

# THE PENN WORLD TABLE (MARK 5): AN EXPANDED SET OF INTERNATIONAL COMPARISONS, 1950–1988\*

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The Penn World Table displays a set of national accounts economic time series covering many countries. Its expenditure entries are denominated in a common set of prices in a common currency so that *real* quantity comparisons can be made, both between countries and over time. It also provides information about relative prices within and between countries, as well as demographic data and capital stock estimates. This updated, revised, and expanded Mark 5 version of the table includes more countries, years, and variables of interest to economic researchers. The Table is available on personal computer diskettes and through BITNET.

## I. INTRODUCTION

The Penn World Table displays a set of national accounts economic time series covering a large number of countries. Its unique feature is that its expenditure entries are denominated in a common set of prices in a common currency so that *real* international quantity comparisons can be made both between countries and over time. In addition, it presents data on relative prices, within and between countries, and demographic data and capital stock estimates as well.

The standard national accounts archives of the various international organizations, following the United Nations "System of National Accounts" (SNA), allow only intertemporal comparisons within countries. The Penn World Table is an attempt to get closer to a System of *Real* National Accounts (SRNA) that makes possible interspatial comparisons as well. The successive versions of the table, Mark 1–Mark 4 and now Mark 5 (henceforth PWT1 to PWT5), represent a series of steps leading to such an SRNA.<sup>1</sup>

\*The authors acknowledge with gratitude the support of the National Science Foundation and the Agency for International Development in carrying out this research. The reactions of innumerable correspondents and callers to earlier versions of the Penn World Table, invited and uninvited, have been invaluable. Improvements in this new version reflect the many suggestions and some corrections that have been received. Users of Mark 5 are encouraged to call attention to any anomalies they encounter. The research assistance of Bettina Aten, Joseph Berger, and Joon Haeng Lee was indispensable in handling the many data sets entering into the large data table produced here.

1. Penn World Table (Mark 1): Summers, Kravis, and Heston [1980]  
Penn World Table (Mark 2): Never published but used in Kravis, Heston, and Summers [1982]  
Penn World Table (Mark 3): Summers and Heston [1984]  
Penn World Table (Mark 4): Summers and Heston [1988].

PWT5 is *very* large. Only a small excerpt from it appears below, but computer-readable versions can be obtained from NLRB Publications, 1050 Massachusetts Avenue, Cambridge, MA 02138. An ASCII file on IBM-format floppy disks can be ordered for \$3 (domestic) or \$4 (foreign). The file is available without charge via BITNET or Internet electronic mail in response to natural language requests to NBER@HARVARDA.HARVARD.EDU.

This paper describing PWT5 is organized as follows: its underpinning, the set of benchmark studies of the United Nations International Comparison Program (ICP),<sup>2</sup> is discussed in Section II. These ICP studies give empirical cross sections of comparisons for each of four years—1970, 1975, 1980, and 1985—for groups of countries varying in number between 16 and 60. PWT5 itself is obtained by extrapolating these cross-section comparisons interspatially to many additional countries and then intertemporally to other years. (The precise coverage of PWT5—countries, dates, variables—and a description of its evolution are given in Appendix A.1 and A.2) The extrapolation procedures used to estimate PWT5's 1950–1988 time series are laid out in Section III. Section IV, concentrating on PWT5 itself, describes the table's contents, and reviews the differences between it and its earlier versions. Readers interested in the detailed procedures followed in implementing Sections III and IV will find a full description in Appendix B. (To conserve *Journal* space, Appendix B has been placed on the first of the computer diskettes that contain the full data table.) Section V presents a sampling of estimates from the 1988 segment of PWT5, an illustration of what can be learned about the world income distribution from the table, and, quite importantly, a set of caveats about the use of the table. The paper closes in Section VI with brief remarks about future prospects for a System of *Real* National Accounts.

2. The ICP's work has been reported in five phases:

Phase 1: Exploratory, covering ten countries in 1970 Kravis, Kenessey, Heston, and Summers [1975]

Phase 2: 1970 and 1973, covering sixteen countries Kravis, Heston, and Summers [1978a]

Phase 3: 1975, covering 34 countries Kravis, Heston, and Summers [1982]

Phase 4: 1980, covering 60 countries [United Nations and Eurostat, 1986]

Phase 5: 1985, covering 56 countries as of March 1990, but still incomplete OECD [1988]; Eurostat [1989]; Economic Commission for Europe [1988]; and unpublished working papers.

## II. THE ICP BENCHMARK COMPARISONS

The Penn World Table is derived from the benchmark studies of the ICP, which so far cover the years 1970, 1975, 1980, and 1985. A description of the ICP's procedures is presented here,<sup>3</sup> along with a brief survey of the salient ICP empirical findings. The methods have been modified in a number of ways since 1968 when the ICP was launched, but the fundamental framework has remained the same.

Basically, an ICP benchmark study is a pricing exercise. Prices of hundreds of identically specified goods and services prevailing in each participating country are collected and processed. The price comparisons that emerge are estimates of price parities for each country's currency at a number of aggregation levels, including an overall purchasing power parity (PPP). The price parities and PPPs are used to convert the countries' national currency expenditures to a common currency unit, thus making real quantity comparisons across countries possible.

### A. *Expenditure and Price Inputs*

The ICP divides up national final output, Gross Domestic Product (GDP), into about 150 detailed categories (approximately 110 consumption, 35 investment, and 5 government). All of a country's individual final output items are assigned to one or another of the categories. The ICP central office works with national data of two sorts from each participating country: national prices for between 400 and 700 particular items; and national expenditures for each of the 150 detailed categories.

For the prices to provide a meaningful basis for determining relative quantities, it is of the utmost importance that they refer to the same items, that is, of the same quantity and quality, from country to country. (It is not essential that each item be represented in every country; in fact, it is inevitable that all items will not be priced in every country.) To this end, specification manuals giving closely detailed technical descriptions of over 1,500 commodities, services, and labor inputs have been developed that cover the universe of all items priced in any country. In a typical benchmark study, experts from participating countries jointly discuss speci-

3. For a more detailed description, see Kravis, Heston, and Summers [1982], Chapter 3.

fications and in many cases visit outlets together to pin down the exact specification to be priced.

In some cases, comparisons require professionals, as in construction where architects or quantity surveyors are used. As methods have evolved, construction price comparisons are built up from costs of components of structures that can be weighted according to the particular type of building being compared. For some categories, like house rents, the country price comparisons draw on hedonic regressions.<sup>4</sup> This makes possible rent estimates for finely specified housing units (e.g., a country's rent for an apartment in a twenty-year old multistoried building, of 120 square meters, with central heating, and one bathroom). Admittedly, this is still a crude basis for comparing rentals, but it has the merit of holding constant some of the more obvious housing characteristics.<sup>5</sup>

Rent comparisons derived from the hedonic regressions still contain a lot of noise, but they probably are free from systematic biases. Observe that location effects on rentals are ignored, but it is unclear how even in principle such an important effect should be treated.

Generally speaking, pricing services is harder than pricing commodities because of the greater difficulties encountered in holding service qualities constant. And in some service areas, primarily general government, medical care, and education, the ICP must deal with the particularly thorny problem of somehow valuing services that are not priced in the market. (The ICP's standard reference to such services as "comparison resistant" indicates how seriously they are taken.) Of course, national income accountants have the same concerns, and the problems are no less formidable in a time-to-time context over a decade or more. As in the national income accounting case, most ICP price parities for these categories are obtained on the basis of input comparisons. The problems that such an approach poses in the national accounts are well-known; the equivalent problems plaguing the ICP have been discussed at length elsewhere. The nature of the difficulties will be reviewed briefly at the end of the next section.

