		1	1	1		14	5	2	3	B
126	67	PRI	Puerto Rico							6	4	1	5	D
127	136	PRT	Portugal	1	1	1	1			14	5	2	4	B
128	80	PRY	Paraguay				1			7	5	1	2	C
129	107	QAT	Qatar	1						5	0	1	4	C
130	137	ROM	Romania	1				1		13	5	1	2	C
131	143	RUS	Russia	1						13	5	1	2	C
132	36	RWA	Rwanda			1				2	5	1	1	C
133	108	SAU	Saudi Arabia							5	0	0	3	D
134	42	SDN	Sudan							5	0	0	2	D
135	37	SEN	Senegal	1		1	1			1	5	2	1	C

PWT6.0 Order	PWT5.6 Order	Code (ISO)	Country	Benchmark Participation (yes=1)						Region Code	Variance Scale 0-5 (8)	Bench- mark Scale 0-2 (9)	Data Rank Scale 1-6 (10)	Grade A-D (11)
				1996 (1)	1990 (2)	1985 (3)	1980 (4)	1975 (5)	1970 (6)					
136	109	SGP	Singapore	1						11	5	1	6	B
137	39	SLE	Sierra Leone	1		1				1	3	2	1	C
138	58	SLV	El Salvador				1			6	5	1	2	C
139	0	STP	Sao Tome & Principe							1	0	0	1	D
140	0	SVK	Slovak Republic	1						14	4	1	3	C
141	0	SVN	Slovenia	1						14	2	1	4	C
142	139	SWE	Sweden	1	1	1				14	5	2	5	A
143	43	SWZ	Swaziland	1		1				4	3	2	2	C
144	38	SYC	Seychelles							3	1	0	3	D
145	111	SYR	Syria	1				1		5	0	2	2	C
146	10	TCD	Chad							2	0	0	1	D
147	45	TGO	Togo							1	0	0	1	D
148	113	THA	Thailand	1		1		1		11	3	2	3	C
149	0	TJK	Tajikistan	1						9	0	1	1	D
150	0	TKM	Turkmenistan	1						9	0	1	2	D
151	71	TTO	Trinidad &Tobago	1		1				8	2	2	3	C
152	46	TUN	Tunisia	1		1	1			5	1	2	3	C
153	141	TUR	Turkey	1	1	1				9	5	2	2	C
154	112	TWN	Taiwan							10	0	0	4	D
155	44	TZA	Tanzania	1		1	1			3	2	2	1	C
156	47	UGA	Uganda							3	1	0	1	D
157	0	UKR	Ukraine	1						13	5	1	2	C
158	83	URY	Uruguay	1			1	1		7	5	2	3	B
159	72	USA	USA	1	1	1	1	1	1	6	5	2	6	A
160	0	UZB	Uzbekistan	1						9	0	1	1	D
161	70	VCT	St.Vincent & Grenadines	1						8	5	1	2	C
162	84	VEN	Venezuela	1			1			7	3	2	2	C
163	0	VNM	Vietnam	1						11	4	1	1	C
164	115	YEM	Yemen	1						5	0	1	1	D
165	41	ZAF	South Africa							4	3	0	2	C
166	48	ZAR	Congo, Dem. Republic							2	0	0	1	D
167	49	ZMB	Zambia	1		1	1	1		2	5	2	1	C
168	50	ZWE	Zimbabwe	1		1	1			4	2	2	2	C
Not in PWT 6.0	0	24	LBR	Liberia						1				D
	0	35	REU	Reunion						3				D
	0	40	SOM	Somalia						3				D
	0	114	ARE	United Arab Emirates						5				D
	0	93	IRQ	Iraq						5				D
	0	82	SUR	Suriname			1			7				D
	0	102	BUR	Myanmar						11				D
	0	120	CSK	Czechoslovakia						14				D
	0	124	DDR	Germany, East						14				D

PWT6.0 Order	PWT5.6 Order	Code (ISO)	Country	Benchmark Participation (yes=1)						Region Code	Variance Scale 0-5	Benchmark Scale 0-2	Data Rank Scale 1-6	Grade A-D
				(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
0	125	DEU	Germany, West		1	1	1	1	1					A
0	144	YUG	Yugoslavia			1	1	1						C

## Notes to Table A

Table A provides classificatory information about the countries in PWT 6.0. The countries are ordered alphabetically, whereas in PWT 5.6 they were first grouped by regions. Table A shows the position of each country in both tables. The ISO code is also provided along with the country name.

It is important to note that PWT 6.0 does not contain all countries that have been in previous versions of PWT or for which there are real income estimates. There are three reasons for this:

- Some countries break up or consolidate. In PWT 6.0 we have given Germany (GER) since consolidation in 1991. Users may wish earlier information on the former DDR or West Germany (DEU) and what we have is in PWT 5.6. Yugoslavia and the Soviet Union are in PWT 5.6 and some of the successor states are in PWT 6.0.
- The national accounts of some countries come and go. For example, a long time series exists in PWT 5.6 for Myanmar=Burma. However, the national accounts in current and constant prices to link these estimates to the present are not available, so Myanmar does not appear in PWT 6.0.
- Some countries, like Libya, have never been in PWT, but rough estimates exist at the GDP level. *Table B* provides a real GDP per capita estimate relative to the United States for 1985 and/or 1990 and/or 1996 for a number of countries falling into the above three categories.

