December, 1994

Appendix TABLE OF CONTENTS
for a Space-Time System of National Account
aka Penn World Table 5.6

I.0 An Update of what was Appendix B of "The Penn World Table (Mark 5): An Expanded Set of International Comparisons, 1950- 1988," The Quarterly Journal of Economics, May 1991 to correspond to PWT 5.6.

NOTE BENE: Some column numbers have been changed from earlier versions and some changes in definitions of variables 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 PPP based conversions across space, we have adopted Space-Time System of National Accounts as a preferred description of our tableaux.

I.0 Appendix

I.1 The Construction of the DATA TABLE: OUTLINE

A General Variables
1. Population: Pop (COLUMN 1)
2. Exchange rates: ExR (COLUMN 17)

B 1985 entries
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i Countries covered by only one of the ICP 1970, 1975, 1980, 1985 and 1990 benchmark studies
ii Countries covered by more than one benchmark study
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i Non-benchmark Countries
ii Special Cases: Countries for which some PPP estimates exist and/or it is difficult to treat these estimates along with the remaining benchmark countries.

2. Real shares of components of RGDPL: Consumption: c (COLUMN [4]; Investment: i (COLUMN [5] Government: g (COLUMN [6]; Net Foreign Balance

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1. International prices of 1985
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e. Real GDP chain per worker: RGDPW (COLUMN [19])
f. Capital Stock per Worker: KapW (COLUMN [20])
g. Producers Durables: % of Capital Stock: KDUR (COLUMN [21])
h. Non Residential Construction: % of Capital Stock: KNRES (COLUMN [22])
i. Other Construction: % of Capital Stock: KOTHER (COLUMN [23])
j. Residential Construction: % of Capital Stock: KRES (COLUMN [24])
k. Transport Equipment: % of Capital Stock: KTRANP (COLUMN [25])
l. Standard of Living: Private and public consumption less defense spending as a percent of RGDPL (COLUMN [29])

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ii Investment: ci (COLUMN [11])
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c. Openness: (exports + imports)/(CGDP): Value of the ratio is the same in national prices. OPEN (COLUMN [26])
d. Real Gross National Product (% of CGDP): RGNP (COLUMN [27])
e. Gross Domestic Private Investment (as a % of gross domestic investment) IPri (COLUMN [28])

I.2 The Construction of the DATA TABLE: DOCUMENTATION [Item in Outline and data source or method of construction]

I.1- A 1. Pop [1] Population is from the World Bank World Tables, Spring 1994 and archives.

I.1- A 2. XR [17] 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.

I.1-B 1. a. i RGDPCH [2], RGDPL [3], RGDPTT [7], and CGDP [9] Obtained from an aggregation using parities for consumption, investment and government from the 1985 benchmark study, and domestic-currency expenditures of Spring, 1994 vintage. For countries with a benchmark year other than 1985 the input component parities were extrapolations. The input parities used in this study can differ somewhat from the originally published estimates. [See Note /1/] The terms of trade adustment for RGDPTT is defined in Note /3/.

I.1-B 1.a.ii RGDPCH [2], RGDPL [3], RGDPTT [7], and CGDP [9] For multiple benchmark countries the procedure is the same as for single benchmark countries as described above except for the input parities. The input parities for C, I, and G were obtained using information on the parities from all of the benchmark studies (1970-1990) in which a country participated. Derivation of these parities is described in Note/4/.

I.1-B 1. b.i Non-benchmark Countries: RGDPCH [2], RGDPL [3], RGDPTT [7], and CGDP [9] Estimated from an equation based upon the relationship between a country's real Domestic Absorption (DA) relative to the US and an estimate of its relative DA derived from price survey data used for post adjustment allowances for international personnel. See Note /2/

I.1-B 1. b.ii Special Cases: RGDPCH [2], RGDPL [3], RGDPTT [7], and CGDP [9]: For these countries the input parities for C, I and G were from other studies, sometimes modified. For those countries included in PWT 5.6, the national accounts are from the World Bank, except for China. For a full discussion of these countries see Note /7/.

I.1-B 2. a. Real shares of RGDP (c [4], i [5], g [6]) taken directly from the benchmark estimates for 1985, or from consistentized or extrapolated components for countries with more than one benchmark and/or countries that did not participate in the 1985 comparison, but did participate in other benchmark studies.

I.1-B 2. b. Real shares for non-benchmark countries (c [4], i [5], and g [6]) were estimated from relationships between nominal and real shares for the 60 benchmark countries for 1980. Note /5/

I.1-B 3. a. Price Level of GDP, P [13] is the PPP over GDP divided by the exchange rate [17] 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.

I.1-B 3. b. Price Level of components PC [14]. PI [15], and PG [16] is derived in the same way as the price level of GDP. In previous versions of PWT through 5.0 these price levels were expressed with the US=100; in PWT 5.5 and 5.6 the US = 100 only for GDP and not for components.

I.1-C 1. b. Components c [4], i [5], and g [6] for international prices of

1985. Each component in international dollars for 1985 is moved to another year by the national accounts growth rate for that component between 1985 and the given year. This includes exports and imports. c [4], i [5], and g [6] are obtained by dividing each component by the sum of all four. (See I.1-C 1.d.)

I.1-C 1. c. RGDPCH [2] is a chain index obtained by computing the growth rate of RGDP between t-l and t, using the current price component shares in t-1 as described in I.1-c 4. below.

I.1 C 1. d. Real Gross Domestic Product, RGDPL [3], is obtained in any year by adding up consumption, investment, government and exports and subtracting imports. It is a fixed base index where the reference year is 1985, hence the designation "L" for Laspeyeres.

I.1-C 1. e. Real GDP chain per equivalent adult: RGDPEA [18]. The equivalent adult measure used here assigns a weight of 1.0 to all persons over 15, and 0.5 for those under age 15. See f.n. 12 of QJE text for additional information.

I.1 C 1. f. Real GDP chain per worker: RGDPW [19] Worker for this variable is usually a census definition based on economically active population The underlying data are from the International Labour Organization, and have been interpolated for other years.

I.1 C 1. g. Capital Stock per Worker: KapW [20] Capital stock has been estimated assuming a geometric depreciation rate for different classes of assets. Capital stock components are built up on a perpetual inventory basis applying national growth to the benchmark estimates for the components described in I C 1. h-k. below. Capital stock here is the sum of machinery and equipment, non-residential and other construction. The stock of residential structures has been provided separately, but it, and change in stocks, and foreign investment are not included in the PWT capital stock total. Details are provided in Note /6/.

I.1 C 1. h. Producers Durables, as % of non-residential Capital Stock: KDUR [21]. Details given in Note /6/.

I.1 C 1. i. Non Residential Construction, as % of non-residential Capital Stock: KNRES [22] Details given in Note /6/.

I.1 C 1. j. Other Construction, as% of non-residential Capital Stock: KOTHER [23] Details given in Note /6/.

I.1 C 1. k. Residential Construction, as % of Capital Stock: KRES [24] Details given in Note /6/.

I.1 C 1. l. Transport Equipment: % of Capital Stock: KTRANP (COLUMN [25]) Details given in Note /6/.

I.1 C 1.m. Standard of Living [29] The definition of this variable is discussed in Note /8/. It is expressed as a percent of RGDPL.

I.1 C 2. RGDPTT [7] is obtained by modifiying RGDP by a factor that takes account of gains or losses in the terms of trade. The definition is provided in Note /2/.

I.1 C 3. Current Year International Prices

I.1 C 3. a. CGDP [9] Estimates in current year international prices are derived in all years from Geary aggregations involving up to 150 countries. The inputs are the national expenditures on consumption, investment and government and the corresponding PPPs are extrapolated from 1985 by the change in the component deflator relative to the US change. The result of this aggregation is an estimate of the PPP for Domestic Absorption (DA). The net foreign balance (NFB) in each year is valued separately at the PPP for DA of each country. CGDP is equal to NFB + DA. In this treatment the PPP for CGDP is identical to that for DA. This is a departure from previous versions of PWT. The advantage of the approach of PWT 5.6 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 price national accounts data for fairly recent years. In the past we have simply provided non-benchmark estimates for these countries for 1985. In PWT we have also make CGDP estimates for these countries for 1990 as well.

We have also used a weighting system to take account of the fact that not all countries have national accounts for all years other than 1985. (While we do not have all countries in 1985, it is virtually the world). The procedure was as follows. Countries in 1985 were divided into 4 groups based upon their per capita GDP (CGDP) in 1985. Group 1, under 15% of the US., Group 2, 15 to 30%, Group 3, 30 - 60%, and Group 4, above 60%. For the purpose of this weighting, each country in 1985 remains in its group in every year. The sum the total real GDP of each group in 1985 and calculate the percentage of each country in that group to the total for the group. In years other than 1985, the sum of the weights of those countries in each group that are to be included in the aggregation in that year is calculated; call this sum, SWi, where i =1,4 for the four groups. The country weight in aggregations in PWT 5 and 5.5 has been its total Domestic Absorption at exchange rates in each year. In the new scheme, each country in a group that is included in an aggregation in a given year will get a weight that is its total DA at exchange rates divided by SWi (divided by 100).