Countries typically provide prices for at least 400 items, which are then grouped by detailed category. For each category, a country's item prices are expressed as ratios of the corresponding item prices of a numeraire country, the United States in the ICP,

4. Hedonic regressions are also used in comparing automobile prices.

5. See Kravis, Heston, and Summers [1982], Chapter 5, for a detailed description of the character and treatment of ICP service price comparisons.

and then averaged. This country average is a detailed category price parity denominated in the country's national currency expressed relative to the U. S. dollar, of the form  $p_{ij}/p_{i,US}$ , (e.g., francs per dollar for fresh vegetables). The averaging procedure, involving a specialized multiple regression, is designed to allow for the fact that every item  $i$  is not priced in every country. (Incidentally, the item prices provided are final product prices including taxes and subsidies. They are the prices imbedded in the expenditures in the national accounts so that division of expenditures by the prices yields the underlying quantities.)

Thus, the first step in the ICP procedure is to compare item prices within each detailed category of expenditure in such a way as to get for each country 150 price parities expressing the average category national prices relative to the corresponding national prices in the United States.

Besides supplying item prices, the countries provide detailed data on the composition of its final output expenditures. Specifically, national currency expenditures  $p_{ij}q_{ij}$  on each of the 150 detailed categories are furnished by each country. Clearly, these expenditure data bear on the problem of unmasking relative quantities in different countries, but only after they have been processed appropriately. Observe that the ratio of a country's expenditure in its own currency to the category price parity referred to above,  $(p_{ij}q_{ij})/(p_{ij}/p_{i,US})$ , is equal to the quantity valued at the U. S. category price,  $p_{i,US}q_{ij}$ . Such U. S. priced quantities for any category are directly comparable across countries. However, comparing country quantities at the category level is only a small part of the more general problem of country comparisons at various levels of aggregation. Much more must be done unless one is willing to use the prices of an arbitrarily chosen base country—in which case the United States would not merely be a numeraire—to reflect the tastes of all countries. Subsection II.B below describes just how detailed category expenditures and price parities are combined in the aggregation process the ICP uses. Price and quantity information is needed, and the ratio of expenditure to price parity plays the quantity role.

Before moving on, however, we return briefly to the treatment of comparison-resistant service categories. A price parity and information on quantity is needed for each category in carrying out the ICP aggregation. Normally, the price parity is obtained as an average of observed price ratios, and the quantity is derived as the ratio of the expenditure to the price parity. However, if prices

cannot be observed for a category (the unpriced-services circumstance), in some cases the price is taken to be the cost of producing a standardized unit of the product. An alternative approach also employed starts with observed relative quantities and then derives price parities as a ratio of expenditures to relative quantities. Where direct quantity information is available (e.g., number of hospital bed-days, number of school-years of elementary education, pension checks processed, etc.), this is a feasible approach, provided that appropriate quality adjustments can be made. Even if quantities are not directly observable, it is still possible to get direct estimates of quantities from information about input quantities if something is known about the production function. In many cases, it has been necessary to use just one grade of labor, to assume constant returns to scale, and to assume something about relative labor productivity across countries. (For example, the total quantity of elementary education of a country is taken to be proportional to the number of its elementary school teachers, appropriately standardized for training.)<sup>6</sup>

Progress has been made, slowly, in moving toward some inclusion of capital as an input in addition to labor, and standardizing the quality of inputs. This helps to reduce the dependence on implausible productivity assumptions about the inputs. However, one should not be in doubt about the relative quality of price parities of comparison-resistant services. Even with the ICP's careful and even subtle treatment of services, unpriced and priced, these are among the least reliable of all those estimated by the ICP.<sup>7</sup> This would be particularly worrisome if the potential errors are systematically related to income.

6. The real difficulty in carrying out these unpriced service comparisons is controlling adequately for quality. The difficulties of holding quality constant are not unique to services, of course, but they may be more pervasive here. In part, this can result from ambiguities in defining what constitutes a difference in quality. Consider a couple of education examples. Is the educational output of an elementary school greater, all other things equal, if its teachers universally had more schooling themselves? (Yes, if students learn more from teachers with more education; no, otherwise.) If two schools teach the same number of students but one has a larger teaching staff than the other, is that school's labor productivity lower, or is its output quality higher? (Is class size important in the learning process?) In the absence of objective measures of educational output, like achievement test scores, one must depend upon results of research on education production functions, not all of which are conclusive.

7. There is both a theoretical and empirical basis for believing that the price parities of the comparison-resistant service categories are closer to those of the priced service categories than to those of the commodity categories. This turns on relative productivities and relative factor costs in the various categories. An examination of how real GDP estimates would vary for alternative assumptions about productivity differentials in the various sectors [Kravis, Heston, and Sum-

### *B. Aggregation of Category Expenditures and Price Parities*

A primary objective of the ICP is to estimate the relative GDPs and purchasing power parities over all of GDP of as many countries as possible. Equally important, however, is the development of a framework that makes possible relative quantity and PPP comparisons at lower levels of aggregation also.

The classical index number problem is normally not thought of in interspatial terms, but it is present in international as well as intertemporal comparisons. It is at the heart of any attempt to develop a two-dimensional (over time and across space) table of expenditure entries that are meant to be mutually comparable in a cardinal "utility" way. (In the jargon of the ICP, a slight variant of this is referred to as the goal of "matrix consistency.") This is not an appropriate place to review the ICP discussions about the possible use of a theoretically-based utility approach in aggregating country bundles of goods. The assumptions underlying such an approach at the level of consumption—common tastes everywhere, the nature of aggregation of individual economic agents within countries, econometric degrees-of-freedom problems arising from more goods than country observations, etc.—make a utility-based approach unattractive. Furthermore, neither the theory of investment nor the theory of social choice provides sufficient guidance for handling the estimation of as much as a third of national output. As useful as it would be to have estimates of *C*, *I*, and *G* in real terms that are appropriately "consistent" over time or space, such numbers do not exist if all the natural economic constraints on such numbers are to be met.

In the benchmark studies to date, the method used to aggregate category price parities and national currency expenditures up to GDP or *C*, *I*, and *G* has been based on a procedure originally suggested by Geary [1958].<sup>8</sup> The result for each benchmark is a set

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mers, 1982, Table 5-2, p. 140] shows that even though the real share of comparison-resistant services in total GDP is by no means trivial, particularly in low income countries, still the real GDP estimates are fairly insensitive.

8. The implementation of the Geary procedure in the ICP context is spelled out in Kravis, Heston, and Summers [1982], pp. 89–94.

In Geary's original formulation, comparisons of country aggregate outputs were developed from data sets for individual countries that contained the physical quantities and national prices of all goods produced. The ICP modified the method so it can be applied to national expenditures and price parities of detailed categories of goods. The solution of a large system of  $[m + (n - 1)]$  linear equations is required, where *m* is the number of detailed categories and *n* is the number of countries. (In the 1980 benchmark study, *m* = 150, and *n* = 60.) Roughly speaking, Geary's idea was to combine two partial approaches. If all the country PPPs were

of expenditures denominated in a common currency, the international dollar, which make possible quantity comparisons across countries and expenditure headings that can be aggregated in a variety of ways. In this international dollar currency relative prices of individual goods are set at the (weighted) average of relative prices for the same goods in all countries, and the level of prices is normalized so that the GDP of the United States is the same in international dollars as in American dollars. A more symmetric treatment of relative prices would be to express them in terms of the world as a whole rather than a particular country, but this runs counter to the customary practice of using the United States as the country of reference. It should be emphasized that a benchmark study's international comparisons based on this approach are invariant under a change in base country. However, in developing intertemporal comparisons such as those developed in PWT5, the choice of base country does make a difference.

The four ICP benchmark studies were done at different times, using evolving procedures and different national income data sets. In preparing PWT5, the original four sets of ICP comparisons were reworked using a more uniform methodology and a World Bank national account data set of 1990 vintage.

