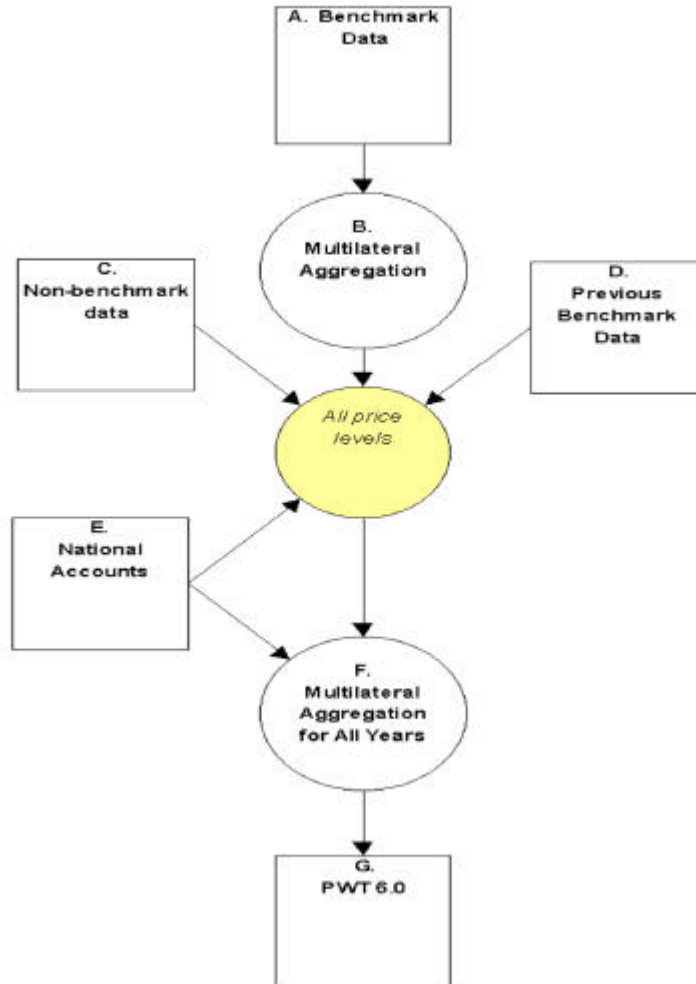


PWT6 Technical Documentation

This note documents the program flows and calculations of the Penn World Table (version 6.1) and is divided into two parts. Part I is an overview of the system and Part II details the sequence of computations and the data requirements. The descriptions are primarily mechanical and intended for programmers, rather than users of PWT. Users should refer to the Data Appendix for a comprehensive description and conceptual explanation of the variables in PWT6.

Figure 1. Letters correspond to paragraphs in Part I



Part I. Overview

A. Benchmark Data:

PWT6 is based on Benchmark data from the 1996 ICP. PWT5 was based on 1985 Benchmark data, PWT4 on 1980 Benchmark data and so forth. Benchmark data consist of price and expenditure data for basic headings of consumption, government expenditures, investment, and exports and imports in local currency units. The calculation of these basic headings is described in more detail in Parts II and elsewhere ¹.

B. Multilateral Aggregation:

The benchmark data are aggregated to obtain price levels for Consumption (C), Government expenditures (G), Investment (I) and Net Foreign Balance (NFB). The method used in PWT is the Geary (G-K) multilateral method, and its corollary is a matrix of additive expenditures valued at international prices at the basic heading level, in addition to the price levels of the aggregate components of GDP. This matrix is termed 'real expenditures' in contrast to the nominal, or exchange rate based expenditures, and is available to users².

C. Non-benchmark Data:

For countries that did not participate in the ICP benchmark, we use a shortcut method to obtain the price levels of C, I and G. This is based on post-adjustment indexes from three independent sources: the International Civil Service Commission (ICSC), the Employment Conditions Abroad, and the U.S. State Department housing allowance. Details of the equations are provided in Part II.

D. Previous Benchmark Data:

In addition to 1996 price levels for C, I and G from both benchmark and non-benchmark countries, we deflate the price levels from previous benchmarks (1970, 1975, 1980 and 1985 price levels).

E. National Accounts Data

Our National Accounts series are the current and constant series for C, I, G and Exports and Imports for all available years between 1950 and 2000, as well as population totals and the exchange rates. These series are compiled from individual country national

¹World Bank report (2000)

² Previous benchmark data are also available from the Penn World Table official web site: <http://pwt.econ.upenn.edu/>.

accounts tables, from the World Bank Development Indicators 2002 ([WDI 2002](#)) and from the [OECD 2002](#) (see Electronic Publications and **National Accounts of OECD countries: Main Aggregates 1970/2000 2002 Edition Volume 1**). For many countries, the constant series are in different base years, and there are gaps in the series. Where possible, we apply the growth rates from previous national accounts series to the missing data. In other cases, the current price series that existed for a country in 1985 is very different from the current price series today for the same years, resulting in significantly different deflators between PWT versions. We use the latest available series, and users can check for themselves if there are major differences that arise from the underlying countries' national accounts data.

F. Multilateral Aggregation for All Years between 1950-1998

The 1996 price levels for C, I and G for the 1996 benchmark data, the non-benchmark data and the previous benchmark data are deflated to all years available in the country's national accounts file (1950-2000). Together with the nominal expenditures on C, I and G for these years, they become inputs to what we term the Mighty G-K (a multilateral aggregation across all countries, for each year). The result is a matrix of additive expenditures valued at international prices for each year, in addition to the price level of GDP for all countries in all years.

G. PWT 6.1

The last step is to obtain different measures of GDP based on the international prices and real expenditures obtained in F above, such as the chain series and the constant price series in international dollars. Data on labor force and equivalent adult populations are added, as well as separate calculations of capital stock (not completed).

The final table consists of price levels, current and constant GDPs per capita at Purchasing Power Parities (price levels times the exchange rates) as well as percentage shares of Consumption, Investment and Government in current and constant prices.

Figure 2. Numbers correspond to paragraphs in Part II



Part II. Programs and Data

1. Multilateral Aggregation of the 1996 Benchmark Data for 115 countries

The data inputs for this multilateral aggregation are the local currency expenditures $(pq)_{ij}$ and price parities (p_{ij}) of 31 basic headings (i) for 115 countries (j) provided by the World Bank. This benchmark is described in their publication (2000). It is built up from the OECD 1996 benchmarks, special comparisons for several countries in South America and Mexico, as well as updates of 1993 comparisons for Africa, the Caribbean, the ESCAP region and the Middle East. The price parities are relative to the United States, that is the p_{iUS} is equal to one for every heading. One could use a different country as the base, without affecting the final results. We divide the local currency expenditures and the price parities by the exchange rate, so that all input values are in nominal US dollars.