I.1 C 3. b. Consumption share: cc [10]; Investment share: ci [11]; and Government share: cg [12] are obtained directly as output from the Geary aggregation in each year. Shares may not add to 1.0 because the denominator includes the net foreign balance.

I.1 C 3. c. OPEN [25] Exports plus Imports/ 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 OPEN will be the same because the price level (conversion factor) for DA and exports and imports are the same.

I.1 C 3. d. RGNP [26] From the World Bank and UN data tapes 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), RGNP can also be treated as though it were in international prices.

I.1 C 3. e. I Pri [28] This is the percentage of domestic investment privately purchased. The basic investment data in national prices is from the IMF tape on government finance statistics and attributes all non-public investment to the private sector. To convert this ratio in national prices to international prices, one needs to know the relative price levels of public and private investment. In general, public investment includes very little machinery and equipment. This means that in international prices IPri should rise with the level of income compared to its value in national prices. This is because the price of construction (most public investment) rises and the price of machinery falls with income per capita.

Endnotes:

Note /1/ The countries participating in the 1985 benchmark comparisons fall into five groups: 22 OECD countries [for which there are also 1990 benchmarks]; comparisons for 11 Asian countries including Japan (also in OECD), 22 African countries, 5 Group II countries in Europe including Finland and Austria in the OECD, and a group of 7 Carribean countries. We carried out a benchmark comparison for the 64 1985 benchmark countries. This comparison is as yet unpublished and differs significantly from World Comparisons of Real Gross Domestic Product and Purchasing Power, 1985 : Phase V of the International Comparison Programme (United Nations, New York, 1994) because it has integrated the Caribbean with the other countries into a world comparison while the UN presentation builds up from the regional comparisons. Our comparison relies on a linking of the 7 Caribbean countries through the 1975 benchmark estimates for Jamaica. The reason that this latter step was necessary is that the Caribbean countries were to have been linked through the African countries but the results of this exercise were quite unsatisfactory. The United Nations decided not to link in the Caribbean countries in their report on the 1985 comparisons cited above. However, we felt that for our purposes this comparison could be linked through Jamaica in a less than ideal, but still usable, way. The following remarks on the earlier benchmark comparisons apply to 1985 as well.

There were three differences between the benchmark data underlying this paper and the Phase IV publication of the world comparisons for 60 countries for 1980 of the UN Statistical Office(1986). First, we have used as control totals the latest current national accounts data of the countries as of Spring, 1994, while the UN for some countries in 1980 has used national accounts as available in 1982 or 1983. Second, in building up the world comparisons, we have not followed the so called fixity procedure but have simply used a Geary aggregation involving all 60 countries. In contrast, the procedure used by the OECD and the UN has been to build up the world or regional comparisons from aggregations of the countries within a grouping, say Africa or the 12 EC members within 24 OECD countries that retains the

relationships between countries within their group. Third, we have used slightly different treatments of two categories, change in stocks and compensation of government employees, and used a different normalization procedure which mainly affects the valuation of the net foreign balance.

For 1975 and 1970 we have similarly re-run the Geary aggregations using Spring, 1994 national accounts revisions for those years. The 1985 RGDPCH (and CGDP, RGDP and RGDPTT) estimates of countries covered by more than one benchmark study were adjusted to reconcile them with the results of other benchmark years. Note that this adjustment---"consistentization" process--- was carried out at the level of Consumption, Investment, and Government, and is described in Note /4/.

For the 1990 OECD benchmark we have used the published results with some important modifications also described in Note/4/. We have also had available the preliminary version of the 1990 benchmark for Group II in Europe that included the former Soviet Union (FSU). Use has been made of these estimates forCzechoslavakia, Hungary, Poland. Romania and the Former Soviet Union in the Data Table.

We have also used the recently available 1988 COMECON study which provides binary comparisons with the FSU with those countries in the 1990 Group II, as well as Bulgaria, the GDR, Mongolia, Cuba and Viet Nam. In PWT 5.6, we have not attempted to unify the accounts for Germany or integrate the successor states of the FSU into PWT. However, we have provided rough estimates of the per capita GDP of these 18 states in the Supplementary Data Table [IV].

For those benchmark countries not participating in 1985, the procedure was to value the 1975 or 1980 benchmark estimates of C,I, and G for these countries at 1985 international prices using the growth rates for these components from their national accounts together with the change in international prices of the components between 1975 and 1985 or 1980 and 1985. The change in international prices can be estimated from the benchmark estimates and the deflator for the numeraire country, the U.S.

Grading of PWT Country Estimates

In earlier versions of PWT a letter grade has been entered for benchmark and nonbenchmark countries to signal the relative reliability of the estimates. The letter grade system has run from A to D, where a D in our minds means the real GDP estimate could well be 30% higher or lower, and an A, 5-10% in either direction. For components of GDP, capital stock and output per worker estimates the error ranges are probably larger.

The basis for these earlier estimates involved three factors: (1) the number of benchmark comparisons a country had entered; (2) its income level since within benchmarks it has been found that the margin of error was greater in low income countries; and (3) for nonbenchmark countries the sensitivity of their estimates. These 3 factors primarily concerned the quality of our estimates in the base year of the Data Table. In fact, much of the use of PWT estimates is to study growth and/or some type of panel analysis. For this purpose, both the base year estimates and the growth rates are of concern. In the grading system in PWT 5.6, we adopted a similar way of grading both benchmark and nonbenchmark countries that ties to combine both errors in levels and growth rates. Unfortunately, our composite single grade does not differentiate between the errors in our level and growth estimates.

(1) As discussed in Note /4/ for multiple benchmark countries an adjustment procedure was used to reconcile the differences that existed between an earlier benchmark extrapolated to a later year and the benchmark estimate of the later year. In Table B2 a set of adjustment factors were provided for these countries for each component and the total of domestic absorption. In our adjustments we have not altered the growth rates of countries; however, the size of the adjustment factors reflect the size of the errors that can arise as we move benchmark estimates to other years. We have therefore built up our grading estimates for multiple benchmark countries on the size of these adjustment factors, as well as the income of countries and the number of benchmarks in which the country had participated. The following Table, derived from B2, indicates our procedure.

Country*		Average Adjustment Factor For Domestic Absorption	Components**	Number of Benchmarks	Grade
Australia	H	5-10%	n.a.	2	A-
Austria	H	5-10%	25-30%	4	A-
Belgium	H	5-10%	20-25%	5	A
Brazil	ML	under 5%	20-25%	2	B
Botswana	L	15-20%	40-50%	2	C-
Canada	H	under 5%	15-20%	3	A
Cameroon	L	15-20&	50-60%	2	D+
Colombia	ML	under 5%	20-25%	3	B
Denmark	H	5-10%	10-15%	4	A
Ethiopia	L	under 5%	30-40%	2	C
Finland	H	5-10%	20-25%	3	A
France	H	5-10%	15-20%	5	A
Germany, W.	H	5-10%	15-20%	5	A
Great Britain	H	5-10%	15-20%	5	A
Greece	MH	5-10%	20-25%	3	B+
Hong Kong	H	under 5%	50-60%	2	B-
Hungary	ML	15-20%	50-60%	5	C-
India	L	15-20%	50-60%	4	C-
Ireland	MH	5-10%	10-15%	4	A
Iran	ML	30-40%	30-40%	3	D+
Italy	H	5-10%	20-25%	5	A-
Ivory Coast	L	10-15%	40-50%	2	C-
Jamaica	ML	under 5%	40-50%	2	C
Japan	H	5-10%	20-25%	5	A-
Kenya	L	5-10%	30-40%	4	C
Korea	M	5-10%	20-25%	4	B+
Luxembourg	H	5-10%	15-20%	4	A
Morocco	ML	20-25%	60-70%	2	D+
Madagascar	L	5-10%	above 100%	2	D+
Mexico	ML	under 5%	20-25%	2	B
Mali	L	5-10%	20-25%	2	C
Malawi	L	10-15%	40-50%	3	C-
Malaysia	MH	under 5%	10-15%	2	B+
Nigeria	L	5-10%	25-30%	2	C
Netherlands	H	5-10%	20-25%	5	A
Norway	H	under 5%	25-30%	3	A
New Zealand	MH	10-15%	n.a.	2	A-
Pakistan	L	5-10%	40-50%	3	C
Philippines	L	5-10%	30-40%	4	C
Poland	ML	20-25%	60-70%	3	C-

Portugal	MH	10-15%	30-40%	3	B+
Senegal	L	15-20%	40-50%	2	C-
Spain	MH	5-10%	25-30%	4	B+
Sri Lanka	L	10-15%	80-95%	3	D+
Sweden	H	5-10%	n.a.	2	A-
Thailand	ML	under 5%	30-40%	3	B-
Tunisia	ML	10-15%	30-40%	2	C
Turkey	ML	10-20%	n.a.	2	C
Tanzania	L	10-15%	40-50%	2	C-
Uruguay	ML	under 5%	60-70%	2	C
United States	H	5-10%	10-15%	5	A
Yugoslavia	ML	under 5%	25-30%	4	B
Zambia	L	10-15%	50-60%	3	C-
Zimbabwe	L	5-10%	15-20%	2	C+

* Countries have been grouped as low (L), low middle (ML), middle (M), high middle (MH), and high (H) income countries.