### *C. Overview of the Empirical Findings of the ICP*

This discussion of the ICP so far has been concerned only with its use in the preparation of PWT5. The substantive importance of comparing countries' outputs, using ICP PPPs for aggregate comparisons and price parities at lower levels of aggregation, turns on the fact that country price structures are not all the same. The systematic variability of relative prices makes it critical in many analytical applications that differences in price structure be taken

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known, it would be an easy matter to find for any category the quantity-weighted average of all countries' relative prices for that category. On the other hand, if the average relative prices were known for all the categories, the PPP for any country could be obtained as the ratio of its total domestic expenditures to the total value of its quantities when priced at the average relative prices of the categories. Geary proposed that the subset of equations defining the first approach be thought of as the first part of a general system of equations, with both the average relative prices and the PPPs treated as unknowns; and similarly, that the subset of equations defined by the second approach, involving the same unknowns also be treated as being part of the general system. Even though the system is large, solving it for the average relative prices and PPPs is quite easy. The system has a very special structure (the matrix requiring inversion has two block diagonal submatrices) so the loss of significant figures is minimal.



into account. This does not mean, however, that PPP-based output comparisons are appropriate for every purpose. This important point will be returned to below in subsection V.C.

A description of two ICP findings of general interest will illustrate the kinds of insights provided by the benchmark studies.

### 1. *The Relationship Between the Exchange Rate and the Purchasing Power Parity*

The best known of the ICP empirical results is the documentation of the difference between a country's exchange rate and its purchasing power parity. The strong version of the Casselian Purchasing Power Parity Doctrine asserts that the equilibrium exchange rate at which the currencies of two countries will trade will be determined by the relative price levels of the countries. The evidence is unmistakable in each of the ICP benchmark studies that this does not hold. Not only do exchange rates differ significantly from corresponding PPPs, but they do so in a systematic way: the national price level of a country, defined as the ratio of its PPP to its exchange rate, is a rising function of the level of its income or stage of development. This fact has important international trade ramifications. Theoretical work on this goes back to Ricardo, Viner, Balassa, and Samuelson; and extensive recent empirical work is reported in Kravis and Lipsey [1983].

A practical consequence of the failure of the strong version of the Purchasing Power Parity Doctrine is that the practice of using exchange rates as quick, easily obtained estimates of PPPs is invalidated. For some time it has been clear that exchange rates by themselves cannot be regarded as satisfactory proxies for PPPs in comparing different countries' GDPs.<sup>9</sup> Many but not all international organizations (e.g., the European Communities, the Organization for Economic Cooperation and Development, and the United Nations Development Program) and some governmental organizations (like the United States Agency for International Development) now extensively use PPP-based comparisons.

9. In early versions of the Penn World Table, the observed empirical relationship between the PPP-exchange rate ratio and per capita GDP was the basis for interspatial extrapolations. In the PWT4 treatment, observed GDP per capita benchmark values were regressed against GDP per capita derived from exchange rates, and other variables. This seemingly perverse reverse-regression approach was then used to "predict" the PPP-based GDP per capita of a country about which only the values of the exchange rate-based GDP per capita and other right-hand-side variables were known. (See subsection III.C for the PWT5 extrapolation procedure.)

Figure I depicts the price-level-versus-income relationship for the 60 countries of the 1980 benchmark study. The fitted curve shows the log-linear regression of the price level (that is, PPP/Exchange Rate) on real GDP per capita, the latter expressed relative to that of the United States. Note two points here: in this regression, the curve was not constrained to go through the United States point, (1, 1); and the distinct heteroskedasticity apparent in the graph is not properly taken into account by the log-linear functional form that was used. The same unmistakable rising tendency of the curve appears in the benchmark data of other years.

The ICP's comparisons of country prices and quantities illuminate a number of aspects of national economic structures. A country's share of its national output that is devoted to a category of goods can be calculated either on the basis of its own national prices or prices representative of a set of countries. Unfortunately, cross-country comparisons based on national-price shares can be misleading if relative prices are not the same everywhere. Since in

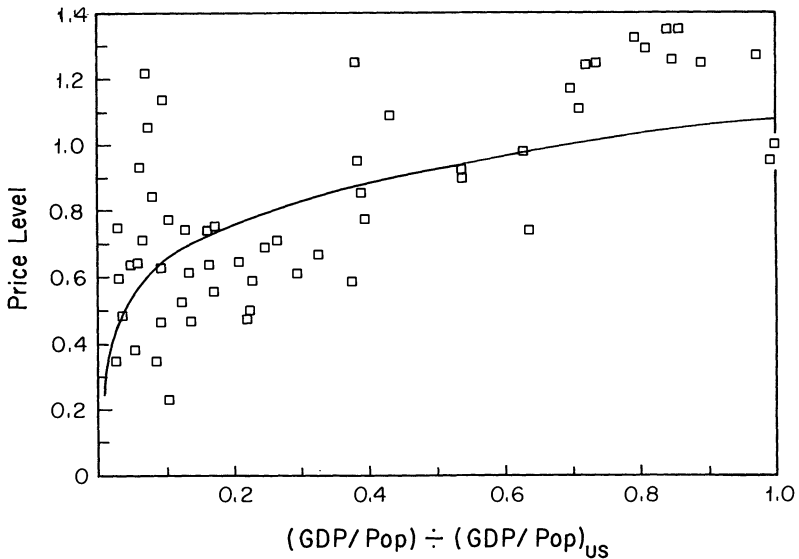


FIGURE I

Price Level versus GDP per capita (US = 1) 1980  
 $\ln PL = 0.0945 + 0.2367 \ln y$ ;  $R^2 = 0.39$ ;  $\sigma_u = 0.31$ .

fact pervasive national-price patterns show up across the countries in the ICP benchmark studies, the use of a common set of prices is necessary. The sensible common set to use is some version of average prices of all the countries under analysis, and that is what international prices are. Expenditures in international dollars can then be used directly for quantity comparisons.

## 2. *Variation in Price Structure*

Table I distributes the benchmark countries for 1980 into six income groups. The averages of the country shares of expenditures, both in national currencies (NC) and in international dollars (I\$), are given for each income group for a number of aggregations of the detailed components of GDP. For any aggregation and country group, the difference between the two share figures is due to differences between the national relative prices of the country group and the common set of world average relative prices. The third line of the aggregation, labeled “%,” gives the ratio of the NC share to the I\$ share, expressed as a percentage. (These ratios are given to show the difference between the income group’s average national relative price and the international price for the aggregation.) A straightforward interpretation of this row is that its entries tell how the relative price of an aggregate changes with income. Domestic investment of group 1 countries can be used to illustrate the table. The average share in national currencies (NC) is 20.6 percent while the average share in international prices (I\$) is only 13.3 percent. This is because investment goods are relatively expensive in low-income countries, by a factor of 1.55, compared with all countries, rich and poor. The decline in the percentage entries across the columns shows this dramatically. The major explanation for this price pattern undoubtedly lies in the area of public policy; for present purposes, the pattern is presented simply as an empirical fact.