1. Expenditures are multiplied by ‘super-country weights’³, and special headings that contain negative values, such as Change in Stock and Net Foreign Balance are treated separately.
2. Notional quantities (q_{ij}) are obtained by dividing the super-country weighted expenditures by the price parities.
3. The aggregate price levels for each country (pl_j) are obtained using the Geary (G-K) multilateral method. A corollary of the Geary method is a set of international prices (π_i) for each basic heading.. The equations are shown below. The program is iterative, with a starting value of 1 for all price levels (pl_j) .

$$p_i = \sum_j \frac{(pq)_{ij}}{pl_j} \times \frac{1}{\sum_j q_{ij}} \quad \text{and} \quad pl_j = \frac{\sum_i (pq)_{ij}}{\sum_i p_i q_{ij}}$$

4. The real expenditure for each heading (i) in each country (j) is the product of the international price of heading (π_i) and the notional quantity q_{ij} . The nominal expenditure $(pq)_{ij}$ divided by the real expenditure $(\pi_i q_{ij})$ is the price parity of heading (i) in country (j). The ratio of the sum of these expenditures over all headings is the price level for country j, or the second equation of the expression above.
5. The international price of a heading is the weighted average of the prices relative to the price levels, with weights equal to the quantities. In practice, we use expenditures and notional quantities, hence the $(pq)_{ij}$ notation rather than a $(p_{ij} q_{ij})$ notation in the first equation above.
6. The ratio of the nominal to the real expenditure value in each heading is equal to the input price parity (it is the price level for each heading, but the term price level generally refers to aggregate rather than individual headings). These differ

³ The total GDP of the world is assigned to the benchmark countries. See 2 below for more details.

from the input price parities by a factor, equal to the U.S. price parities. In other words, the international prices are expressed relative to the U.S. dollar, and the reciprocal of the vector of international prices ($1/\pi_i$) is equal to the price parities of the U.S.⁴.

7. The matrices of nominal and real expenditures, as well as the heading price levels, are available to users⁵. For subsequent calculations, we keep only the aggregate values of C, I and G and their sum, equal to Domestic Absorption.
8. The difference between our estimates and the published work of the OECD is that they have done their aggregation for 51 countries and have used the EKS method, a technique also used by the European Union. We also use the supercountry weighted Geary method, in an attempt to assign proportional representation of the benchmark countries relative to the world. The World Bank has used a different weighting scheme, one that assigns equal weight to each country over all of GDP, so that small countries such as Belize and Luxembourg, will have the same importance over all headings as larger countries such as Mexico and Germany. Given the input data (prices and expenditures) the reader may choose to use any other price index aggregation method. The use of super-country weights in the Geary system provides continuity with previous versions of PWT.

2. Supercountry Weights

The purpose of supercountry expenditure weights is to minimize the difference in results that may occur as countries are added or subtracted from an aggregation. This has been done in all the work with Penn World Tables and the underlying benchmark estimates, and was especially important when the benchmark countries were not a large proportion of world population and income. Since neither China nor India are included in the 1996 benchmark, and they both number in the top ten world economies, it is important to make some allowance for their weight.

Supercountry weighting simply allocates the expenditures of countries not in the benchmark to similar countries that are in the benchmark. A convenient cutoff for very small countries is to say that their GDP at exchange rates must be at least \$1 billion, that may be thought of as a thousand million, namely \$1,000 per capita times 1 million in population, or other combinations. The allocation has been tried using numerous combinations of income and geographic location. However, in what is described below, only income is considered.

For most countries estimates of GDP per capita at PPPs have been presented for 1996 in the WDI (2000). Countries were put into 7 per capita GDP tiers, shown below:

- 1) under \$1,200
- 2) \$1,200 – 2,400

⁴ The use of the U.S. as the numeraire country is arbitrary and built upon the convention of expressing the exchange rate relative to the U.S. dollar. Price levels are simply the purchasing power parities (PPPs) divided by this exchange rate, but they could just as easily be expressed relative to any other currency.

⁵ These expenditures are in unweighted form.

- 3) \$2,400-3,600
- 4) \$3,600-7,000
- 5) \$7,000-12,000
- 6) \$12,000-18,000
- 7) above \$18,000

The construction of these tiers could be done by using quintiles or some other standard procedure, but since the basic income classification of countries is itself subject to error, fairly simple divisions were made. The most significant countries, India and China, were intentionally not in the lowest group, but rather fall into groups 2 and 3 respectively. For most of the other tiers, the added weight is much less, and for group 7, all the countries are in the 1996 benchmark.

For each of the tiers, the population of all countries and of all benchmark countries was calculated. Then a factor was derived, the ratio of total population in the tier to the total in the benchmark population in that tier. For tier 7, this factor was 1.0 because all countries were benchmark countries. The total expenditure of each benchmark country within each tier was multiplied by this factor. This means that when the G-K system is used, the set of international prices are used that will be appropriate for valuing the total GDP for the world, not simply the GDP of the benchmark countries.

The supercountry weights for the 115 countries in 1996 are shown in Table 1.

3. Estimates (for Non-benchmark Data)

For countries not in the 1996 benchmark, we use a short-cut method. First, we estimate the relationship of the price levels for the 115 benchmark countries to their national accounts series and three other published sources. Using this relationship, we predict the price levels for the non-benchmark countries that have national accounts series and at least one other data source. These sources are (i) the International Civil Service Commission (ICSC) published in the Monthly Bulletin of Statistics of the UNSO (UN below), with 105 countries of the 115 in the benchmark, (ii) the Employment Conditions Abroad (EC), an organization based in London with members including multinational firms, governments and non-profit international agencies (103 countries), and (iii) the U.S. State Department (ST) housing allowance (103 countries). There are 196 countries total with at least one of these post-adjustment indexes. These indexes are shown in Table 2.