** Percentage differences have been calculated without regard to sign over the three components, C, I, and G and over the total of DA. The sum of the percentage differences over all the benchmarks are divided by the number of benchmarks so that comparisons can be made across countries participating in different numbers of benchmarks. The percentage differences for the 3 components will tend to be larger than for domestic absorption to the extent that the former offset each other.

Nonbenchmark Countries

The method used for the nonbenchmark countries is parallel to that for the benchmark countries in that it combines information on the consistency of level and growth of GDP. This method has also been employed for countries with single benchmarks. The method is similar to what has been used previous versions of PWT for nonbenchmark countries, but will use comparisons for more recent years. It is more limited than for the multiple benchmark countries because it only involves the aggregate of GDP.

Equations of the form described in note /2/ were estimated for 1985 and 1990 (the observations were multiple benchmark countries only) were used to provide estimates of the domestic absorption of nonbenchmark countries and single benchmark countries in 1985 and 1990. The estimate for 1985 was moved to 1990 and the percentage difference between the two estimates was calculated. The grade for nonbenchmark countries took account of this difference and the income level of the country.

For single benchmark countries the procedure was similar except that the difference between the estimates from the equation for 1985 and 1990 and the actual benchmark estimate of that year or extrapolated to that year were estimated.

At the time of preparation of this section (November,1994), these estimates had not been completed. Also note that for China, Mongolia and Taiwan, the estimates are from quasi benchmarks. For purposes of making error estimates, the same procedure was used as if the these were single benchmark countries.

Note /2/ In PWT4 and PWT5 an empirical equation was found for estimating real DA (domestic currency domestic absorption converted to dollars by the PPP) for nonbenchmark countries. 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 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, it does appear that there are systematic factors affecting the post- adjustment indices compared to PPPs for DA for countries in Africa, so in the estimating equations we have included a dummy variable for African countries.

In the estimating equations below for PWT5.6 (and 5.5) the post adjustment indexes have again been used to provide an estimate of the real domestic absorption of each country; this estimate is obtained by dividing the national currency domestic absorption by the PPP implicit in the post adjustment index. The International Civil Service Commission (ICSC) index is published in the Monthly Bulletin of Statistics of the United Nations Statistical Office, usually in September of each year. It provides an index with New York city as a base and is denoted (UN) in the equations below. The other index that we also used in PWT4 has kindly been supplied to us 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 PWT5 and 5.6 a third index was also used, that of the U.S. State Department. 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 also. The ECA index covered somewhat fewer countries than the ICSC index in 1985, so that the addition of a third index allowed us to sharpen some of our estimates. For the ICSC index this variable is termed r(UN), for the ECA estimate, r(ECA), and for the State Department, r(USS). Although there are more benchmark countries for 1985 and 1990 than there had been earlier, there are also more countries for which nonbenchmark estimates need to be made because the size of PWT has expanded. However, the proportion of world production covered by nonbenchmark estimates has declined.

In PWT 6.0 we plan a review of our nonbenchmark estimates. In PWT 5.5 and 5.6 the method applied had an important difference from earlier practice. The consistentized estimates for 1985 that are discussed in Note /4/ were used as basis for the estimating equations. Further, since it is our experience that countries with multiple benchmarks typically have more reliable benchmark information, we only used the 48 countries in the 1985 benchmark with multitple benchmarks in generating our estimating equations for non-benchmark countries. Put another way, the benchmark data for countries participating in a single benchmark or multiple benchmarks but not 1985 were used as a basis for their 1985 Data Table entries, but they were not used in

deriving the estimating equations for nonbenchmark countries. While a review of these procedures awaits PWT 6.0, it may be noted for now that while less observations were used in the estimating equations for PWT 5.5 and 5.6, the root mean square errors were smaller and the adjusted R2s were higher than in PWT 5.0 estimating equations.

The equations estimated for 1985 are given in (1) - (7) below with the standard errors of the coefficients in parentheses. The number of observations differs among equations because each post adjustment index has its own group of countries without complete overlap. The post adjustment indexes are taken separately in (1) - (3) as pairs in equations (4) - (6) and all three in equation (7). The variable AD is the dummy variable for African countries. Individually and in all pairings the US state department and ECA indexes are more important variables that the UN index, while the State Department index does better against ECA.

(1) ln r(j) = .739 ln r[UN(j)] - .234 AD + .008 Root MSE = .175
(.027) (.089) (.067) n=42 R2 =.978

(2) ln r(j) = .703 ln r[ECA(j)] - .211 AD - .026 Root MSE = .161
(.023) (.041) (.043) n=46 R2 =.981

(3) ln r(j) = .737 ln r[USS(j)] - .213 AD + .135 Root MSE = .147
(.022) (.068) (.053) n=47 R2 =.985

(4) ln r(j) =.296 ln r[UN(j)] + .429 ln r[ECA(j)] - .199 AD - .009
(.130) (.122) (.074) (.046)
Root MSE = .156: n=40 R2 =.972

(5) lnr(j) =.111 ln r[UN(j)] + .629 ln r[USS(j)] - .213 AD + .121
(.186) (.144) (.072) (.056)
Root MSE = .155: n=42 R2 =.983

(6) ln r(j) = .437 ln r[USS(j)]+ .293 ln r[ECA(j)] -.195 AD + .077
(.121) (.116) (.066) (.046)
Root MSE = .159: n=45 R2 = .986

(7)lnr(j)=.440lnr[USS(j)]+.309lnr[ECA(j)]-.021lnr[UN(j)]-.197AD
(.207) (.130) (.193) (.071)
Root MSE = .149: n=40 R2 = .985 Intercept .075 (.059)

The coefficients on r(UN), r(ECA) and r(USS), when taken individually, range from about .70 to .74 indicating that typically prices in the capital cities relative to New York are low relative to the price level of GDP in the same countries compared with the U.S. The coefficients in the above equations were used to estimate a level of DA for each non-benchmark country, the estimating equation depending upon which post-allowance indexes were available for the country.

A description is provided in Note /5/ of how the real shares of C, I and G were obtained for the nonbenchmark countries. The associated PPPs for C, I, and G and the national expenditures were then merged with those data for the

benchmark countries. A Geary aggregation was then performed on these 150 countries, producing a consistent set of national absorption (and GDP figures when the net foreign balance is included) for all of the countries. This procedure is different than PWT3 and PWT4, in that the benchmark values are not necessarily preserved for the benchmark countries in the base year in PWT5.

Note \3\ The terms of trade adjustment used in PWT follows the Courbis-Kurabayashi method discussed in PWT3 (p. 214). However, our printed formula in that source is incorrect. The correct formula is:

TTADJ = [Mx/M+X (Px /Pm -1)] - [Xm/M+X (Pm /Px -1)]

where X: current exports, M: current imports, x: current exports deflated by Px, m: current imports deflated by Pm, Px: price index for exports, and Pm: price index for imports. In the publication of PWT3 the - sign between the two terms in []s was published as a + sign.

In the data table RGDPTT = RGDP + TTADJ.

Note /4/ The procedure described as "consistentization" in PWT 4 is briefly discussed in the text and in this note was more fully set out in Summers and Heston (1988) in the references in connection with PWT 4. One key input in that formulation was the underlying differences between implied benchmark growth and national growth rates, the Deltas. The Deltas have been calculated for each country participating in more than one benchmark study. The model underlying PWT 4 allowed for the estimation of adjustment factors that could be used to reconcile the benchmark estimates and the national growth rates. These adjustment factors were derived using the Deltas and the parameter values used for variances of the benchmark estimates and the covariances among successive benchmark estimates and the covariance between successive national accounts growth rates. It was assumed that the covariances between growth rates and bench mark estimates were zero. While we believe this errors in variables formulation is an appropriate way to model the estimation problem, we have in fact assumed covariance and variance estimates in PWT 5.5 and 5.6 that permit a somewhat transparent interpretation of the adjustments being made. It is this simpler formulation that is described below.

The deltas represent the departure of any two benchmarks from what one would obtain by extrapolating one benchmark forward to the second benchmark and comparing the results. One can also think of this consistency check as follows. Each benchmark for years other than 1985 is extrapolated to 1985. For countries participating in 5 benchmark comparisons there would be 5 estimates for 1985. The reconciliation process that is carried out may be thought of as an averaging of these 5 estimates. For a country with two benchmarks, the averaging would be of the 2 1985 estimates. Each of these averages would be done separately for consumption, investment and government.

What kind of average is being taken? While the average is not a simple average, it basically has as input a judgement about the variance of each benchmark estimate relative to all others. The major departure this simplification introduces over PWT 4 and 5, is that no modification is made of

the national growth rates of the components.

One problem in this reconciliation process was the 1990 benchmark for the OECD countries. At the level of C, I and G, OECD prices will tend to differ from the international prices of a world comparison that underlies the 1970, 1975, 1980 and 1985 benchmarks because the OECD consists primarily of high income countries. As a consequence, only one delta was estimated for the 1990 OECD benchmark at the level of Domestic Absorption (DA). Our adjustment was in two stages for the OECD countries. At the component level the 1970-85 benchmarks were taken into account. Then an overall Domestic Absorption adjustment was applied to these components based upon the 1970-90 benchmarks.