For an aggregation like bread and cereals, the two kinds of share are virtually the same in each of the income groups. This is because the relative prices here do not vary much from country to country, and therefore are all close to the relative international price. (As one would expect from many budget studies, the average share goes down as one moves to higher income groups.) For food as a whole, national relative prices tend to decline with country income so the international-price shares are less than national-price shares for the poor countries and larger for the high-income

TABLE I  
EXPENDITURE SHARES IN NATIONAL AND INTERNATIONAL PRICES, 1980

Expenditure aggregation		Country income groups (low to high)						All*
		1	2	3	4	5	6	
Food	NC	36.2	29.3	23.7	18.7	11.7	9.8	23.7
	I\$	34.0	27.8	22.4	18.3	12.2	10.8	22.8
	%	106	105	106	102	96	91	104
Bread and cereals	NC	12.8	7.7	4.5	2.6	1.6	1.2	5.9
	I\$	12.6	7.7	4.4	2.5	1.5	1.2	5.8
	%	102	100	102	104	107	100	102
Milk, eggs, & cheese	NC	2.6	3.2	2.7	2.3	1.6	1.4	2.5
	I\$	1.6	2.6	2.4	2.4	2.0	1.8	2.2
	%	162	123	112	96	80	78	114
Housing	NC	13.2	14.5	11.9	12.9	15.2	15.9	13.8
	I\$	13.9	15.4	13.1	11.6	15.0	16.2	14.1
	%	95	94	91	111	101	98	98
Health care	NC	2.1	3.7	3.8	4.6	5.8	6.5	4.1
	I\$	2.8	4.6	4.4	4.5	6.0	5.3	4.4
	%	75	80	86	102	97	123	93
Domestic investment	NC	20.6	25.5	28.1	25.1	24.6	23.5	24.6
	I\$	13.3	17.5	25.0	26.4	26.4	25.1	21.3
	%	155	146	112	95	93	94	115
Producers durables	NC	8.5	10.0	6.4	8.6	9.0	8.6	9.4
	I\$	5.7	5.8	4.9	7.5	10.7	10.2	7.6
	%	149	172	131	115	84	84	124
Construction	NC	10.2	13.9	14.7	15.1	14.1	13.7	13.5
	I\$	6.0	10.3	15.0	17.4	14.2	13.7	12.3
	%	170	135	98	87	99	100	110
Services	NC	31.5	29.9	29.9	35.7	40.7	41.6	33.8
	I\$	43.3	37.9	34.1	34.3	39.0	36.9	37.8
	%	73	79	88	104	104	113	89
Nontradables	NC	41.7	43.8	44.6	50.7	54.8	55.3	47.3
	I\$	49.3	48.2	49.1	51.7	53.2	50.6	50.1
	%	85	91	91	98	103	109	94
Country group		1	2	3	4	5	6	
GDP/POP (% US)		<10%	10-20	20-35	35-60	60-75	>75%	
No. of countries		12	14	10	10	8	6	60

NC: Share of GDP in national prices.  
I\$: Share of GDP in international prices.  
\*Group averages and "All" are unweighted.

ones. Of course, the dramatic decline with income in the share of food in GDP (Engel's Law) is evident using either share measure.

The two components of domestic investment, producers durables and construction, each have higher national-to-international price ratios in low-income countries than in high. The combining of the components produces the systematic relationship referred to above, that the share of real GDP going to domestic investment goes up with GDP per capita rather than being almost flat, as is indicated by the national-price shares.

The last aggregation rows of Table I cover services and nontradables (services plus construction). These show one of the major structural differences between poor and rich countries: the higher relative prices of services in the latter. The service row also reveals an almost flat relationship between real service shares and income, which is quite contrary to the conventional wisdom. (For more on this, see Kravis, Heston, and Summers [1983]; Summers [1985]; Heston and Summers [1990].)

### III. FROM BENCHMARK COMPARISONS TO PWT5

#### A. Level of Aggregation

PWT5's version of a System of *Real* National Accounts reports in *real* terms national income aggregates at the level of private consumption *C*, private and public gross domestic capital formation *I*, public consumption (government) *G*, and the net foreign balance *NFB*. Only for a small number of countries, like OECD members, is a more detailed level of aggregation feasible over time. The level of aggregation of the available country national accounts data dictates how finely detailed PWT can be. Time series are needed on current- and constant-price national accounts expenditures to extrapolate each subaggregate, and these are generally available from the United Nations or the World Bank only at the level of *C*, *I*, and *G*.

#### B. Reconciliation of Benchmark and National Accounts Data

The national accounts series can be used to connect the results of different benchmark studies. An immediate concern then is how well the ICP benchmark data sets and the national accounts data fit together. One should expect a problem to arise from working with intertemporal (national accounts) and interspatial (ICP) data sets that appear to view country-time interrelations in the same

way but in fact do not. The problem at hand in part is one of merging different empirical data sets not based on identical prices and goods. As a minimum, the reconciliation process described below provides a reasonable smoothing-over of the "errors in measurement."

Even if all expenditures and prices entering into the ICP work were the same as all of the expenditures and prices entering into the national accounts time series, a country's standing in successive benchmark years would still not necessarily equal what would be expected from the growth rates and price indexes of the national accounts. The intrinsic problem is that the ICP's *real* standings within a benchmark year are based on a common set of so-called "international dollar prices" of *that* year. These remarks indicate that even if the data of the national accounts and ICP were perfectly in accord, the SRNA based on them still must be regarded as a conceptual "tableau" for displaying relative standings over time and space.

In fact, the two data sets are far from being perfectly in accord. In *many* cases, a country's standings in consecutive benchmark studies—at the level of GDP or its components—imply a growth rate between the benchmark years that differs significantly from the growth rate embedded in the constant-price series of the country's national accounts. Such observed inconsistencies arise partly from the "tableau effect" and partly as a consequence of mismatches between the specifications and pricing of goods by the national income accountants and by the ICP. A seasoned guess would be that the mismatching and "errors in measurement" are much more responsible for the inconsistencies than the tableau effect.

The resolution of this problem adopted in PWT5 follows a time-honored procedure in national accounting developed by Stone, Champernowne, and Meade [1942]. A reconciliation of differences between ICP benchmark quantity estimates and national accounts growth rates is equivalent to a reconciliation of differences between ICP estimates of purchasing power parities in successive years and price indexes derived from the national accounts. A procedure is applied to eliminate in PWT5 any violations of the intertemporal identity: "Next period's level must be equal to this period's level times the growth rate between the two periods." The procedure is needed only for countries involved in more than one benchmark study. A simple errors-in-measurement model has been used that provides maximum likelihood estimates of adjustment factors for

ICP benchmark comparisons and national accounts growth rates to reconcile them. (This process makes use of a priori information about the relative reliabilities of the benchmark estimates and the national accounts growth rates.) Details of these adjustments are provided in Appendix B.

### *C. Extensions to Nonbenchmark Countries*

PWT5 covers many more countries than were included in the various ICP benchmark studies. This section presents a brief, general description of the methods used to get real product and PPP estimates for these countries. These estimates are necessarily more problematical than the benchmark estimates. However, they have the great merit that on an expected-value basis they are properly centered, unlike exchange rate-based estimates. The quality ratings in Appendix A.2 reflect the large variance of the estimates, particularly for the low income nonbenchmark countries. The accuracy of the price survey method can be judged by examining the residuals in a regression covering the data for 1985 of 77 ever-benchmarked countries. The percentage accuracy, to be interpreted in 0.95 confidence interval terms, is guessed to range from 60 percent up or down for countries with GDPs per capita less than a tenth of the United States, to 19 percent up or down for countries between half and seven-tenths of the United States; and 15 percent for countries as close as seven-tenths of the United States. Appendix B gives the details of the procedures followed for nonbenchmark market economies, and also discusses aspects of the estimation problem for centrally planned economies (CPEs).

The PPPs of nonbenchmark market economies were estimated on the basis of capital city price surveys conducted around the world by the United Nations International Civil Service Commission, a British firm serving an association of international businesses, and the U. S. State Department. The surveys were conducted as part of a postallowance program designed to supplement salaries in such a way as to equalize real incomes of high-ranking civil servants and business executives assigned to different foreign countries. The price indexes appropriate for this very special population—high-income nonnationals, living usually in capital cities—does not properly reflect all the prices in the country, of course, nor do the individual price weights built into the indexes reflect the relative importance of the individual goods in the countries for the nationals. However, a structural relationship was found in the benchmark countries between a country's PPP

and its postallowance PPP. This relationship was exploited to estimate for the nonbenchmark countries missing PPPs from their postallowance PPPs.<sup>10</sup> Of course, real quantity estimates followed easily once PPPs were available.