- 1) The first set of equations regress the log of the per capita real expenditures of Domestic Absorption (DA) on the log of the nominal expenditures divided by the post-adjustment indexes (both relative to the U.S. values), with dummy variables for the sub-Sahara African countries and the Central Asian countries. In essence, this is to verify how closely our benchmark price levels are to the indexes, since the nominal per capita DA expenditures enter the equation on both sides. Various specifications are tested to capture regional effects (in part because of prior knowledge of how the benchmark comparisons are built up from linkages across

regions), and our judgment of the 'best' specification is based on the explained variance of each regression. For countries with only the UN post-adjustment index, only the Central Asia dummy is used, but for all other combinations, both the sub-Saharan African and the Central Asia dummy variables are used.

Table A Real per capita Domestic Absorption

Ln Real pc DA std.errors in ()s	1	2	3	4	5	6	7
Number of observations	N=105	N=103	N=103	N=97	N=95	N=93	N=88
Constant	0.086 (0.05)	-0.030 (0.05)	0.035 (0.05)	0.067 (0.06)	-0.03 (0.07)	-0.014 (0.06)	-0.024 (0.07)
Ln ST	0.686** (0.02)	-	-	0.438* (0.18)	0.004 (0.20)	-	-0.091 (0.25)
Ln EC	-	0.657** (0.02)	-	-	0.655** (0.19)	0.602** (0.14)	0.597** (0.20)
Ln UN	-	-	0.707** (0.02)	0.253 (0.18)	-	0.068 (0.15)	0.164 (0.19)
S.S.Africa	-0.151* (0.09)	-0.210** (0.08)	-	-0.120 (0.09)	-0.205* (0.09)	-0.172* (0.09)	-0.167* (0.09)
C.Asia	0.311** (0.08)	0.261** (0.08)	0.283** (0.08)	0.336** (0.09)	0.325** (0.086)	0.272** (0.09)	0.357** (0.09)
Adj. R²	0.93	0.92	0.92	0.93	0.93	0.93	0.93
RMSE	0.28	0.27	0.29	0.28	0.27	0.28	0.28
** p<0.001							
* p< 0.005							

The coefficients are applied to the non-benchmark data and the exponent of the result is the short-cut estimate of the real per capita DA. Since the intercept is not zero, the predicted value for the U.S. is not one. Before the next step, we normalize the predicted per capita DA by the U.S. value.

- 2) The second set of equations is the regressions of the real shares of C, I and G on the nominal shares and the real per capita DA. They are shown below:

$$\text{real share } C = \mathbf{a}_1(\text{nom share } C) + \mathbf{b}_1(\text{nom share } I) + \mathbf{g}_1(\text{nom share } G) + \mathbf{d}_1(\text{realDA})$$

$$\text{real share } I = \mathbf{a}_2(\text{nom share } C) + \mathbf{b}_2(\text{nom share } I) + \mathbf{g}_2(\text{nom share } G) + \mathbf{d}_2(\text{realDA})$$

$$\text{real share } G = \mathbf{a}_3(\text{nom share } C) + \mathbf{b}_3(\text{nom share } I) + \mathbf{g}_3(\text{nom share } G) + \mathbf{d}_3(\text{realDA})$$

The real share C for each country j is defined as:

$$real\ share\ C_j = \frac{\sum_{i \in C} p_i q_{ij}}{\sum_{i \in DA} p_i q_{ij}}$$

Similarly for the real shares of I and G.

The sum of the real shares equal one, as do the sum of the nominal shares, so the estimated coefficients are constrained and, $\alpha_1 + \alpha_2 + \alpha_3 = 1$, $\beta_1 + \beta_2 + \beta_3 = 1$, $\gamma_1 + \gamma_2 + \gamma_3 = 1$ and $\delta_1 + \delta_2 + \delta_3 = 0$.

Table B. Real Shares of Consumption, Investment and Government Expenditures

N=115	(1)	(2)	(3)	Sum
St.errors in ()s	Real share C	Real share I	Real share G	
α	0.961** (0.02)	-0.040* (0.02)	0.079** (0.02)	1.00
β	0.074 (0.06)	0.753** (0.05)	0.174** (0.05)	1.00
γ	0.608** (0.11)	-0.132 (0.08)	0.524** (0.09)	1.00
δ	-0.081** (0.02)	0.178** (0.02)	-0.095** (0.02)	0.00
Adj R²	0.99	0.94	0.84	
RMSE	0.06	0.05	0.05	
** p<0.001				
* p<0.005				

As in 1) above, the estimated coefficients are applied to the non-benchmark countries and a set of predicted real shares are obtained. The predicted price levels are the nominal divided by the predicted real values for each component. That is, the price level for Consumption is:

$$pl\ C = \frac{(nom\ share\ C)}{(real\ share\ C)} \times \frac{nom\ DA}{real\ DA}$$

and similarly for Government (pl G) and Investment (pl I) price levels.

4. Extrapolation of previous Benchmark Data and Consolidation of All Price Level Estimates

There are 78 countries out of the 115 that have been in one or more previous benchmark comparisons. Price levels from the 1970, 1975 and 1985 were taken into account in the 1985 estimates, and we extrapolate these to 1996 using the national accounts deflators.

Thus we have a total of three possible price levels:

1. Actual price levels from the 1996 benchmark (115 countries)
2. Predicted price levels from the short-cut regression estimates (153 countries)
3. Extrapolated price levels from the 1985 benchmark.(64 countries)

These result in seven combinations corresponding to a country having only one of the above, two of the above or three of the above price levels. That is, if we label the countries with actual price levels {1}, the set with predicted price levels {2} and with extrapolated price levels {3}, then each country will have at least one price level, but possibly two or even three price levels:

- {1} or {2} or {3} only (Actual), (Predicted) or (Extrapolated)
- {1,2} or {1,3} or {2,3} (Actual and Predicted) or (Actual and Extrapolated) or (Predicted and Extrapolated)
- {1,2,3} (Actual and Predicted and Extrapolated)

There are countries with only predicted price levels, or only extrapolated price levels, or both extrapolated and current benchmark data, and so forth. The total number of countries with at least one set of price levels is 168. Unfortunately some countries that could have been estimated using the short-cut method did not have a national accounts series for 1996, so they were dropped. These include Afghanistan, Brunei, Libya, North Korea, and Western Samoa, as well as smaller countries.

Countries that were in previous PWTs that do not have series for 1996 (or between 1985 and 1996) have to be dropped, and include: Liberia, Reunion, Somalia, United Arab Emirates, Iraq, Suriname, Myanmar, Czechoslovakia, the former East and West Germanys and Yugoslavia. Out of these, Suriname, Yugoslavia and West Germany were also in previous benchmarks.