Table B1 provides the adjustment factors for the components for each multiple benchmark country. An adjustment factor is provided for the 5 benchmark years. The adjustment factor would be multiplied by the benchmark value for that country for the component. An entry of 1.0 means the country did not participate in the benchmark. For 1990 OECD benchmark the adjustment factors are identical for the three components and the total for reasons indicated above. For 1985 this will also be true for OECD countries, like Australia (AUS) for which 1985 is their lst benchmark, while for countries like Austria (AUT), which has particpated in benchmarks since 1975, the 1985 factors will differ. In terms of the construction of the Data Table, the only adjustment factors actually used are those for 1985 for the three components of DA. The factors for the total of DA, and the components for other benchmark years are provided as information on how these would be adjusted if one were reconciling all of the benchmarks by our procedure. In Table B2 for each country (noted by its World Bank code) a row is given for consumption (C), government (G), investment (I), and the total (T) of the 3, domestic absorption.

Table B1

Adjustment Factors Derived from the
Procedure to Reconcile Benchmark and National Growth Estimates

Country	1970	1975	1980	1985	1990
AUS C	1.000000	1.000000	1.000000	0.919798	1.087195
AUS G	1.000000	1.000000	1.000000	0.919798	1.087195
AUS I	1.000000	1.000000	1.000000	0.919798	1.087195
AUS T	1.000000	1.000000	1.000000	0.919798	1.087195
AUT C	1.000000	0.964725	0.947269	0.886365	1.234555
AUT G	1.000000	0.952045	0.950716	0.894913	1.234555
AUT I	1.000000	0.841016	0.846382	1.137938	1.234555
AUT T	1.000000	0.940489	0.913497	0.942820	1.234555
BEL C	0.993001	0.958836	1.014634	0.907686	1.140411
BEL G	1.172491	0.873163	0.942500	0.908766	1.140411
BEL I	0.949664	0.971016	0.967019	0.983347	1.140411
BEL T	1.030514	0.964046	0.987955	0.893407	1.140411
BRA C	1.000000	0.918477	1.088759	1.000000	1.000000
BRA G	1.000000	1.209914	0.826505	1.000000	1.000000
BRA I	1.000000	0.996765	1.003246	1.000000	1.000000
BRA T	1.000000	0.969094	1.031891	1.000000	1.000000
BWA C	1.000000	1.000000	0.772855	1.293905	1.000000
BWA G	1.000000	1.000000	0.760949	1.314149	1.000000
BWA I	1.000000	1.000000	0.986426	1.013761	1.000000
BWA T	1.000000	1.000000	0.849995	1.176478	1.000000

CAN	C	1.000000	1.000000	0.989590	0.951394	1.062146
CAN	G	1.000000	1.000000	0.876251	1.074453	1.062146
CAN	I	1.000000	1.000000	0.921887	1.021264	1.062146
CAN	T	1.000000	1.000000	0.960321	0.980392	1.062146
CIV	C	1.000000	1.000000	1.004728	0.995294	1.000000
CIV	G	1.000000	1.000000	0.733063	1.364140	1.000000
CIV	I	1.000000	1.000000	0.823528	1.214288	1.000000
CIV	T	1.000000	1.000000	0.868548	1.151347	1.000000
CMR	C	1.000000	1.000000	0.790472	1.265067	1.000000
CMR	G	1.000000	1.000000	0.731843	1.366413	1.000000
CMR	I	1.000000	1.000000	1.000594	0.999407	1.000000
CMR	T	1.000000	1.000000	0.824058	1.213507	1.000000
COL	C	0.903986	1.061364	1.042255	1.000000	1.000000
COL	G	1.116042	1.026222	0.873128	1.000000	1.000000
COL	I	1.023620	1.117911	0.873885	1.000000	1.000000
COL	T	0.944915	1.046304	1.011462	1.000000	1.000000
DEU	C	0.900916	0.980817	0.990025	0.952988	1.199483
DEU	G	1.085725	0.881619	0.999062	0.871791	1.199483
DEU	I	1.032530	0.921845	0.907558	0.965098	1.199483
DEU	T	0.977126	0.960026	0.963674	0.922236	1.199483
DNK	C	1.000000	0.961245	1.020746	0.910301	1.119601
DNK	G	1.000000	0.889054	1.028359	0.976931	1.119601
DNK	I	1.000000	1.005533	0.938263	0.946708	1.119601
DNK	T	1.000000	0.973721	0.993779	0.923022	1.119601
ESP	C	1.000000	0.979004	0.957956	0.884002	1.206193
ESP	G	1.000000	0.839709	1.108571	0.890617	1.206193
ESP	I	1.000000	0.912570	1.006103	0.902972	1.206193
ESP	T	1.000000	0.959707	0.993105	0.869860	1.206193
ETH	C	1.000000	1.000000	1.079958	0.925962	1.000000
ETH	G	1.000000	1.000000	0.881788	1.134059	1.000000
ETH	I	1.000000	1.000000	1.155774	0.865221	1.000000
ETH	T	1.000000	1.000000	0.989323	1.010792	1.000000
FIN	C	1.000000	1.000000	0.965290	0.929479	1.114558
FIN	G	1.000000	1.000000	0.833625	1.076283	1.114558
FIN	I	1.000000	1.000000	0.959528	0.935060	1.114558
FIN	T	1.000000	1.000000	0.946742	0.947689	1.114558
FRA	C	0.870390	0.972474	1.022641	0.975895	1.183809
FRA	G	1.059971	0.896641	0.978068	0.908733	1.183809
FRA	I	0.964141	0.971376	0.964094	0.935559	1.183809
FRA	T	0.939593	0.969942	0.990796	0.935510	1.183809
GBR	C	1.043684	0.914692	0.947263	0.941208	1.174896
GBR	G	0.957840	0.869619	1.122413	0.910386	1.174896
GBR	I	1.014946	0.884726	0.924713	1.025041	1.174896
GBR	T	1.015833	0.871991	0.995901	0.964829	1.174896
GRC	C	1.000000	1.000000	0.925648	0.947958	1.139634
GRC	G	1.000000	1.000000	0.912684	0.961423	1.139634
GRC	I	1.000000	1.000000	0.849441	1.033002	1.139634
GRC	T	1.000000	1.000000	0.895753	0.979595	1.139634
HKG	C	1.000000	1.000000	1.077699	0.927903	1.000000
HKG	G	1.000000	1.000000	0.660295	1.514474	1.000000
HKG	I	1.000000	1.000000	0.980110	1.020293	1.000000
HKG	T	1.000000	1.000000	1.006717	0.993328	1.000000
HUN	C	0.818395	0.743168	1.265364	1.299375	1.000000
HUN	G	0.818694	0.801409	1.267172	1.202786	1.000000
HUN	I	1.016800	0.798506	1.035919	1.188942	1.000000
HUN	T	0.911675	0.773192	1.193576	1.188563	1.000000
IND	C	1.150441	1.186335	0.881565	0.831140	1.000000

IND G 1.195063 1.070430 1.189477 0.657196 1.000000
IND I 1.291875 1.091650 0.908920 0.780136 1.000000
IND T 1.163899 1.124210 0.948946 0.805370 1.000000
IRL C 1.000000 0.938666 0.977998 0.969980 1.123022
IRL G 1.000000 0.871955 1.083489 0.942526 1.123022
IRL I 1.000000 0.926107 0.998807 0.962651 1.123022
IRL T 1.000000 0.930918 0.972065 0.984022 1.123022
IRN C 0.770530 0.980133 1.000000 1.324113 1.000000
IRN G 0.859066 0.987795 1.000000 1.178437 1.000000
IRN I 0.946805 0.988807 1.000000 1.068138 1.000000
IRN T 0.673929 1.028955 1.000000 1.442080 1.000000
ITA C 0.864077 0.901141 1.061358 0.994169 1.217119
ITA G 0.936550 0.807675 0.995693 1.090872 1.217119
ITA I 0.917863 0.929800 0.973040 0.989392 1.217119
ITA T 0.910385 0.887717 1.016347 1.000289 1.217119
JAM C 1.000000 1.036061 1.000000 0.965194 1.000000
JAM G 1.000000 1.460294 1.000000 0.684793 1.000000
JAM I 1.000000 0.953387 1.000000 1.048892 1.000000
JAM T 1.000000 1.039807 1.000000 0.961717 1.000000
JPN C 0.963289 0.932551 1.025796 0.948031 1.144689
JPN G 1.068125 1.134052 0.819030 0.880557 1.144689
JPN I 0.937943 1.013633 1.073537 0.855930 1.144689
JPN T 0.984276 0.987327 1.001644 0.897473 1.144689
KEN C 1.155135 0.949975 0.881189 1.034155 1.000000
KEN G 1.067435 0.872701 0.804249 1.334757 1.000000
KEN I 0.870446 1.055113 1.047476 1.039478 1.000000
KEN T 1.208661 0.950249 0.878410 0.991198 1.000000
KOR C 0.912592 1.154427 0.948938 1.000273 1.000000
KOR G 0.943242 1.030862 0.971888 1.058182 1.000000
KOR I 0.865298 1.161050 1.041573 0.955638 1.000000
KOR T 0.921884 1.136683 0.976297 0.977468 1.000000
LKA C 1.000000 1.374118 0.936757 0.776871 1.000000
LKA G 1.000000 1.375260 0.621616 1.169751 1.000000
LKA I 1.000000 1.395813 0.565579 1.266716 1.000000
LKA T 1.000000 1.222219 0.835387 0.979407 1.000000
LUX C 1.000000 0.942891 1.012194 0.935570 1.119949
LUX G 1.000000 1.008840 1.021561 0.866394 1.119949
LUX I 1.000000 0.812992 1.009797 1.087630 1.119949
LUX T 1.000000 0.948141 1.007590 0.934641 1.119949
MAR C 1.000000 1.000000 0.808637 1.236648 1.000000
MAR G 1.000000 1.000000 0.859167 1.163918 1.000000
MAR I 1.000000 1.000000 0.789117 1.267240 1.000000
MAR T 1.000000 1.000000 0.812230 1.231178 1.000000
MDG C 1.000000 1.000000 1.017180 0.983110 1.000000
MDG G 1.000000 1.000000 0.683354 1.463370 1.000000
MDG I 1.000000 1.000000 3.596582 0.278042 1.000000
MDG T 1.000000 1.000000 0.940263 1.063532 1.000000
MEX C 1.000000 0.944533 1.058725 1.000000 1.000000
MEX G 1.000000 1.035392 0.965818 1.000000 1.000000
MEX I 1.000000 1.123094 0.890398 1.000000 1.000000
MEX T 1.000000 0.971240 1.029612 1.000000 1.000000
MLI C 1.000000 1.000000 1.022751 0.977755 1.000000
MLI G 1.000000 1.000000 0.942223 1.061320 1.000000
MLI I 1.000000 1.000000 1.179158 0.848063 1.000000
MLI T 1.000000 1.000000 0.945545 1.057592 1.000000
MWI C 1.000000 0.954807 0.922241 1.135639 1.000000
MWI G 1.000000 1.223383 0.794844 1.028385 1.000000