A similar approach, but one involving quantities rather than PPPs, was used to estimate the real shares of *C*, *I*, and *G* for nonbenchmark countries. A relationship was found within the benchmark countries between each of the real shares and the level of total output and the three nominal shares (the shares based on national prices). The three relationships for *C*, *I*, and *G* were then used to estimate the real shares for the nonbenchmark countries. These extrapolations to nonbenchmark countries were carried out in such a way that a complete set of entries, for both benchmark and nonbenchmark market economies, was in hand for 1985.

Only four centrally planned economies have full representation in PWT5. China (P. R.), Hungary, Poland, and Yugoslavia all supply SNA data over time. The latter three have participated in benchmark studies, and China has been involved in a quasi-benchmark comparison with the United States. As a consequence, for these four countries, the PWT5 time series of expenditures and PPPs can be estimated in the same way as the benchmark market economies included in PWT5. Although Romania participated in one benchmark study [1975], SNA time series are not available for it; as a result, Romania estimates only for 1975 are provided in Appendix B.

Times series for the per capita GDPs of four other CPEs—Bulgaria, Czechoslovakia, East Germany, and the Soviet Union—were given in PWT4, but do not appear in PWT5. Recent events, and particularly the growing consensus among CPE specialists that both the levels and growth rates in these economies have been overstated, have led us to hold off attempting to provide expenditure and PPP estimates for them at this time. The 1990 United Nations benchmark study will include these countries, so good estimates for them will be available in the future. (For now, see the

10. A variety of methods have been used in the past to estimate the PPPs of nonbenchmark countries. See, for example, the Beckerman physical-indicator approach as first described in Beckerman [1966], and the exchange-rate approach of Kravis, Heston, and Summers [1978b]. In PWT1–PWT3, nonbenchmark PPPs were estimated using the exchange-rate approach. (A visual impression of the efficacy of the exchange-rate approach can be obtained from Figure I.) Kravis and Lipsey [1989] in a recent review of different methods found that the price-survey approach performed marginally better than the others.



review of estimates for these and a few additional countries provided in Appendix B.)

#### *D. Extrapolating from Benchmark Years to the Rest of 1950–1988*

Section IV below deals with all the variables in PWT5 as listed in Appendix A.1. Here the intertemporal aspects of PWT5 will be discussed by focusing attention on four measures of GDP per capita given in the table: variable 2, RGDPCH; variable 6, RGDP; variable 7, RGDPTT; and variable 9, CGDP.

The simplest extrapolation is for RGDP (variable 6), real per capita GDP expressed in 1985 international prices. Its components, *C*, *I*, *G*, *X* (exports), and *M* (imports), are also per capita and expressed in 1985 international prices. Suppose that all of the components are known for 1985 from the ICP. The corresponding component values for any other year are obtained by applying the relevant growth rates from the constant-price national accounts series—the values for the year of interest divided by the corresponding 1985 ones—to the 1985 numbers. Then the RGDP for the new year, still in 1985 international prices, is simply the national accounting sum of the extrapolated components. Thus, RGDP for 1985 can be extrapolated to any year covered by the national accounts. The full set of RGDPs are directly comparable across time and countries.

Now consider CGDP, variable 9. The mnemonic first letter is meant to indicate that this version of GDP per capita is measured in *current* year international prices. In any year, CGDP is directly comparable across countries, but inflation effects keep it from being comparable over time. How is CGDP obtained for a nonbenchmark year? Its value for a benchmark year is known from the ICP's benchmark study or from a postallowance extrapolation. The PPPs of its components, *C*, *I*, and *G*, are also known. Moving to another year requires national accounts data. Component price indexes, easily obtained from the current- and constant-price time series of the national accounts, are used to extrapolate the PPPs to another year. These new PPPs, along with the current-price national accounts components for the new year, constitute the inputs for a standard Geary benchmark procedure. (Sixty benchmark countries and 150 goods were involved in the 1980 benchmark study; here all benchmark and nonbenchmark countries enter the calculations but just three goods, *C*, *I*, and *G*.) The Geary output would be all of

the countries' GDPs for the new year, expressed in the new year's international prices. These are the CGDPs.

If countries' CGDPs can be compared within a year but not across years, what advantage can they have over RGDP? If one were interested only in comparisons for a particular year other than 1985, CGDPs might reasonably be regarded as more directly comparable than RGDPs. The payoff from giving up intertemporal comparability is that the prices entering the comparisons are the current ones rather than those of (possibly remote) 1985. RGDP suffers from the Laspeyres fixed-base problem: After a while, relative prices change, and the base year weights become less and less appropriate. The differences between relative CGDPs and relative RGDPs are likely to be small for years close to 1985, but could be significant for the 1950s, 1960s, and 1970s.

A way of mitigating the declining appropriateness of the base year weights for comparison years distant from 1985—of retaining more of the flavor of CGDP in intertemporal comparisons—is to bring changing relative prices into the analysis explicitly through a chain index, RGDPC, variable 2. The merit of RGDPC (what makes it the recommended intertemporal GDP time series) is the fact that its growth rate for any period is based upon international prices most closely allied with the period.

RGDPTT, variable 7 in PWT5, was devised to take account of changes in the value of the country's output arising from changes in its terms of trade as well as changes in its production. (Thus, the mnemonic TT in RGDPTT.) The domestic absorption (DA) part of RGDPTT ( $C$ ,  $I$ , and  $G$ ), is the same as the DA part of RGDP. However, the net foreign balance is valued in *current* prices instead of 1985 prices. This is to allow for the part of the country's increased well-being that results from lower prices paid for imports or higher prices received for exports. (Considering all of the countries of the world, gains and losses from changes in the terms of trade should sum to zero. Unfortunately, in the standard international trade statistics underlying the national accounts, the total of all countries' NFBs is positive and not zero. Thus, the sum of all of PWT 5's RGDPTTs will not equal the sum of all of PWT5's RGDPs. This nontrivial disability should be kept in mind when relying on this variable.)

#### IV. DESCRIPTION OF PWT5

PWT5 presents in a variety of forms time series on expenditures of various sorts and on relative prices (that is, PPPs). These cover nearly all of the countries of the world for the period

1950–1988 or part thereof. (Note that expenditures and PPPs are not given explicitly. Nearly all PWT5 entries are expressed in some functional way. Expenditures appear in per capita, per equivalent adult, or per worker terms, or in percentage form. PPPs are expressed relative to exchange rates.<sup>11</sup>

#### A. From PWT4 to PWT5

Appendix A.3 shows how PWT has evolved from its original form. PWT5's expanded temporal and spatial coverage over PWT4, three more years (1986–1988) and a net addition of nine new countries (some with only partial data, however), surely make the table more useful now for analysis of the current economic scene. A more noteworthy improvement in the table over its predecessor, however, is that it is based on better data sets. Use of better national accounts data (the World Bank data archive has been adopted) certainly makes a difference, but of greater importance is the exploitation of a more extensive ICP data base. Where PWT4 barely drew on the 1985 benchmark data, PWT5 explicitly uses it to get the first clear look at comparative prices in a number of new countries. Eighty-one countries have now participated in benchmark studies, forty-seven in more than one. This reduces the need to rely on nonbenchmark estimating methods described in subsection III.C, above; but more than that, now the postallowance estimating method can be implemented with more observations.

PTW4 was enormous, and reasonably self-contained. Adding new entries at the extensive margin, more countries and years, was obviously worthwhile. However, the value of adding new entries at the intensive margin, that is, new variables, is not so clear. More variables would help researchers make new kinds of international comparisons, but they would also make the table (even) more unwieldy. The primary consideration in judging new candidates for PWT5 was, does the construction of the new variable draw particularly on ICP expertise, namely knowledge of PPPs? Pragmatism dominated the second consideration: is there a compelling international comparison need for variables that are the marriage of ICP-type numbers and international statistics available elsewhere? The new variables of PWT5, representing an uneasy compromise, cover, (i) new demographic information, (ii) sharper estimates of some national income variables, and (iii) capital stock estimates.