Once we obtain one or more price levels, we weight them depending on their benchmark year and other factors, described below.

1. If countries have only one set of price levels (Actual or Predicted or Extrapolated), then we have no choice and simply use that set.
2. If countries have Actual and Predicted price levels, we use the Actual levels.
3. If countries have Actual and Extrapolated price levels then
 - a. If they had adjusted 1985 benchmark data (meaning they had a prior year benchmark, or 1993, as well as 1985 data) and 1996 data then weight the extrapolation by $1/3$ and the actual by $2/3$.
 - b. If they had only 1985 and 1996 data, then weight the extrapolation by $1/4$ and the actual by $3/4$.
 - c. Some are benchmark countries but could not be extrapolated because of missing national accounts data (Bahamas, Barbados, Suriname).
4. If they have Extrapolated and Predicted regression estimates, then
 - a. If it was a 1980 benchmark, weight the extrapolation $2/3$ and the regression estimate $1/3$ (Colombia, Costa Rica, Dominica, Guatemala, Honduras, Paraguay, El Salvador).
 - b. If it was a 1985 benchmark, weight the extrapolation $3/4$ and the regression estimate $1/4$ (India, Ethiopia, Rwanda).
 - c. For Malaysia, use $3/8$ for the extrapolation, $1/4$ for the regression and $3/8$ for the 1993 benchmark extrapolated to 1996.
 - d. For Laos, use $1/2$ for the regression and $1/2$ for the extrapolation (1993).

5. If countries have all three, we do not use the Predicted estimates, only the Actual and Extrapolated values, and the decision rule of 3 above.
6. China and Taiwan are treated separately: Taiwan is not in the WDI and China's treatment is covered in a separate document.
7. For many African countries, the estimated price level for Investment results in extremely low shares (sometimes negative shares). We calculate the African average relative to DA price levels (2.201 of the DA price level) and use 2/3 of this plus 1/3 of the extrapolated value for the price level of Investment for Angola, Burundi, Burkina Faso, Central African Republic, Ghana, the Gambia, Guinea-Bissau, Mozambique, Mauritania, Namibia, Niger, Togo, and Zaire. Djibouti and Tchad have no regression estimate, so we use only the extrapolated value.

The Data Appendix document provides a table with a grading system that reflects the variances of these estimated price levels so that users can judge the reliability of the estimates.

The final price levels for 1996 are shown in Table 3.

5. Deflators and National Accounts Series

The World Development Indicators (2002) were taken as the starting point in the creation of a National Accounts series. This series contains current and constant prices for Consumption, Government and Investment as well as Exports and Imports in local currencies, the exchange rate relative to the U.S. dollar and the population of each country. The base year in the WDI was 1997 for most countries, but 1990 for some and not obvious for a few others.

China data were estimated separately, as were the Taiwan and Puerto Rico series. ECLAC kindly provided an updated series for Cuba⁶. For countries that were not in the WDI, we imputed wherever possible the growth rates from the National Accounts series used in PWT5.6 (1985 base). For the United States, we used the growth rate from the previous national accounts series to get 1950-1959 data.

In many cases, the growth rates between 1960-61 were used to link the 1950-59 data from the previous national accounts series. Countries that were separated or reunited (Yugoslavia, Czechoslovakia and the Germanys, for example) had to be treated on a case-by-case basis. PWT6 contains only one Germany from 1991 onward, and it is now coded GER to distinguish it from the previous Federal Republic (DEU) and Democratic Republic (DDR) which had to be dropped. We could not continue to provide a series for Yugoslavia for lack of a consistent series after 1990. The series for the Czech republic in the WDI only goes back to 1990 and we were unable to link it to our 1985 national accounts data.

⁶ It is hoped that Cuba will participate in the next ICP round, but in PWT6 they were treated like the other non-benchmark countries, leading to estimates that were considered too high to be included in the UNDP report of 2002.

Other countries such as Myanmar (Burma), Iraq and Sudan were also previously in PWT, but it was not possible to update our old series to 1996 using the WDI. For Myanmar, both the Consumption and Government series were missing although the Investment series was complete. The CIA provided estimates for some countries that are not available in the WDI, and together with the OECD National Accounts Volume 1 Aggregates for 2002, we have put together a partial or complete series for 213 countries between 1950-2000.

We welcome any feedback on problems and discrepancies in the series, as well as information on sources of more current data for any particular country that is incomplete.

6. Multilateral Aggregation of all countries for each year between 1950-2000.

The final price levels for C, I and G for the 1996 benchmark data, the non-benchmark data and the previous benchmark data are deflators to all years available in the country's national accounts file (1950-2000). Together with the weighted nominal expenditures on C, I and G for these years (see 1) below), they become inputs to the Mighty G-K (a multilateral aggregation across all countries, for each year).

- 1) We weight the expenditures for each country and each year by the super-country weights for that year⁷. These are the weighted nominal expenditures in current prices, divided by country j's exchange rate relative to the U.S: $nomC_{jt}$, $nomI_{jt}$, and $nomG_{jt}$. The price levels are plC_{jt} , plI_{jt} , plG_{jt} with the U.S. price levels equal to one.
- 2) The notional quantities qC_{jt} , qI_{jt} , qG_{jt} are the weighted expenditures divided by the price levels.
- 3) The iterative procedure for arriving at a set of price levels for each country and a set of international prices (π_i) is identical to that described in A above, with the number of headings 'i' reduced to 3 (C, I, and G) and repeated for every year.
- 4) Exports and Imports are converted at the purchasing power parity of domestic absorption.
- 5) The U.S. price level for GDP is normalized to equal 1.00 for all years (but the price levels for C, I and G for the U.S are not normalized).
- 6) The real current expenditure for each component equals the international price of the component times the unweighted notional quantity:

$$real C_{jt} = (\pi C_t) (q C_{jt}), \text{ where } (q C_{jt}) = \frac{nom C_{jt}}{pl C_{jt}};$$

Similarly for the real expenditures of I and G.

- 7) The shares of these components relative to Domestic Absorption are used in the chain series, described below.

⁷ The total number of countries in 1996 is 168 but decreases in other years because of missing national accounts data, so the supercountry weights are recalculated for each year.

7. PWT6.1

This last major step in the system compiles the current price series, shares, and price levels obtained above, and adds the national accounts data with the constant series and population data. We also use population data from the ILO, namely, percent workers and equivalent adult population.