MWI	I	1.000000	1.221748	0.765435	1.069326	1.000000
MWI	T	1.000000	1.051935	0.853330	1.114022	1.000000
MYS	C	1.000051	0.999950	1.000000	1.000000	1.000000
MYS	G	1.082551	0.923744	1.000000	1.000000	1.000000
MYS	I	0.979593	1.020832	1.000000	1.000000	1.000000
MYS	T	1.015503	0.984734	1.000000	1.000000	1.000000
NGA	C	1.000000	1.000000	0.976735	1.023819	1.000000
NGA	G	1.000000	1.000000	0.788531	1.268181	1.000000
NGA	I	1.000000	1.000000	1.000247	0.999753	1.000000
NGA	T	1.000000	1.000000	0.911884	1.096631	1.000000
NLD	C	0.916608	0.953173	1.031420	0.966433	1.148252
NLD	G	1.211927	0.796736	0.972674	0.927266	1.148252
NLD	I	0.982561	0.967332	0.920706	0.995191	1.148252
NLD	T	0.977848	0.943721	0.980620	0.962381	1.148252
NOR	C	1.000000	1.000000	1.093486	0.932965	0.980216
NOR	G	1.000000	1.000000	1.119574	0.911225	0.980216
NOR	I	1.000000	1.000000	0.938654	1.086858	0.980216
NOR	T	1.000000	1.000000	1.052127	0.969640	0.980216
NZL	C	1.000000	1.000000	1.000000	0.891441	1.121780
NZL	G	1.000000	1.000000	1.000000	0.891441	1.121780
NZL	I	1.000000	1.000000	1.000000	0.891441	1.121780
NZL	T	1.000000	1.000000	1.000000	0.891441	1.121780
PAK	C	1.000000	0.970700	0.992836	1.037617	1.000000
PAK	G	1.000000	1.026077	0.628154	1.551508	1.000000
PAK	I	1.000000	1.103474	0.972290	0.932056	1.000000
PAK	T	1.000000	0.959848	0.954761	1.091196	1.000000
PHL	C	0.967973	0.948711	0.993965	1.095550	1.000000
PHL	G	0.946537	0.844014	1.036432	1.207736	1.000000
PHL	I	0.969984	0.953191	0.773599	1.398105	1.000000
PHL	T	0.972261	0.956705	0.950008	1.131649	1.000000
POL	C	1.000000	0.793747	1.012917	1.243780	1.000000
POL	G	1.000000	0.814905	1.033972	1.186818	1.000000
POL	I	1.000000	0.629665	0.912995	1.739491	1.000000
POL	T	1.000000	0.701867	1.020725	1.395842	1.000000
PRT	C	1.000000	1.000000	0.985365	0.842195	1.205009
PRT	G	1.000000	1.000000	0.844364	0.982833	1.205009
PRT	I	1.000000	1.000000	0.828948	1.001112	1.205009
PRT	T	1.000000	1.000000	0.930387	0.891962	1.205009
SEN	C	1.000000	1.000000	0.832958	1.200541	1.000000
SEN	G	1.000000	1.000000	1.014190	0.986008	1.000000
SEN	I	1.000000	1.000000	1.245805	0.802694	1.000000
SEN	T	1.000000	1.000000	0.849198	1.177582	1.000000
SWE	C	1.000000	1.000000	1.000000	0.909357	1.099678
SWE	G	1.000000	1.000000	1.000000	0.909357	1.099678
SWE	I	1.000000	1.000000	1.000000	0.909357	1.099678
SWE	T	1.000000	1.000000	1.000000	0.909357	1.099678
THA	C	1.000000	0.962522	1.000000	1.038938	1.000000
THA	G	1.000000	0.853845	1.000000	1.171173	1.000000
THA	I	1.000000	1.154754	1.000000	0.865985	1.000000
THA	T	1.000000	0.991900	1.000000	1.008167	1.000000
TUN	C	1.000000	1.000000	0.917353	1.090093	1.000000
TUN	G	1.000000	1.000000	0.817726	1.222903	1.000000
TUN	I	1.000000	1.000000	0.899187	1.112116	1.000000
TUN	T	1.000000	1.000000	0.881237	1.134769	1.000000
TUR	C	1.000000	1.000000	1.000000	1.112757	0.898669
TUR	G	1.000000	1.000000	1.000000	1.112757	0.898669
TUR	I	1.000000	1.000000	1.000000	1.112757	0.898669

TUR T	1.000000	1.000000	1.000000	1.112757	0.898669
TZA C	1.000000	1.000000	0.955111	1.046999	1.000000
TZA G	1.000000	1.000000	0.791339	1.263680	1.000000
TZA I	1.000000	1.000000	1.161602	0.860880	1.000000
TZA T	1.000000	1.000000	0.884194	1.130973	1.000000
URY C	1.000000	1.016183	0.984074	1.000000	1.000000
URY G	1.000000	1.398892	0.714851	1.000000	1.000000
URY I	1.000000	0.745819	1.340808	1.000000	1.000000
URY T	1.000000	0.982093	1.018234	1.000000	1.000000
USA C	0.995015	0.909441	0.946634	1.034668	1.128268
USA G	1.045854	0.999955	0.890173	0.952054	1.128268
USA I	0.930808	1.000614	0.934669	1.018130	1.128268
USA T	0.993434	0.942868	0.930611	1.016786	1.128268
YUG C	1.000000	1.010199	0.887352	1.115570	1.000000
YUG G	1.000000	1.071992	1.100737	0.847470	1.000000
YUG I	1.000000	0.847912	1.050119	1.123080	1.000000
YUG T	1.000000	1.017181	0.981173	1.001974	1.000000
ZMB C	1.000000	1.068171	0.829222	1.128986	1.000000
ZMB G	1.000000	0.911368	0.734360	1.494160	1.000000
ZMB I	1.000000	1.180695	1.088280	0.778255	1.000000
ZMB T	1.000000	1.067645	0.818030	1.144996	1.000000
ZWE C	1.000000	1.000000	0.898970	1.112384	1.000000
ZWE G	1.000000	1.000000	0.950657	1.051904	1.000000
ZWE I	1.000000	1.000000	0.969092	1.031893	1.000000
ZWE T	1.000000	1.000000	0.914587	1.093389	1.000000

Note/5/:

Once values of real domestic absorption are available for 1985 as discussed in the previous endnote, it is then possible to estimate the real shares for each of the 57 non-benchmark economies for which short cut estimates have been made. We follow the same procedure used in PWT 3 and PWT 4 to estimate share equations based on shares in national currency and real domestic absorption. These equations have been estimated for the 49 benchmark countries that had particpated in more than one benchmark comparison between 1970 and 1990.