11. Even extra information about exports and imports is provided in the form of a new "openness" variable.

### B. The Anatomy of PWT5

Appendix A.1 lists the 27 variables presented in PWT5, and Appendix A.2 lists the countries and years covered. The 27 variables in PWT5 divide naturally into five groups.

1. *Estimates of Gross Output, Measured in Eight Ways.* As indicated in the intertemporal extrapolation subsection III.D above, a country's real gross product can be valued in two basic ways: in the current year's international prices or in the international prices of a base year. These are given in PWT5 by CGDP (9) and RGDP (6). In addition, blends of the two are given: RGDPTT (7) is one kind of blend, valuing as it does domestic absorption at base year international prices and net foreign investment at current international prices; RGDPCH (2), a chain index series that is another kind of blend, is linked enough to the base-year approach to make intertemporal comparisons possible, but the base year is changed from year to year.

All four of these gross output series are expressed in per capita terms, and refer to gross *domestic* product. For some purposes, gross *national* product per capita is regarded as a better measure of the material well-being of the citizens of a country than a GDP measure, so CGNP/CGDP (26) is provided. Alternatives to per capita measures are provided in the per equivalent adult variable RGDPEA (18)<sup>12</sup> and the per worker variable RGDPW (19). (Each of these is based on RGDPCH.) The last of the eight measures,  $y$  (8), is simply the ratio of the country's CGDP to that of the United States in the same year.

2. *Subaggregates of Gross Domestic Product.* The shares of gross product devoted to  $C$ ,  $I$ , and  $G$  (in percentage form), are given for each year in two ways. They are expressed relative to 1985-priced output (RGDP:  $c$  (3),  $i$  (4), and  $g$  (5)); and current-priced output (CGDP:  $cc$  (11),  $ci$  (12), and  $cg$  (13)).

The percentage share of the net foreign balance is given implicitly for both measures of gross output, since  $NFB/RGDPCH = nfb = 100 - c - i - g$  and  $NFB/CGDP = cnfb = 100 - cc - ci = cg$ . The net

12. The equivalent-adult value for an adult fifteen years of age or older is one, and for a person under fifteen years of age it is assumed here to be one half. Researchers preferring to assume an alternative value  $\alpha$  for the equivalent value of a person under fifteen may calculate the appropriate GDP per equivalent adult from

$$RGDPEA = RGDPCH/[1 - 2(1 - R)(1 - \alpha)],$$

where  $R$  is the ratio of RGDPCH and the tabled value of RGDPEA.

foreign balance gives the difference between exports and imports, but gives no information about their individual values. Putting in PWT5 the variable OPEN (25), the sum of current-priced exports and current-priced imports divided by CGDP, enables the user to recover the individual values.<sup>13</sup>

A decomposition of gross domestic investment into its private and public components can be useful for a variety of purposes. IPri (27) gives gross domestic private investment as a percentage of total gross domestic investment.

3. *Purchasing Power Parities.* Four measures of the purchasing power parity of each country's currency relative to the United States dollar are available in PWT5. The PPPs are presented in "price-level" form, as a percentage of the country's U. S. dollar exchange rate. *P* (13) relates to all of gross output; *PC* (14) to consumption; *PI* (15) to investment; and *PG* (16) to government.

4. *Capital Stock and Components.* Short time series of capital stock measures have been developed for a limited number of PWT5 countries using a perpetual inventory method. *KapW*<sup>14</sup> (20), an estimate of a country's capital stock per worker, is the cumulated, depreciated sum of past gross domestic investment in producers durables, nonresidential construction, and other construction. The capital stock components, expressed as percentage shares of *KapW*, are also provided: *KPDUR* (21): producers durables; *KNRES* (22): nonresidential construction; and *KOTHER* (23): other construction. A by-product of this capital stock work was a measure of capital in the form of residential construction. Although it is not included in *KapW*, it is presented as a percentage of *KapW*: *KRES* (24).

5. *National Income Accounts.* The country expenditures in PWT5 are all expressed in international prices. However, a country's national accounts expenditures—both the current- and constant-price series—can be recovered if the PPPs built into the price levels are applied appropriately to the PWT5 expenditures. (This is precisely the case for nonmultiple benchmark countries. For

13. The appropriate formulas for the recovery are

(i) 
$$\text{Exports/CGDP} = [\text{OPEN} + \text{cnfb}]/200$$

(ii) 
$$\text{Imports/CGDP} = [\text{OPEN} - \text{cnfb}]/200.$$

14. The residential construction capital stock is *not* included in *KapW*. It is presented here primarily as a by-product of other capital stock calculations.

multiple benchmark countries what can be recovered is the World Bank's current-price time series and its constant-price time series as modified in the reconciliation process described in subsection III.B above.) The procedure requires information not in PWT5 itself about each year's average international prices of *C*, *I*, and *G*. Appendix B provides full information required to effect the national accounts recovery.

6. *General Variables Outside the National Accounts.* Four variables outside the national accounts are available from PWT5. Population POP (1) and the exchange rate ExR (17) appear explicitly. Implicit in the table is the proportion of the population under fifteen. It can be derived from the information on equivalent adults contained in RGDPEA combined with RGDPCH.<sup>15</sup> Similarly, the labor force participation rate, is given implicitly by the values of gross domestic product per capita, RGDPCH, and per worker, RGDPW.

Appendix B on the diskettes contains a full set of references for the variables of PWT5, and spells out all the details of how each was calculated.

*Country and Year Coverage.* Appendix A.2 lists the 139 countries that appear in PWT5. It gives each country's years of coverage for the 27 variables, and details its benchmark experience. In addition, it gives a rough estimate of the quality of the country's data, based somewhat subjectively on the error patterns displayed in checking consistency in multiple benchmark years and in the residual patterns described in footnote 10. (Appendix B provides the formal procedures followed.)

## V. THE USE OF PWT5

This part of the paper deals with three areas: subsection A contains a 1988 excerpt from PWT5 to give the reader a feeling for what is on the diskettes, and a table that gives a number of kinds of growth rates. Subsection B illustrates a particular kind of use the table can be put to. Most users of previous versions of PWT have introduced its entries into multiple regressions (either as independent variables or, less commonly, as dependent variables, in level or growth form). Here we draw on the table as a whole—all countries and all years—to give a brief, empirical description of how the

15. (Population proportion under 15) =  $2 \times (1 - (\text{RGDPCH}/\text{RGDPEA}))$

(Labor Force Participation Rate) =  $\text{RGDPCH}/\text{RGDPW}$ .

income distribution of the world has been changing. Finally subsection C concludes with a number of caveats about the use of PWT5. At the end of the section are brief comments on the use of growth rates of GDP per capita based on national versus international prices. More attention is paid to this important subject in Appendix B where empirical comparisons are presented.

#### A. The 1988 Segment of PWT5 and Growth Rates

Table II presents most of the 1988 segment of PWT5. All 139 countries are represented, listed alphabetically by continents. To save space, 11 of PWT5's 27 variables are omitted here. The table contains chain index estimates of GDP, valued in 1985 international prices, expressed in per capita, per equivalent adult, and per worker terms. Except for the capital stock estimates, which incidentally refer to the end of 1987, the table focuses on entries that are based on 1988 international prices. From what is provided, one can infer other country values like labor-force participation rates, children-adult demographic ratios, comparative levels of consumption, prices of investment goods relative to prices of all other goods, and so on. The following summarizes what is extracted from PWT5 in Table II.