- 1) The fixed base (Laspeyres) real constant expenditure for each component, for year t , is the 1996 real expenditure multiplied by the national accounts growth rate for that component. The GDP in 1996 prices (RGDPL) is the sum of these component values, plus net foreign balance. This is why the GDP growth rates from the national accounts series will not necessarily be equal to PWT6.0 growth rates in the constant series.

$$realC(constant)_{jt} = realC(constant=current)_{j96} \times \frac{nomC(constant)_{jt}}{nomC(constant)_{j96}}$$

Similarly for real expenditures of I and G.

- 2) The chain series requires the growth rate between each pair of consecutive years, also obtained from the national accounts series. Together with the real shares of the components from C 7) above, we obtain the growth rate of Domestic Absorption ($DA\ growth_{jt}$) where t is from 1950 to 1999.

$$\begin{aligned} DA\ growth_{jt} = & (real\ share\ C_{jt} \times \frac{nomC(kon)_{j,t+1}}{nomC(kon)_{j,t}}) + \\ & (real\ share\ G_{jt} \times \frac{nomG(kon)_{j,t+1}}{nomG(kon)_{j,t}}) + \\ & (real\ share\ I_{jt} \times \frac{nomI(kon)_{j,t+1}}{nomI(kon)_{j,t}}) \\ & \forall t = 1950, \dots, 1999 \end{aligned}$$

where (kon) refers to constant price values.

- 3) We then take the real DA (sum of the real current C, G and I) for 1996 and apply the $DA\ growth_{jt}$ for each year and country, that is:

$$Chain\ DA_{jt} = real\ DA_{j,t-1} \times DA\ growth_{jt}; \quad t = 1997\ and\ 2000$$

$$Chain\ DA_{jt} = real\ DA_{j,t+1} \div DA\ growth_{jt}; \quad t = 1950, \dots, 1995$$

The Chain GDP (RGDPCH) series is this Chain DA plus the constant price net foreign balance.

- 4) The GDP with Terms of Trade adjustment (RGDPTT) is the constant price DA for each year plus current exports minus current imports deflated the deflator and the 1996 PPP of domestic absorption.

$$TTadj = \frac{(EXP_{cur} - IMP_{cur})}{(DA_{cur} / DA_{kon})} \bigg/ \frac{PPP_{DA96}}{PPP_{US96}}$$

- 5) The Openness (COPEN) measure is the current series exports plus imports divided by the current series real GDP. KOPEN is the constant price equivalent of COPEN.
 - 6) The final step is to divide total GDPs by the population, equivalent adult population and labor force proportion to obtain per capita estimates.
-

Table 1. Supercountry Weights 1996. (see Table 2 for Isocode name)

SCW	ISOCODE	GROUP
1.564583	SLE	1
1.564583	TZA	1
1.564583	MWI	1
1.564583	MLI	1
1.564583	YEM	1
1.564583	NGA	1
1.564583	MDG	1
1.564583	ZMB	1
1.564583	BGD	1
1.564583	NPL	1
1.564583	TJK	1
1.564583	KEN	1
3.969191	BEN	2
3.969191	MDA	2
3.969191	MNG	2
3.969191	AZE	2
3.969191	VNM	2
3.969191	PAK	2
3.969191	SEN	2
3.969191	COG	2
3.969191	CIV	2
3.969191	GEO	2
3.969191	GIN	2
3.969191	CMR	2
3.969191	TKM	2
3.969191	KGZ	2
3.969191	UKR	2
3.969191	ALB	2
3.969191	ARM	2
3.969191	ZWE	2
3.969191	LKA	2
4.017816	UZB	3
4.017816	BOL	3
4.017816	EGY	3
4.017816	MKD	3
4.017816	SYR	3
4.017816	SWZ	3
4.017816	IDN	3

SCW	ISOCODE	GROUP
4.017816	PHL	3
4.017816	MAR	3
4.017816	KAZ	3
4.017816	JOR	3
4.017816	JAM	3
1.171763	IRN	4
1.171763	LVA	4
1.171763	LTU	4
1.171763	FJI	4
1.171763	VCT	4
1.171763	DMA	4
1.171763	BGR	4
1.171763	BLZ	4
1.171763	BLR	4
1.171763	RUS	4
1.171763	PER	4
1.171763	ROM	4
1.171763	EST	4
1.171763	GRD	4
1.171763	HRV	4
1.171763	ECU	4
1.171763	TUN	4
1.171763	LCA	4
1.171763	LBN	4
1.171763	TUR	4
1.171763	POL	4
1.171763	BRA	4
1.171763	TTO	4
1.171763	THA	4
1.171763	HUN	4
1.483148	ATG	5
1.483148	BRB	5
1.483148	OMN	5
1.483148	PAN	5
1.483148	BWA	5
1.483148	GAB	5
1.483148	SVK	5
1.483148	KNA	5
1.483148	MEX	5
1.483148	VEN	5
1.483148	URY	5
1.483148	MUS	5
1.483148	ARG	5
1.483148	CZE	5
1.483148	SVN	5
1.249799	BHS	6
1.249799	QAT	6
1.249799	CHL	6
1.249799	GRC	6
1.249799	KOR	6

SCW	ISOCODE	GROUP
1.249799	PRT	6
1.249799	ESP	6
1.249799	BHR	6
1.249799	NZL	6
1.000000	BMU	7
1.000000	ISR	7
1.000000	IRL	7
1.000000	FIN	7
1.000000	SWE	7
1.000000	GBR	7
1.000000	ITA	7
1.000000	AUS	7
1.000000	NLD	7
1.000000	GER	7
1.000000	FRA	7
1.000000	CAN	7
1.000000	ISL	7
1.000000	AUT	7
1.000000	BEL	7
1.000000	DNK	7
1.000000	JPN	7
1.000000	NOR	7
1.000000	HKG	7
1.000000	CHE	7
1.000000	SGP	7
1.000000	USA	7
1.000000	LUX	7

Table 2. Post-Adjustment Indexes 1996 (U.S = 100)

ISOCODE	Country	ST	EC	UN
ABW	Aruba			
ADO	Andorra			
AFG	Afghanistan		104.3	
AGO	Angola	178.0	123.4	158.5
ALB	Albania		109.6	69.6
ANT	Netherlands Antilles	117.0	148.9	111.0
ARE	United Arab Emirates	112.0	98.9	98.2
ARG	Argentina	134.0	121.3	130.7
ARM	Armenia	100.0	105.3	
ASM	American Samoa		107.4	
ATG	Antigua and Barbuda		134.0	125.7
AUS	Australia	123.0	98.9	108.4
AUT	Austria	160.0	120.2	144.5
AZE	Azerbaijan	109.0	116.0	117.8
BDI	Burundi	148.0	110.6	
BEL	Belgium	151.0	122.3	131.1
BEN	Benin	97.0	108.5	146.6