Real Share	Share in National Currency				RBAR2
	Consumption	Investment	Government	r(j)	
Consumption	.912	.261	.004	.019	.996
	(.031)	(.087)	(.117)	(.023)	
Investment	-.035	.753	-.092	.162	.971
	(.025)	(.068)	(.093)	(.018)	
Government	.123	-.014	1.088	- .181	.965
	(.027)	(.074)	(.101)	(.020)	

These equations require as input an estimate of r(j) (the real domestic absorption of country j relative to the U.S. = 100), and the shares in

national currencies available from the World Bank tape. However, an average of the shares in the three years, 1984- 86 have used rather than the single year 1985. The reason for this is that investment in any one year can show great fluctuations so that for example, the estimated real share can even be negative with plausible nominal shares. (E.g. .87 for C, .01 for I and .12 for G, with an r(j) of .05). Since we even observe instances of the investment share being negative (decline in stocks exceeds exceeds gross fixed investment), it seemed better to smooth the input for countries for use in these estimating equations. On the basis of these real share estimates, price levels for C,I, and G can be estimated for 1985 by dividing the estimated nominal share for the the three years by the share from the estimating equation; these inputs are in turn used to generate estimates in other years as discussed above for CGDP (I.1 C 3.a). Two non-benchmark countries have received different treatment, namely China and Taiwan. For China, the quasi benchmark estimates have been used and for Taiwan the 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.)

Note /6/: Estimation of the capital stock has been carried out in two stages; first a constant 1985 international price time series of investment was built up for residential, nonresidential and other construction, transport equipment and other machinery; then the depreciated series of investment was summed up to obtain the total stock of each of the 5 components in a given year as in equation (1).

(1) $KiT = \sum_{t=1950}^{T} Iit\,(1-Di)^{\exp(T-l)}$

KiT is the stock of asset type i, in year T,
Iit is the investment in asset type i in year t in 1985 international prices,
Di is the depreciation rate of asset type i for all countries, and
t is the year.

The depreciation rate, D, only varies by asset type in our estimates; d might also vary by country and a brief discussion of why this was not attempted is provided below. The perpetual inventory method used here follows closely the work of Hulton and Wycoff ("The Measurement of Economic Depreciation," Charles R. Hulton and Frank C. Wycoff, in Depreciation, Inflation and the Taxation of Income from Capital, C.R. Hulton, ed., Urban Institute, 1981). The way in which Hulton and Wycoff have formulated their depreciation estimates is as in equation (2).

(2) $Di = Xi/Si$

Di is the depreciation rate of asset type i,
Si is the average service life of asset type i, and
Xi is a factor taking account of the degree of declining balance due to the rate of obsolescence and other features of each asset type.

While we have produced estimates for three types of construction, there is not really enough information available to distinguish these three types of capital in terms of equation (2). The typical service lives used for depreciation for taxation purposes are 35 to 40 years. Hulton and Wycoff find the value of X for these assets to be around 1.0. In practice, we have simply used a D of 3.5% for all three types of construction.

There is however, a large difference between construction and machinery and transport equipment. Hulton and Wycoff find a value of X of about 1.8 for producers durables, and average service lives in the United States of about 12 years for machinery 7-8 years for transport equipment. This would imply Ds for these assets of 15% and 24% respectively which is what we have used.

Assumptions of Common Depreciation Rates Across Countries

Two issues should be mentioned. First, how appropriate is it to use common depreciation rates across countries? It clearly must be wrong, but what is right? With respect to the OECD countries, there are different assumptions about service lives made in the various countries, though there is little agreement on whether this primarily reflects different tax treatments across the countries or some underlying reality about service lives of capital.

What about poor countries? It is common to observe taxis, trucks and cars in India and other developing countries where the average age is much more than in say, Europe. This is often attributed to the high price of transport equipment and the low cost of repair services. Shouldn't an allowance be made for different maintenance practices across countries? The answer is that of course an allowance should be made if there is a sound basis for making it. Having no special expertise, however, we can only report that efforts to elicit information on maintenance practices or variations in service lives across countries has yielded some anecdotal information, many blank stares, and few hard facts.

One experiment we did perform was to examine the relationship between the cost of repairs and the price of capital in the benchmark countries. In particular, the ratio or the parity for automobile repair to the parity for producers durables was examined for each ICP benchmark country across all benchmarks. For countries in more than one benchmark, the average of the ratio was used. When this ratio was plotted against per capita GDP in 1985, the ratio rose systematically with income suggesting the inducement for poorer countries to maintain their capital longer than rich countries. However, without modeling the relationship of the years of service as a function of the price of equipment, cost of repairs, and other variables, it is not easy to translate this empirical regularity into its quantitative effects on service lives and depreciation rates. There is certainly some presumption that for developing countries that service lives would be longer and the depreciation rates lower for machinery and transport equipment than in higher income countries. However, with the present state of our knowledge we leave it to users of these capital stock to introduce any adjustments on this account.

Relation of Present Real Capital Stock Estimates to Alternatives

The present capital stock estimates will tend to be considerably lower than alternative measures that use the one-horse shay measure of gross capital stock. The latter estimates will retain the full value of past investments in the capital stock for the average service life of the asset. This is the method used by Maddison (1992), for example. A rationale for this approach is that until it is scrapped a piece of equipment is contributing to production at a constant rate. In the approach we have used, the assumed contribution of equipment to production is much less if it is 10 years old than if it is 5 years old. The measure we have provided is much closer to the value of capital at any point in time. Whatever the merits

of alternative approaches, the user should not be surprised if our capital per worker estimates are often half those of alternative measures.

In Summary

Our method does not deal with many issues including the importance of maintenance expenditures and the likely difference in depreciation rates across countries. Investment in 1985 international dollars from the ICP benchmark study is the basis for the
capital stock estimates most countries; it does not include foreign investment and change in stocks which are not included in capital stock in our treatment.

Many countries do not provide these component growth rates to the United Nations, so that we were only able to work with 64 countries, including most of the OECD countries. Because the depreciation rates for construction are quite low, we have tried to generate constant price investment figures back to 1950, with assumed growth back to 1947. Where countries had only partial time series of growth rates for a component, we made assumptions to fill in the rest of the series. Since we have the growth rate of aggregate domestic investment for all of the countries with which we worked, we could make some reasonable estimates for missing figures. The result of this work was a series in 1985 international dollars of the five components of investment described above. This basic data is provided on this diskette as a separate file called, invest.wk1 in the DOS version and as a menu option in the Windows version.

The total of capital stock provided in PWT 5.6 includes plant and equipment, non-residential construction and other construction. Residential construction has been estimated and provided as a ratio to the sum of the above three items. The series begins in 1980 for most countries as it could not be very reliably pushed back before that time.

Note/7/: This note discusses two sets of countries, the first are those historically planned economies (HPEs) that were in PWT 4, and an additional set of nonbenchmark countries. We have included many of these countries in the Data Table; however, for a few of these countries we only provide estimates of their per capita income in 1985 and 1990 international dollars and their population in this Note. These latter income estimates, as the discussion should make clear, are subject to even wider margins of error than our D- countries in the Data Table. They are provided because we know some users may wish a "best guess" estimate.

A. The Historically Planned Economies

In PWT 5 we have included 4 countries that have at various times had significant degrees of central planning, China, Hungary, Poland and Yugoslavia. These countries had full benchmark treatments except for China, which has had only partial studies. In addition to Hungary, Poland and Yugoslavia, Czechoslovakia, the former U.S.S.R. and Romania participated in the 1990 Group II benchmark study in Europe. Since our earlier work, these countries have become members of the World Bank, and have since PWT 4 provided significant time series of current and constant price national accounts following the SNA. This has made it possible to treat them like any other country treated as a market economy in PWT 4. These countries are discussed

first.

1. The 1990 Benchmark Countries

The six countries mentioned above participated in a benchmark comparison under the auspices of the United Nations Economic Commission for Europe. These results are about to be published (). This study will certainly be improved in subsequent rounds because the national accounts compilation and price statistics of these countries were in a transition state during much of the 1990 benchmark study. For our needs the ECE study provides a PPP for C, I, and G for each of these countries with respect to the numeraire country in Group II, Austria. These 1990 PPPs were restated with respect to the United States dollar using the 1990 OECD relationship between Austria and the United States as modified above in Note /4/. They were then moved back to 1985 by the relative price deflators in the United States and these countries.

With respect to the former Czechoslovakia, Soviet Union, and Yugoslavia, the estimates provided here will be principally of historical interest. In PWT 6 it should be possible to treat these countries in their present political boundaries. As a first approximation, we have provided estimates of per capita GDP below for the 18 successor states of the Soviet Union. We modified some of the work of Yuri Dikhanov of the World Bank on the national accounts for these countries as the basis for the estimates presented in this note. We have not attempted to provide similar estimates for Czechoslovakia and Yugoslavia.

It should also be mentioned in this vein that our estimates in the Data Table are for East and West Germany separately. Again this historical treatment should not be necessary in PWT 6. Derivation of the estimate for the GDR was done in a parallel way to that of several other Council of Mutual Economic Assistance (CMEA) countries, a subject to which we now turn.

2. Other CMEA Countries

The CMEA carried out PPP studies of its member since the 1960s but the only published comparison relates to 1988. The CMEA studies were binary comparisons with the USSR. Their structure followed the MPS not the SNA system of national accounts, but it is possible to use their parities to approximate PPPs for C, I, and G. For the Bulgaria, GDR and Mongolia, it has been possible to estimate their PPPs for 1988 and move them to 1985 and use these as a basis for our estimates. The method of carrying this out was to use the Fisher parities between these countries and the Soviet Union in 1988 in conjunction with the ruble/$ parities moved to 1988 from the 1990 benchmark.

Two other CMEA countries, Viet Nam and Cuba, do not provide national accounts that permit a similar treatment. We have therefore simply provided an estimate for them below that is derived from their relationship to the USSR in the 1988 study.