VALUES FOR 1988 OF VARIABLES REPRESENTED IN TABLE II

Column # in Table II		Variable # in PWT5
1	Population (in thousands)	1
2	GDP/Pop (RGDPCH; 1985 int. prices)	2
3	GDP/EA (RGDPEA; 1985 int. prices)	18
4	GDP/W (RGDPW; 1985 int. prices)	19
5	GDP/Pop (CGDP; 1988 int. prices)	9
6	C/GDP (%) (cc: 1988 int. prices)	10
7	I/GDP (%) (ci: 1988 int. prices)	11
8	G/GDP (%) (cg: 1988 int. prices)	12
9	PPP/ExR	13
10	PPP <sub>c</sub> /ExR	14
11	PPP <sub>e</sub> /ExR	15
12	PPP <sub>w</sub> /ExR	16
13	Exchange Rate	17
14	KapW (1985 int. prices) (as of 12/31/87)	20
15	KPDUR KapProdDur/KapW (%) (1985 int. prices) (as of 12/31/87)	21
16	KRES KapRes/KapW (%) (Kap4: 1985 int. prices) (as of 12/31/87)	24
17	OPEN	25
18	CGNP/CGDP (%)	26

TABLE II  
ESTIMATES OF REAL PRODUCT AND PRICE LEVEL (DIFFERENT CONCEPTS AND AGGREGATION LEVELS); POPULATION; EXCHANGE RATE;  
CAPITAL STOCK: 138 COUNTRIES, 1988 (BASE YEAR: 1985)

OBS COUNTRY	YR	POP	RGDPCH	RGDPEA	RGDPW	CGDP	CC	CI	CG	P	PC	PI	PG	XR	KAPW	KPDUR	KRES	OPEN	RGNP
AFRICA																			
1 ALGERIA		23805	2726	3515	12011	2662	52.1	28.8	18.3	85.3	81.6	103.7	77.0	5.915	.	.	.	29.7	96.6
2 ANGOLA	*	8605	840	1081	1944	840	58.1	11.0	24.9	60.3	65.0	64.2	43.8	79.5	.	.	.	.	.
3 BENIN		4454	952	1246	2020	1054	75.7	4.3	24.8	38.2	44.8	120.4	16.3	297.85	.	.	.	48.6	102.4
4 BOTSWANA	#	1103	2282	3025	6402	2507	33.5	19.3	40.5	43.3	50.0	55.9	22.6	1.868	.	.	.	116.3	87.3
5 BURKINA FASO		8546	566	726	1209	616	64.8	14.2	31.1	35.3	42.5	70.0	26.4	297.85	.	.	.	59.0	99.8
6 BURUNDI		5149	552	713	1054	597	58.2	13.0	33.5	35.6	47.6	57.8	16.2	140.39	.	.	.	38.0	98.0
7 CAMEROON		11213	1615	2067	4314	1669	70.1	8.0	23.8	68.9	75.2	164.3	24.9	291.71	.	.	.	35.0	96.7
8 CAPE VERDE IS	*	327	1419	1786	3835	1419	65.5	32.0	18.6	24.5	35.4	46.8	21.0	93	.	.	.	101.8	97.0
9 CENTRAL AFR. R.		2794	686	874	1428	747	77.4	4.7	24.6	53.6	62.9	153.4	19.4	297.85	.	.	.	45.9	98.0
10 CHAD	*	5018	519	658	1455	519	70.6	5.0	23.7	25.6	30.5	38.5	15.5	449.26	.	.	.	53.6	99.5
11 COMOROS	*	395	711	923	1377	711	65.8	23.0	25.3	40.8	51.8	62.2	34.4	449.26	.	.	.	73.3	99.3
12 CONGO	#	1953	2219	2839	5989	2116	37.3	8.8	60.1	44.8	71.8	165.7	16.6	346.3	.	.	.	93.5	92.6
13 EGYPT		51447	1716	2136	6373	1935	56.4	5.3	42.5	36.2	50.0	157.1	10.6	1.588	.	.	.	56.8	94.7
14 ETHIOPIA	#	43496	332	428	738	351	67.7	3.8	31.9	34.3	40.1	126.2	18.2	2.07	.	.	.	35.4	99.4
15 GABON	*	997	4210	5093	8103	4210	38.9	38.7	14.5	84.0	71.9	99.6	80.8	449.26	.	.	.	95.4	84.3
16 GAMBIA	*	748	725	920	1766	725	68.6	12.1	20.8	31.8	37.2	49.2	18.0	4.988	.	.	.	100.2	78.1
17 GHANA		14040	877	1146	2287	991	71.1	5.4	25.7	37.6	44.7	96.9	12.1	202.35	.	.	.	43.0	97.5
18 GUINEA	*	6081	501	638	1070	501	65.9	13.1	20.4	74.5	82.4	108.8	40.4	24.332	.	.	.	.	.
19 GUINEA-BISS		940	709	.	.	786	66.4	15.2	26.7	19.9	30.6	42.3	7.8	1111.1	.	.	.	77.8	96.6
20 IVORY COAST		11587	1300	1687	3445	1434	59.9	6.1	29.4	58.6	58.0	158.8	32.7	297.85	.	.	.	57.9	89.6
21 KENYA		23021	902	1224	2226	1014	63.2	12.0	26.1	36.8	34.5	89.3	23.6	17.747	1211	36.0	45.9	42.2	96.7
22 LESOTHO	*	1545	1236	1568	2616	1236	79.4	14.0	22.1	13.1	27.9	37.0	13.1	2.191	.	.	.	153.9	199.7
23 LIBERIA	#	2250	867	1133	2357	896	61.9	9.2	24.2	53.8	56.6	62.4	33.9	1	.	.	.	76.8	93.3
24 MADAGASCAR		11259	608	782	1426	670	71.3	7.9	22.9	25.0	28.2	59.0	11.4	1407.1	.	.	.	50.9	91.4
25 MALAWI		8155	543	705	1334	617	70.9	4.2	26.8	23.7	26.3	103.8	10.6	2.561	.	.	.	53.3	116.2
26 MALI		7989	474	617	1348	505	80.4	5.2	23.2	48.2	56.2	155.4	18.5	297.85	.	.	.	47.5	98.5
27 MAURITANIA		1907	958	1250	2846	1061	64.4	12.2	27.1	49.5	58.9	81.8	21.9	75.261	.	.	.	109.4	92.7
28 MAURITIUS		1048	4629	5486	11570	5316	64.9	16.2	18.9	35.0	34.4	62.8	17.6	13.438	.	.	.	144.0	98.1
29 MOROCCO		23920	2060	2565	6711	2376	61.4	9.5	29.1	38.7	39.3	109.2	17.1	8.209	.	.	.	49.9	95.1

\* = 1985; # = 1986; † = 1987.



TABLE II  
(CONTINUED)