ISOCODE	Country	ST	EC	UN
BFA	Burkina Faso	115.0	100.0	156.9
BGD	Bangladesh	81.0	103.2	89.5
BGR	Bulgaria	88.0	96.8	83.4
BHR	Bahrain	112.0	91.5	93.0
BHS	Bahamas, The	134.0	111.7	123.4
BIH	Bosnia and Herzegovina			92.8
BLR	Belarus	106.0	100.0	107.5
BLZ	Belize	118.0	109.6	
BMU	Bermuda	155.0	0.0	133.6
BOL	Bolivia	90.0	97.9	84.1
BRA	Brazil	138.0	116.0	126.3
BRB	Barbados	143.0	116.0	131.2
BRN	Brunei	130.0	101.1	120.2
BTN	Bhutan		100.0	
BWA	Botswana	87.0	88.3	68.4
CAF	Central African Republic	130.0	120.2	
CAN	Canada	105.0	95.7	94.4
CHE	Switzerland	185.0	134.0	184.8
CHI	Channel Islands			
CHL	Chile	120.0	108.5	95.7
CHN	China	122.0	108.5	125.4
CIV	Cote d'Ivoire	118.0	106.4	153.6
CMR	Cameroon	127.0	108.5	138.1
COG	Congo, Rep.	176.0	118.1	193.0
COL	Colombia	113.0	112.8	103.0
COM	Comoros		121.3	
CPV	Cape Verde	101.0	114.9	
CRI	Costa Rica	92.0	96.8	93.5
CUB	Cuba	123.0	104.3	125.7
CYM	Cayman Islands			
CYP	Cyprus	116.0	105.3	103.1
CZE	Czech Republic	106.0	107.4	91.1
DFA	Germany, Fed. Rep. (former)			
DJI	Djibouti	164.0	116.0	203.4
DMA	Dominica		125.5	
DNK	Denmark	165.0	128.7	167.9
DOM	Dominican Republic	117.0	112.8	104.5
DZA	Algeria	89.0	103.2	75.1
ECU	Ecuador	88.0	101.1	85.2
EGY	Egypt, Arab Rep.	99.0	106.4	91.2
ERI	Eritrea	98.0	106.4	
ESP	Spain	139.0	105.3	114.4
EST	Estonia	97.0	128.7	94.1
ETH	Ethiopia	111.0	116.0	106.3
FIN	Finland	149.0	125.5	159.2
FJI	Fiji	116.0	103.2	93.1
FRA	France	152.0	119.1	134.8
FRO	Faeroe Islands			
FSM	Micronesia, Fed. Sts.	99.0	119.1	97.0
GAB	Gabon	172.0	111.7	214.1

ISOCODE	Country	ST	EC	UN
GBR	United Kingdom	146.0	108.5	87.0
GEO	Georgia	119.0	110.6	
GER	Germany	151.0	123.4	137.3
GHA	Ghana	108.0	111.7	90.1
GIN	Guinea	154.0	98.9	147.5
GLP	Guadeloupe			142.8
GMB	Gambia, The	110.0	109.6	
GNB	Guinea-Bissau	113.0	117.0	124.2
GNQ	Equatorial Guinea		119.1	
GRC	Greece	136.0	100.0	118.7
GRD	Grenada	122.0	134.0	
GRL	Greenland			161.4
GTM	Guatemala	106.0	96.8	105.6
GUF	French Guiana			
GUM	Guam			124.5
GUY	Guyana	81.0	98.9	80.6
HKG	Hong Kong, China	135.0	116.0	126.8
HND	Honduras	79.0	93.6	89.1
HRV	Croatia		103.2	124.1
HTI	Haiti	116.0	100.0	
HUN	Hungary	98.0	102.1	83.9
IDN	Indonesia	114.0	106.4	114.7
IMY	Isle of Man			
IND	India	84.0	102.1	64.8
IRL	Ireland	142.0		106.9
IRN	Iran, Islamic Rep.			111.2
IRQ	Iraq			
ISL	Iceland	156.0		169.5
ISR	Israel	155.0		138.1
ITA	Italy	169.0	105.3	125.0
JAM	Jamaica	111.0	113.8	129.8
JOR	Jordan	119.0	93.6	91.2
JPN	Japan	172.0	154.3	226.7
KAZ	Kazakhstan	156.0	116.0	120.5
KEN	Kenya	120.0	96.8	93.6
KGZ	Kyrgyz Republic	121.0	101.1	94.6
KHM	Cambodia	87.0	113.8	98.4
KIR	Kiribati		113.8	122.9
KNA	St. Kitts and Nevis		107.4	
KOR	Korea, Rep.	147.0	106.4	154.9
KWT	Kuwait	123.0	107.4	101.9
LAO	Lao PDR	119.0	111.7	103.0
LBN	Lebanon	94.0	120.2	126.7
LBR	Liberia	140.0	0.0	
LBY	Libya		139.4	517.4
LCA	St. Lucia		124.5	106.1
LIE	Liechtenstein			
LKA	Sri Lanka	109.0	104.3	79.9
LSO	Lesotho	78.0	96.8	62.4
LTU	Lithuania	122.0	104.3	85.0