## Benchmark History

Columns 1-6 indicate which of 6 benchmarks a country has taken part. This is not an exhaustive list of benchmarks. There was an early 1967 exercise, and most countries listed as in the 1996 benchmark either undertook a separate exercise for that year or had taken part in a 1993 benchmark that was updated. In addition the EU carries out annual estimates for its members and the OECD has undertaken 1999 comparisons.

## Geographical Grouping

Column 7 of Table A provides a geographical code for each country so the user may sort countries by region. The coding system is as follows:

1. Africa, West
2. Africa, Central
3. Africa, East
4. Africa, South
5. North Africa and Middle East
6. America, North
7. America, South
8. Caribbean
9. Asia, Central
10. Asia, East

11. Asia, Southeast
12. Asia, Southwest
13. Europe, Eastern
14. Europe, Western
15. Oceania

Users should note that in addition to being classificatory, these groups may be related to systematic measurement errors across regions. This is because many of the regions carried out the underlying benchmark work as a group.

### *Grading of PWT Country Estimates*

In earlier versions of PWT a letter grade has been entered for benchmark and non-benchmark countries to signal the relative reliability of the estimates. The basis for these earlier estimates involved three factors: (1) the number of benchmark comparisons a country had entered; (2) its income level, because within benchmarks it has been found that the margin of error was greater for low income countries; and (3) for non-benchmark countries, the sensitivity of their estimates. We follow the same practice in PWT 6.0. In the case of one very important country, China, we have modified official growth rates as discussed in the China Annex. To the extent quality of growth and level data are similar for the same countries, the grading system may also be helpful for judging growth rates.

In Table A we have provided the ranking of the scales entering into the final letter grade so that users who may prefer a different weighting scheme may create their own scale. We have continued with the 3 components listed above assigning ranks to characteristics as follows:

1. Variance of Price Level Estimates (Column 8): This measure looks at the difference between short-cut estimates, extrapolated benchmark estimates, and current 1996 benchmark consumption price level estimates. If there is only one estimate, the variance is zero, and hence the country is ranked 0 for no information; otherwise, a country is ranked 1 for high variances up to 5 for low variances between the estimates. (See also *Section I B 3*)
2. Number of Benchmarks (Column 9): 0 for never-benchmark, 1 for one benchmark or quasi-benchmark, and 2 for more than one benchmark. Quasi benchmark estimates refer to China, Laos, Puerto Rico and Taiwan.
3. Quality of Statistics or Data Rank (Column 10): It is assumed with much anecdotal support that the resources countries devote to collecting economic statistics increases with income. We have put countries into 6 income groups, assigning a score of 1-6 from less to more affluent.

In this framework the three components could be combined in various ways. If the scores are simply added together the minimum score would be 1 for a country like Angola, which has never been in a benchmark, does not have enough statistical information available to compute a variance, and is in the lowest income group. The top score would be 13, corresponding to a relatively affluent country with at least 2 benchmarks and little variance among its alternative price level estimates.

Alternatively, one could give the variance measure (column 8) twice the weight of the other two components. This is our preferred rating and the one that determines the letter grade in column (11), where A denotes a high score and D a low score on this scale.

## IV Table B

Table B shows the estimated population, GDP per capita, and the GDP per capita relative to the U.S. for countries in previous PWTs or for years prior to 1996, and our current estimate for 1996. These countries are not in PWT 6.0 for reasons discussed in *Sections I, II and III* above.

PWT History	ISO code	Country	Year	Population (000s)	GDP pc \$ (US=100)	GDP pc (US=100)	Population (000s)	GDP pc \$ (US=100)	GDP pc (US=100)
<b>Estimates Prior to 1996</b>							<b>Estimates for 1996</b>		
Never	BRN	Brunei					301	17868	60.0
PWT 5.6	CZE	Czechoslovakia	1990	15,662	5066	23.2			
PWT 5.6	DDR	East Germany	1988	16,670	11209	56.9			
PWT 5.6	DEU	West Germany	1992	65,120	20197	87.0			
PWT 5.6	IRQ	Iraq	1987	16,382	2775	15.0	21,313		
PWT 5.6	LBR	Liberia	1986	2,247	804	4.6	2,806	454	1.5
Never	LBY	Libya	1996				5,076	7570	25.4
PWT 5.6	MMR	Myanmar	1989	40,810	691	3.3	43,389	1027	3.4
Never	DRK	North Korea	1985	20,380		14.3			
PWT 5.6	REU	Reunion	1989	593	4021	19.2	663		
PWT 5.6	SLB	Solomon Is	1988	299	2269	11.5	391	3099	10.4
PWT 5.6	SOM	Somalia	1989	7,284	931	4.4	8,483		
PWT 5.6	SUR	Suriname	1989	400	2495	11.9	410		
PWT 5.6	SUN	U.S.S.R.	1989	287,630	8780	41.9			
PWT 5.6	TON	Tonga	1985	95	1929	11.6	97	3486	11.7
PWT 5.6	ARE	United Arab Emirates	1989	1,706	14132	67.4	2,458	18624	62.5
PWT 5.6	VUT	Vanuatu	1990	147	1881	8.6	173	2324	7.8
PWT 5.6	WSM	Western Samoa	1990	160	2224	10.2	168	3308	11.1
PWT 5.6	YUG	Yugoslavia	1990	23,809	5467	25.0			