3. Peoples Republic of China

(a) Introduction

In earlier versions of PWT we have made estimates for the PRC based upon quasi-benchmark estimates of individual researchers including Irving Kravis, who, in the early 1980s, made PPP estimates for the year, 1975. Because of the

large population of China, much interest has attached to real product estimates for China. The present range of estimates for the PRC would put it as the 2nd or 3rd largest economy in the world. The wide range of PPP estimates for China and the large size of their difference from the exchange rate suggest the great uncertainty attached to these numbers. Presently China is participating in a ESCAP benchmark study for 1993 limited to comparisons between Shanghai and Tokyo and Hong Kong and Guangdon. Although this urban comparison is limited, the availability of these estimates should improve substantially on the present basis of comparison.

Even though much better information may become available in 1995 referring to China's price structure in 1993, we have substantially revised the estimates PWT 5.6. There are two principal reasons for this. One problem with present estimates can be illustrated from PWT 5.5 where for the PRC the PPPs have been based upon quasi-benchmark estimates of individual researchers including Irving Kravis who in the early 1980s made estimates for 1975 and the Rouen-Kai study. As we move PWT 5.5 estimates forward from the reference year of 1985, the results become less plausible because China's growth rates appear overstated. This point is discussed more fully below. Second, the World Bank in World Tables, 1994, has published a substantial upward revision of China's yuan GDP figures. While these are not official Chinese revisions, it is likely that there will be a substantial upward revision in China's official national accounts and it seems an appropriate time to consider the implications of these revisions for estimates of China's real product.

Finally, a note for the reader on the present treatment of China's growth rates. Anyone who reads on will be struck by the very large and seemingly arbitrary adjustments (40% in some cases) that have been made in China's growth rates. It is widely felt that these growth rates are too high as is evidenced in a recent World Bank study. But politically it is convenient to have high growth rates, and associated lower inflation rates, so there has been little incentive for China to officially lower its growth or raise its inflation estimates. While we do not claim to know very accurately how to correct these growth rates we certainly know the right direction and we doubt that we can have overshot truth in the direction of understatement by more than truth is presently being overshot by official Chinese growth rates.

(b) The Problems with PWT and Other Existing Estimates

One guideline for judging a country like China is whether its price level (PPP/Exchange Rate) is unusual compared to countries at a similar income level, e.g., perhaps a large country somewhat richer than India, like Indonesia. Of course the yuan/$ exchange rate has been controlled, but it has not been thought to have been as far out of line with market rates in earlier years as Eastern European planned economies. Therefore, one can learn something by comparing trends in the price level in China with trends in other countries. In PWT 5.5 the price level of China fell from 57 to 14 between 1968 and 1990, and would have declined further by 1993.

For rapidly growing countries like Korea or Japan the price level typically has risen over time. This is clearly the prediction of the Balassa-Samuelson formulation. Yet, that is not the case for China. As will be discussed in the concluding section, this could be due to the movement of China's exchange rate towards a market rate. However, it appears the main problem is with the growth rates. Unfortunately, there is little guidance on exactly how much growth rates are overstated. However, there appears to be no purpose served by providing estimates for China for a set of

years without a substantial downward revision of their growth rates. This is because any base estimate for a late year would become implausibly small in an earlier year just as any early year estimate would become implausibly large in a later year. In the discussion below we further explain the assumptions made about growth rates and deflators of consumption, government and investment; how the changes in the national accounts numbers proposed by A. Keidel of the World Bank have been incorporated into the national accounts; and which PPPs have been used as a basis for 1985 for China.

By way of background, the following provides the Paasche- Laspeyere spreads (PLS) from Kravis and Rouen-Kai, and also the relative PPPs for the components to GDP. By PLS, we mean the ratio of the per capita GDP of China at US price weights versus Chinese price weights, which is the same as the yuan/$ PPP at U.S. quantities divided by the same PPP at Chinese quantities.

	Paasche-Laspeyre Spread		Ratio of Component to GDP PPP	
	Kravis-1975	Rouen-Kai-1986	Kravis	Rouen-Kai
GDP	3.27	3.18	1.00	1.00
Investment	3.17	2.95	.74	1.90
Government	6.80	1.00	.28	.14
Consumption	2.15	2.76	1.21	.90

The similarity of the spreads for GDP are interesting, both being somewhat larger than those found in the 1975 benchmark study for low income countries (Malawi and Kenya had the largest spreads of 2.78 and 2.70 respectively). For investment and consumption the spreads are quite typical of what was found for the Phase III ICP benchmark countries. There is no spread for government for Rouen- Kai because they simply applied a salary based PPP to all of government. In contrast, Kravis used weights for different skill levels of government employees and included commodities, clearly a better procedure. What produces the large spread for government for Kravis is that the United States reported that compensation was 52% of Government consumption whereas China reported compensation as 93% of G, a percentage very much higher than ICP benchmark countries.

The conclusion drawn is that Rouen-Kai have too low a PPP for government since the commodity PPP is much higher than the compensation PPP and they in effect assume all of government is payroll. This also has implications for the growth rate of government. Normally the deflator for government is the index of salaries. Since commodity purchases have probably experienced higher inflation rates than reported, and higher than for salaries, it is probable that government deflators are too low, and the growth of government is also too high in the Chinese accounts.

(c) Present Revisions of Real Product Estimates for China

1. On Growth Rates:

The following are the adjustments that used for the national accounts growth rates (and implicit deflators)for the period 1980- 93.

(a) Investment growth rates have been reduced by 40%.
(b) Consumption growth rates, private and public have been reduced by 30%.

(c) Growth rates in exports and imports have been left

unchanged.

We are not able to provide more than heuristic support for the actual adjustments made. It is thought that much of the recent understatement in deflators has come about because production units often report their own estimates of real output. These estimates usually begin with current price increase in output and then decide on how much of this is due to output growth including quality improvement and new products. It is thought that this reporting system leads to overstatement of output growth and that this is likely to be larger for investment items, where many new products have been introduced, than for consumption.

Is this source of overstatement of growth rates likely to have been constant over time. The answer is that it has been more important in recent years when diversity in production and consumption have changed rapidly. However, there has also been substantial overstatement of growth rates in earlier years of two kinds. The first is the tendency for large weight being given in production to plan targets most likely to be fulfilled. Secondly, in the case of China, the local self reporting of output statistics has received uneven political pressure from above as to the importance of accuracy versus reported acheivement. A case in point is the lst year in our series, 1960, which clearly reflects in official statistics the exhortions of the Great Leap Forward.

Because there is likely to have been somewhat less overstatement in the years 1961-78, we have as a consequence thought it appropriate to reduce our adjustment of the constant price figures in those years; the year 1960 is special and we have treated it accordingly.

2. On the national accounts revisions:

The World Bank has revised upward the national currency estimates for China for the years from 1978-1993 by 34% (World Tables 1994). These are not official Chinese figures. Further, the Bank has not so far attempted to reconcile this overall revision of GDP with the expenditure accounts; this means there exists a C, I, and G distribution from 1960-90 that the World Bank has previously made available through World Tables and Stars (The World Bank data diskette). Because we use PPP estimates from the expenditure side, it has been necessary to develop a new expenditure distribution.

This has led us to generate a revised set of national accounts for China from 1960-1993 for the major expenditure aggregates. It should be made clear that this work may be daring, but it is not original research. We simply build upon work of the Bank, but bend the data to suit the needs of obtaining a current and constant price expenditure series that will provide a basis for more realistic real product estimates for China over time. The Table we provide uses the Keidel upward revisions for undercounting including those for the undervaluation for housing. Altogether this means that our national accounts figures have been revised upward by 20.6% as opposed to 34% in the 1994 World Tables.

It would appear that most of this adjustment should go to household consumption. The reason for this is that most of the activities adjusted represent either prices of housing or inclusion of previously undercounted production much of which is used in household consumption. However, some of this undercounted production is also likely to go to capital formation, especially construction so some has been allocated to I. The old current

price values for G, X and M have been retained while new estimates have been made for C and I. In 1985, a the 20.6% upward adjustment of GDP was allocated as 3/4 to private Consumption and 1/4 to Investment, representing 32% and 12% of their original values respecively. In the years from 1985 to 1993, C and I in current prices have been multiplied by 1.32 and l.12 respectively. For the years prior to 1985 these adustments were gradually reduced to nil for Investment by 1978 and to 5.3% for Consumption from 1960 to 1974. The bank did not report revised figures prior to 1978 and our procedure is based on the assumtion that from 1960 to 1978, the understatement of GDP would have been much less. This is because the reforms stimulating small rural enterprises and the like only began in 1978.

These adjustments provide a new constant price=current price yuan figure for GDP and the main components for 1985. The existing constant price export and import series have been retained. Applying 60% of the old annual growth rates of I and 70% of the old growth rates of C and G during recent years with modifications discussed earlier for earlier years, we can derive a new constant price series. Needless to say these are very rough approximations that we guess are in the right direction and are unlikely to overcompensate for China's overstated growth rates. These revisions are presented in Tables 1 and 2.