ISOCODE	Country	ST	EC	UN
LUX	Luxembourg	128.0		139.0
LVA	Latvia	126.0	121.3	99.0
MAC	Macao		102.1	
MAR	Morocco	109.0	103.2	111.2
MCO	Monaco			
MDA	Moldova	90.0	90.4	
MDG	Madagascar	101.0	106.4	100.8
MDV	Maldives		105.3	
MEX	Mexico	94.0	101.1	78.5
MHL	Marshall Islands	120.0	117.0	125.3
MKD	Macedonia, FYR	111.0	100.0	
MLI	Mali	126.0	110.6	115.9
MLT	Malta	118.0	103.2	94.8
MMR	Myanmar	94.0	147.9	86.3
MNG	Mongolia		117.0	75.8
MNP	N. Mariana Islands			
MOZ	Mozambique	126.0	105.3	95.3
MRT	Mauritania	153.0	130.9	123.0
MTQ	Martinique			159.8
MUS	Mauritius	105.0	96.8	84.4
MWI	Malawi	100.0	114.9	99.7
MYS	Malaysia	120.0	98.9	97.2
MYT	Mayotte			
NAM	Namibia	95.0	98.9	66.8
NCL	New Caledonia		155.3	162.7
NER	Niger	135.0	108.5	
NGA	Nigeria	113.0	117.0	107.9
NIC	Nicaragua	110.0	101.1	88.5
NLD	Netherlands	139.0	116.0	116.5
NOR	Norway	184.0		173.4
NPL	Nepal	100.0	93.6	77.6
NZL	New Zealand	125.0		111.7
OMN	Oman	126.0	102.1	96.3
PAK	Pakistan	96.0	104.3	70.9
PAN	Panama	94.0	95.7	107.2
PER	Peru	126.0	114.9	103.7
PHL	Philippines	106.0	109.6	99.4
PLW	Palau	104.0		109.0
PNG	Papua New Guinea	146.0	116.0	107.2
POL	Poland	109.0	114.9	87.4
PRI	Puerto Rico			
PRK	Korea, Dem. Rep.		114.9	
PRT	Portugal	122.0	97.9	106.0
PRY	Paraguay	111.0	93.6	107.1
PYF	French Polynesia			180.6
QAT	Qatar	107.0	123.4	100.2
REU	Reunion			153.6
ROM	Romania	109.0	102.1	112.6
RUS	Russian Federation	147.0	118.1	167.2
RWA	Rwanda	126.0	108.5	

ISOCODE	Country	ST	EC	UN
SAU	Saudi Arabia	147.0		95.9
SDN	Sudan	118.0	110.6	84.4
SEN	Senegal	134.0	109.6	139.9
SGP	Singapore	137.0	111.7	129.1
SLB	Solomon Islands		109.6	100.4
SLE	Sierra Leone	124.0	116.0	116.7
SLV	El Salvador	93.0	98.9	89.2
SOM	Somalia			
STP	Sao Tome and Principe		111.7	
SUR	Suriname	95.0	104.3	97.1
SVK	Slovak Republic	89.0		84.7
SVN	Slovenia	118.0		105.7
SWE	Sweden	161.0	108.5	153.6
SWZ	Swaziland	88.0	88.3	62.2
SYC	Seychelles		129.8	120.9
SYR	Syrian Arab Republic	112.0	113.8	117.8
TCD	Chad	141.0	127.7	
TGO	Togo	119.0	104.3	115.9
THA	Thailand	110.0	101.1	105.0
TJK	Tajikistan	98.0		
TKM	Turkmenistan	109.0	87.2	
TON	Tonga		108.5	95.6
TTO	Trinidad and Tobago	104.0	101.1	88.6
TUN	Tunisia	113.0	94.7	104.9
TUR	Turkey	135.0	101.1	93.0
TWN	Taiwan, China	134.0		136.6
TZA	Tanzania	130.0	120.2	111.2
UGA	Uganda	153.0	119.1	130.5
UKR	Ukraine	132.0	107.4	142.9
URY	Uruguay	151.0	123.4	115.9
USA	United States	100.0	100.0	100.0
UZB	Uzbekistan	123.0	101.1	97.7
VCT	St. Vincent and the Grenadines		130.9	
VEN	Venezuela, Republica Bolivariana de	109.0	103.2	87.2
VIR	Virgin Islands (U.S.)			
VNM	Vietnam	103.0	104.3	97.7
VUT	Vanuatu		113.8	120.1
WBG	West Bank and Gaza			
WSM	Samoa			103.1
YEM	Yemen, Rep.	97.0	103.2	66.7
YUG	Yugoslavia, FR (Serbia/Montenegro)		96.8	112.4
ZAF	South Africa	94.0	91.5	64.2
ZAR	Congo, Dem. Rep.	199.0		
ZMB	Zambia	120.0	105.3	95.9
ZWE	Zimbabwe	76.0	97.9	64.3

Table 3. All Price Levels 1996 (U.S. = 1.00)

ISOCODE	PLC	PLG	PLI
ABW			
ADO			
AFG			
AGO	0.34593	0.28960	1.31980
ALB	0.28810	0.11010	0.45460
ANT			
ARE			
ARG	0.75051	0.41770	0.96689
ARM	0.20100	0.04780	0.37630
ASM			
ATG	0.82960	0.18620	1.65370
AUS	1.00250	0.89243	1.08175
AUT	1.34506	1.30188	1.47541
AZE	0.21840	0.05060	0.43000
BDI	0.23021	0.09792	0.87453
BEL	1.26407	1.13258	1.27017
BEN	0.32301	0.23971	0.99617
BFA	0.26880	0.12949	0.71595
BGD	0.20563	0.06865	0.51237
BGR	0.22470	0.07180	0.58500
BHR	0.67370	0.57940	1.23680
BHS	0.78430	0.33630	1.19990
BIH			
BLR	0.22880	0.09600	0.32100
BLZ	0.51910	0.16890	0.92890
BMU	1.46760	0.80960	1.89630
BOL	0.36349	0.20709	0.72018
BRA	0.68605	0.47166	1.00798
BRB	0.41955	0.69035	2.44598
BRN			
BTN	0.18845	0.10692	0.56408
BUR			
BWA	0.39952	0.44521	0.94728
CAF	0.34374	0.34321	0.77261
CAN	0.86836	0.97494	0.81432
CHE	1.77787	1.81110	1.54221
CHI			
CHL	0.57117	0.25369	0.68683
CHN	0.24300	0.10400	0.42500
CIV	0.35572	0.29141	1.10740
CMR	0.31150	0.23543	1.26080
COG	0.38634	0.28782	2.87778
COL	0.44339	0.26693	0.80263
COM	0.27459	0.10916	0.84655
CPV	0.37668	0.15918	0.92103
CRI	0.47068	0.31234	1.12193
CSK			
CUB	0.38597	0.26066	2.11433
CYM	0.00000	0.00000	0.00000
CYP	0.72993	0.46846	1.23636
CZE	0.39120	0.21030	0.64060
DDR			

ISOCODE	PLC	PLG	PLI
DFA			
DJI	0.36587	0.26976	0.97461
DMA	0.59200	0.14660	1.30360
DNK	1.48564	1.26557	1.48896
DOM	0.45882	0.08707	0.87361
DZA	0.32420	0.16919	0.85045
ECU	0.46937	0.18463	0.58193
EGY	0.26897	0.25331	1.20070
ERI	0.20933	0.15125	0.88138
ESP	1.01754	0.82437	1.09662
EST	0.39810	0.19610	0.86820
ETH	0.17915	0.07894	0.72212
FIN	1.34018	1.12002	1.20987
FJI	0.56260	0.26120	0.83740
FRA	1.34465	1.14589	1.24915
FRO			
FSM			
GAB	0.38910	0.66750	2.21350
GBR	1.02194	0.84771	1.09047
GEO	0.23510	0.04110	0.68100
GER	1.38128	1.34667	1.49981
GHA	0.30149	0.11351	1.23866
GIN	0.18310	0.26240	0.68120
GLP			
GMB	0.30868	0.17844	0.77871
GNB	0.34111	0.06066	0.56829
GNQ	0.36203	0.12525	0.97207
GRC	0.93879	0.76285	1.04815
GRD	0.56838	0.32735	1.19410
GRL			
GTM	0.41246	0.11732	0.95891
GUF			
GUM			
GUY	0.27705	0.12506	0.72385
HKG	0.85214	1.15533	1.20751
HND	0.29509	0.16210	0.71338
HRV	0.60610	0.35970	0.99070
HTI	0.25347	0.05603	0.99908
HUN	0.50276	0.27650	0.73887
IDN	0.30259	0.09620	0.49761
IMY			
IND	0.23108	0.05040	0.44767
IRL	1.10218	0.95698	1.20814
IRN	0.37331	0.26297	0.80663
IRQ			
ISL	1.29760	1.02181	1.32937
ISR	1.07353	0.88988	0.94959
ITA	1.05557	1.01115	1.13305
JAM	0.54053	0.26308	1.10688
JOR	0.48400	0.16140	0.87070
JPN	1.63845	1.31525	1.60634
KAZ	0.24010	0.08520	0.57770
KEN	0.23805	0.17803	0.65876
KGZ	0.19200	0.04510	0.40320
KHM	0.25366	0.05385	0.76058

ISOCODE	PLC	PLG	PLI
KIR			
KNA	0.60090	0.15720	1.50670
KOR	0.83901	0.71417	0.84920
KWT	0.67652	0.67136	1.21314
LAO	0.38345	0.05065	0.46105
LBN	0.62490	0.30140	1.43140
LBR			
LBY			
LCA	0.58621	0.35807	1.24986
LIE			
LKA	0.23727	0.08439	0.58628
LSO	0.30296	0.08431	0.72816
LTU	0.33040	0.15790	0.69530
LUX	1.21472	1.63088	1.32092
LVA	0.36140	0.15810	0.70030
MAC	0.66049	0.35319	1.23785
MAR	0.31175	0.29333	0.85303
MCO			
MDA	0.17910	0.07600	0.50710
MDG	0.35663	0.13705	1.74386
MDV			
MEX	0.46748	0.24198	0.78020
MHL			
MKD	0.48660	0.27060	0.89900
MLI	0.30256	0.16008	1.12090
MLT	0.63434	0.41754	1.19550
MMR			
MNG	0.32580	0.19080	0.59500
MNP			
MOZ	0.19944	0.05995	1.24276
MRT	0.36746	0.16382	0.80987
MTQ			
MUS	0.25804	0.29064	0.88784
MWI	0.28378	0.29396	0.98440
MYS	0.50066	0.27247	0.74786
MYT			
NAM	0.43240	0.29129	1.06150
NCL			
NER	0.27806	0.10745	0.75120
NGA	1.17035	0.90828	1.83617
NIC	0.24380	0.09180	0.64191
NLD	1.22992	1.09344	1.39617
NOR	1.51745	1.19086	1.47605
NPL	0.17934	0.04627	0.24735
NZL	1.03594	0.75059	1.13745
OMN	0.39690	0.69870	1.06710
PAK	0.25852	0.10463	0.49055
PAN	0.52099	0.36957	0.71861
PER	0.59449	0.27635	0.75028
PHL	0.35932	0.19838	0.62788
PLW			
PNG	0.30271	0.17531	0.86497
POL	0.46977	0.38214	0.62883
PRI	0.80000	0.68000	1.10000
PRK			

ISOCODE	PLC	PLG	PLI
PRT	0.86869	0.46743	0.99999
PRY	0.36830	0.13122	0.79452
PYF			
QAT	0.47710	0.70620	1.22500
REU			
ROM	0.27244	0.20334	0.77016
RUS	0.38720	0.18420	0.78360
RWA	0.26230	0.08890	1.42721
SAU	0.49604	0.43602	1.40070
SDN	0.27281	0.06575	0.71297
SEN	0.34053	0.20615	1.11776
SGP	1.15450	0.97780	0.97980
SLB			
SLE	0.21231	0.17619	0.45420
SLV	0.42174	0.18532	0.96274
SOM			
STP	0.25176	0.11232	0.69007
SUN			
SUR			
SVK	0.33530	0.21560	0.58840
SVN	0.76370	0.47340	0.84720
SWE	1.47832	1.20986	1.38477
SWZ	0.21030	0.20330	0.48110
SYC	0.49068	0.41457	1.47653
SYR	0.98817	0.35423	3.32123
TCD	0.28445	0.10166	0.64458
TGO	0.44432	0.14432	0.61843
THA	0.45755	0.24551	0.49883
TJK	0.15500	0.03020	0.47440
TKM	0.09860	0.02780	0.17220
TON			
TTO	0.44808	0.29409	0.88705
TUN	0.30622	0.32848	0.82450
TUR	0.43088	0.27661	0.68475
TWN	0.79920	0.68252	1.09575
TZA	0.39871	0.20243	0.99206
UGA	0.37021	0.09927	1.79482
UKR	0.20520	0.08920	0.57820
URY	0.68152	0.35204	0.80616
USA	1.00000	1.00000	1.00000
UZB	0.20940	0.08510	0.76360
VCT	0.53480	0.10620	1.43350
VEN	0.49385	0.12570	0.73464
VIR			
VNM	0.18630	0.07040	0.41440
VUT			
WBG			
WSM			
YEM	0.76630	0.11630	2.39040
YUG			
ZAF	0.46673	0.28142	1.17235
ZAR	0.24819	0.08144	0.81360
ZMB	0.42918	0.25018	0.67010
ZWE	0.23568	0.21038	0.50661