3. On the initial parities for C, I, and G.

In PWT 5.5 the base PPPs for 1985 were an average of those extrapolated from Kravis and those from Rouen-Kai. These are not the only expenditure PPPs available for consideration; further there are a number of PPP estimates for GDP from the production side. However, it is important to make clear why we think the low end of the range of real GDP estimates available, including those used by the IMF in its World Economic Outlook since 1993 are inappropriate for an exercise like PWT. Because all of the low end GDP (high end PPP) estimates for China are characterized by being production side estimates these will now be discussed.

(a) Production Side Estimates for China

Jeffrey Taylor has made an estimate from the production side that generates very much higher estimates of China's PPP for 1981 and subsequent years than any of the estimates from the expenditure side. Since extrapolations of Taylor's estimates for China have been adopted by the IMF in their WEO, it is useful to discuss what are the sources of difference. When one estimates PPPs from the production side, one should in principle compare prices of both outputs and inputs for each sector of value added. This is a much more difficult task than expenditure side comparisons since many more items need to be priced and one needs to know the input-output relationships for each sector in each country. None of the production side estimates for China come close to fully implementing ideal production PPP estimates.

One reason for this is that the emphasis of most of these studies has been binary and normative. Typically China has been compared with the United States normatively in the sense that China's prices were compared with border prices that happened to be denominated in U.S. dollars. For example, in his study based on 1981 prices, Taylor used a sample of 200 commodities as a basis for comparison with the United States. All of the prices were published Chinese prices. However, the dollar prices, with the exception of some catalogue items for machinery, were not prices of those items in the United

States; rather they were Chinese export prices in yuan converted to dollars or import prices in Hong Kong or similar markets, again converted to U.S. dollars. Further the conversion factor was not the official exchange rate of 1.705 yuan/$ in 1981, but Taylor's estimate of the shadow rate of exchange, namely 2.23 yuan/$. Such border prices and shadow rates of exchange are quite appropriate for a study of effective rates of protection or domestic resource cost. However, they are not really what one wants for estimating the purchasing power parity of the yuan to the U.S. dollar, since the dollar prices are not from U.S. markets, nor are they the prices of the items if they had been imported to the United States from China. The latter would presumably be at least 30% higher since the transaction would be at official exchange rates. Thus there must be a strong presumption that the dollar prices Taylor uses are too low and the resulting yuan/$ ratios entering into his estimates are too high; especially when compared to other estimates for China or ICP estimates for other countries based on a comparison of final product prices in each country.

Taylor's estimates have been used here for illustration, but they characterize a number of production side estimates that have been made between the United States and formerly planned economies. These have generally been binary estimates, often using Chinese weights, border prices, and approximations of sectors not subject to price comparisons by sectors that are; all of these factors would be expected to push PPPs higher, and real product estimates lower. Often for the purposes for which these studies were undertaken the normative and binary character of the studies was appropriate.

However, for multilateral studies that are trying to get China's real GDP in relation to the Algerias, Nigerias, and Indonesias of the world, then China should be treated on a par with those countries in terms of the methods applied. What this means in the present context is that use of border prices and a binary approach are really not appropriate for putting China in its economic position in a world of many nations.

(b) Expenditure Side Estimates for China

In our estimates for China for PWT 5.5 we had relied upon the older Kravis estimates and the then preliminary estimates by Rouen- Kai. Extrapolating the Kravis estimates to 1985 is problematic because of the large change in relative prices and the understatement of inflation in China. While the Rouen-Kai study probably understates the PPP for government, and may in turn overstate it for many durable items where import prices were used, it has been the most detailed study to date that fits into the framework of the ICP and PWT. Another study by Chen Haichun, Myron Gordon and Yan Zhiming (HGZ) was the valuation of the cost of the budget of an urban family in the 4th decile in China as priced in Canada in 1989. Their result was a PPP of about 0.418 Y/$US for purchased services and .364Y/$US including government provided services (ICP concept). The exchange rate in 1989 was 2.764 Y/$US so the HGZ study implies a Paasche price level of around 10% for consumption. If the P-L spread were 2.5, then the Fisher price level would be 15.8% [Incidentally, the HGZ paper (p.2) mentions a 1990 study by Gordon implying that the Chinese price level for GDP of 1987 was about 1/6 with respect to Canada.] An implication of this study is that an urban price level for China might well be below what has been observed in most ICP benchmark studies, where 20% is at the low end. The HGZ paper is mentioned because it appears fairly consistent with previous expenditure side studies for consumption.

For PWT 5.6 we have chosen to rely principally on the Rouen- Kai PPP

estimates from the expenditure side for 1986. Their Fisher PPP estimates for consumption and investment have been modified to a multilateral basis by multiplying the Fisher PPPs by 0.9. Rouen-Kai estimated house rent PPPs on the basis of the user cost of a recently constructed residential unit; this seems like the appropriate PPP to go with Keidel's adjustments of house rents in the national accounts. As discussed earlier, the Rouen-Kai PPP for government seems too low as it does not include commodity purchases. The following illustrates the derivation of the final PPPs used for the three components.

PPP Estimates Circa 1985-6 for China

	Rouen-Kai 7/94 Fisher yuan/$	Adj to Multilateral yuan/$	Price Level U.S.=1.0
Consumption	.87	.78	.265
Investment	1.65	1.48	.503
Government	.12 (.25)	.25	.084

The first column gives the Rouen-Kai estimates. The figure in () by government is our adjustment based upon assuming 20% commodity purchases at the consumption PPP and 80% at the salary based government PPP (that is .25 = .78 x .2 + .12 x .8). The second column adjusts to a multilateral basis, where there is no adjustment for government. These PPPs are on a 1986 base. However, they have been used for 1985 as there did not appear to be a large enough inflation differential between China and the United States between 1985 and 1986 to justify further modifying what are numbers probably already containing one too many places to the right of the decimal.

(d) When all is said and done

The ingredients of our interim treatment of China have been set out. For the record, which it is hoped is short-lived, the revised set of national accounts that have been used for China after the modifications were given in Tables 1b and 2b, and the proposed basic PPPs for C, I and G were just presented. What does it all add up to? There are several influences at work. The national currency GDP is higher, the growth rates are lower, and the initial PPPs are somewhat higher than we have used in our previous work. As users will see, the net result is to lower China's growth rates and as a result to substantially reduce our estimates of real product for China in the 1990s by at least one- fourth. As users may wish to make different assumption, we have tried to provide in this discussion enough information to do that.

Are these revisions an improvement? They are certainly closer to other PPP estimates for China, but that does not mean they are necessarily an improvement. However, we would argue that Table 3 does present a more coherent picture for China over the period covered than have previous treatments.

B. Additional Nonbenchmark Countries

The estimating equation described in Note/2/ 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 the basic Data Table of PWT 5.6. 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 Panel B of Table B2. We have also included estimates in Panel A of even a more casual nature for three CPEs, Cuba, Viet Nam, and North Korea. These last three 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). The spirit of these additions is to stimulate work that may allow reasonable estimates for these countries to be developed in the near future.

[Note that Panel A has not as of December 1994 been revised]

Table B2
Estimates of Real GDP: US=100

Panel A: Countries not Previously in PWT in 1985

Country	Relative per Capita GDP	Population (000)
Antigua	19.5	80
Brunei	108.7	220
Cuba	19.9	10,090
Djibouti	8.3	43
Libya	45.0	3,600
Nambibia	18.1	1,555
North Korea	14.3	20.380
Vietnam	3.1	59.710
Yemen, S-PDR	6.6	6.850

Panel B: Successor States of the USSR in 1990

Republic	WBCode	Per Capita GDP		Population	
		1990	1991	1990	1991
ARMENIA	ARM	4,741	4,438	3,325,000	3,418,000
AZERBAIJAN	AZE	3,977	3,658	7,153,000	7,121,000
BELARUS	BLR	5,727	n.a.	10,278,000	10,316,000
ESTONIA	EST	6,438	6,170	1,571,000	1,562,000
GEORGIA	GEO	4,572	4,384	5,464,000	5,478,000
KAZAKHSTAN	KAZ	4,716	4,807	16,742,000	16,844,000
KYRGYZSTAN	KGZ	3,114	3,289	4,394,000	4,453,000
LATVIA	LVA	6,457	6,721	2,683,000	2,641,000
LITHUANIA	LTU	4,913	4,901	3,722,000	3,741,000
MOLDAVIA	MDA	3,896	3,984	4,368,000	4,363,000
RUSSIA	RUS	7,968	8,115	148,263,008	148,700,000
TADJIKISTAN	TJK	2,558	n.a.	5,303,000	5,465,000
TURKMENISTAN	TKM	4,230	n.a.	3,670,000	3,758,000
UKRAINE	UKR	5,389	5,603	51,857,008	52,031,008
UZBEKISTAN	UZB	3,115	3,226	20,531,008	20,886,000
TOTAL		6388			

Note /8/: The Standard of Living variable (SL) is a constant price measure of total consumption: private and public as a percentage of RGDPL. In practice it subtracts military spending (Alan Heston and Bettina Aten, "Real World Military Expenditures", Economic Issues of Disarmament ed. J.Brauer and M. Chatterji, MacMillan, 1993), from government expenditures and adds the total to private consumption:

SL = {[C + (G - Mil)] / Population} / RGDPL