OBS COUNTRY	YR	POP	RGDPCH	RGDPEA	RGDPW	CGDP	CC	CI	CG	P	PC	PI	PG	XR	KAPW	KPDUR	KRES	OPEN	RGNP
30 MOZAMBIQUE		14967	919	1173	1694	1034	65.6	9.1	29.1	8.1	11.5	32.8	5.4	525	.	.	.	77.6	80.5
31 NIGER		6998	602	787	1222	659	72.0	5.9	25.0	52.0	61.3	99.0	20.5	297.85	.	.	.	40.1	97.4
32 NIGERIA		110131	1003	1324	2786	1033	72.5	5.5	21.4	26.4	26.7	70.3	13.0	4.537	.	.	.	48.4	93.9
33 RWANDA		6657	661	871	1322	733	68.8	6.5	29.3	47.3	56.6	128.7	17.1	76.445	.	.	.	25.8	99.4
34 SENEGAL		7154	1126	1448	2623	1248	68.0	5.9	29.1	55.8	61.3	156.9	27.5	297.85	.	.	.	56.5	95.3
35 SEYCHELLES	#	66	3069	.	.	3246	46.2	41.7	28.9	98.3	121.1	59.2	115.6	6.177	.	.	.	93.2	96.0
36 SIERRA LEONE	†	3841	924	1166	2561	1031	64.2	1.6	34.0	15.4	19.8	116.2	2.5	31.847	.	.	.	25.1	109.6
37 SOMALIA		5882	791	1021	2232	881	70.4	15.9	23.6	32.4	40.0	78.8	12.2	170.45	.	.	.	46.1	93.9
38 SOUTH AFRICA		33938	4431	5574	12781	4936	58.8	17.3	21.2	52.5	50.3	70.4	40.2	2.261	.	.	.	52.2	96.1
39 SUDAN		23776	883	1140	2754	1003	77.1	1.2	23.4	49.1	54.1	483.6	16.2	3.75	.	.	.	12.0	96.3
40 SWAZILAND	*	665	2113	2741	5147	2113	61.0	18.3	26.7	24.1	33.2	49.9	15.5	2.191	.	.	.	163.1	110.3
41 TANZANIA		24739	488	646	1015	567	47.4	13.3	45.1	22.4	43.9	40.5	5.3	99.292	.	.	.	57.5	93.3
42 TOGO		3362	668	863	1685	710	63.4	12.8	27.6	56.9	61.8	108.0	30.7	297.85	.	.	.	74.8	96.2
43 TUNISIA		7796	2921	3608	9336	3170	70.3	6.3	23.2	40.6	37.4	137.4	24.9	0.858	.	.	.	84.6	95.0
44 UGANDA	*	14680	430	566	895	430	81.1	3.0	17.5	60.2	69.9	206.8	13.2	672.02	.	.	.	27.7	98.2
45 ZAIRE		33615	356	460	958	391	59.2	10.9	31.2	49.2	56.6	56.2	33.1	187.07	.	.	.	75.5	91.9
46 ZAMBIA		7486	715	938	2162	868	63.3	9.6	25.5	61.5	67.3	82.8	36.3	8.266	.	.	.	53.4	89.9
47 ZIMBABWE		9257	1265	1663	3158	1371	51.1	11.2	36.2	49.8	56.0	106.9	22.5	1.802	1860	37.9	18.1	51.7	96.7
CENTRAL & NORTH AMERICA																			
48 BAHAMAS	†	241	10516	.	.	11004	63.4	19.0	11.9	102.3	103.1	114.1	92.2	1	.	.	.	117.1	94.0
49 BARBADOS	*	253	6152	7123	12256	6152	62.8	16.9	17.0	77.2	80.1	82.8	61.7	2.011	.	.	.	124.8	98.8
50 CANADA		26104	16272	18220	32421	17681	57.0	25.8	16.4	105.9	109.2	103.8	105.1	1.231	41422	33.8	33.7	51.7	96.9
51 COSTA RICA		2670	3800	4647	10421	4317	60.0	15.0	24.8	40.3	39.7	79.5	21.1	76.7	.	.	.	71.9	92.9
52 DOMINICA	*	78	2570	.	.	2570	79.9	7.2	23.3	49.2	61.1	66.4	33.3	2.7	.	.	.	101.8	98.9
53 DOMINICAN REP		6859	2209	2742	7388	2423	66.2	21.4	14.4	27.9	32.8	34.9	10.4	6.1	5514	16.5	94.9	74.3	93.1
54 EL SALVADOR		5056	1705	2185	4269	1948	62.0	6.0	35.5	55.5	72.9	132.5	17.6	5	.	.	.	38.1	97.9
55 GRENADA	*	96	2619	.	.	2619	65.5	27.6	20.1	46.0	53.8	65.8	37.9	2.7	.	.	.	120.6	98.4
56 GUATEMALA		8688	2228	2886	7822	2431	83.4	6.3	12.5	38.3	38.6	96.8	21.9	2.55	2961	44.7	35.1	37.2	98.0
57 HAITI		6254	877	1121	1826	973	78.2	5.8	18.4	41.0	45.0	78.0	21.1	5	.	.	.	31.2	98.9
58 HONDURAS		4837	1346	1747	4458	1491	66.6	8.0	28.4	60.9	65.9	136.5	32.6	2	.	.	.	51.5	94.7
59 JAMAICA	†	2401	2362	2876	4918	2628	59.8	11.3	28.8	45.4	47.6	102.8	20.5	5.487	.	.	.	109.4	88.2

\* = 1985 # = 1986 † = 1987

TABLE II  
(CONTINUED)

OBS	COUNTRY	YR	POP	RGDPCH	RGDPEA	RGDPG	CGDP	CC	CI	CG	P	PC	PI	PG	XR	KAPW	KPDUR	KRES	OPEN	RGNP
60	MEXICO		83593	4996	6258	14581	5323	71.3	15.3	12.4	39.7	37.7	59.9	28.2	2250	.	.	.	30.6	95.7
61	NICARAGUA	#	3387	1759	2293	5773	1888	49.6	22.1	37.0	42.8	54.3	39.0	41.3	159	.	.	.	40.9	90.2
62	PANAMA	#	2226	3569	4380	10168	3794	46.5	17.0	34.5	60.6	75.3	68.5	34.6	1	.	.	.	64.5	103.9
63	ST. LUCIA	†	142	2730	.	.	3164	55.5	27.8	25.3	44.3	42.1	78.9	35.9	2.7	.	.	.	152.3	94.0
64	ST. VINCENT & GR	#	118	2396	.	.	2469	60.8	24.6	19.4	40.2	43.2	54.8	31.2	2.7	.	.	.	153.9	97.0
65	TRINIDAD & TOBAGO		1241	5674	6770	14671	4839	59.1	11.1	27.7	70.4	68.3	133.2	48.3	3.844	.	.	.	74.8	94.0
66	U.S.A.		245871	18339	20605	37608	19851	66.5	17.3	17.7	100.0	100.0	100.0	100.0	1	32046	40.1	52.4	24.1	100.7
SOUTH AMERICA																				
67	ARGENTINA		31506	4030	4771	11258	4363	78.2	7.1	11.9	65.2	59.4	146.1	52.6	8753E4	9632	13.5	39.7	16.1	94.3
68	BOLIVIA		6917	1362	1744	4362	1481	62.7	8.3	30.7	42.1	49.3	60.5	24.7	2350E3	.	.	.	35.2	93.9
69	BRAZIL	†	141453	4441	5414	12142	4621	74.3	14.9	9.3	46.4	38.7	77.9	56.8	3922E9	.	.	.	14.9	96.3
70	CHILE		12760	4099	4804	11480	4719	61.8	11.5	24.1	36.7	38.9	61.9	14.1	245.05	8399	18.0	31.7	67.5	92.1
71	COLOMBIA		30007	3568	4366	10818	3807	72.1	13.5	13.8	34.2	31.9	59.3	23.3	299.2	9198	12.7	35.3	30.2	93.5
72	ECUADOR		10154	2727	3432	8933	2810	61.5	19.4	19.8	36.2	40.1	49.5	17.1	301.61	.	.	.	55.1	96.5
73	GUYANA		799	1302	1583	2859	1542	61.5	15.9	24.2	33.6	30.3	51.0	34.5	10	.	.	.	131.9	78.1
74	PARAGUAY		4042	2376	2992	7210	2590	71.4	12.2	17.5	57.6	58.2	131.6	16.2	550	.	.	.	54.6	96.5
75	PERU		20681	2847	3552	8725	3084	67.1	14.4	20.2	40.3	40.7	90.5	14.5	200200	.	.	.	24.1	94.8
76	SURINAME	*	398	4074	5001	13859	4074	65.3	10.8	24.2	61.5	67.9	51.6	51.3	1.785	.	.	.	82.3	99.3
77	URUGUAY		3004	5163	5950	12948	5787	66.4	13.5	18.3	45.7	50.6	38.0	28.5	359.44	.	.	.	40.3	96.2
78	VENEZUELA	†	18272	5717	7102	16719	5648	64.3	15.0	20.4	48.0	48.6	87.8	21.2	14.5	.	.	.	43.8	97.4
ASIA																				
79	AFGHANISTAN	*	18140	714	903	2806	714	72.0	7.7	15.6	33.4	33.9	59.9	7.7	50.64	.	.	.	.	.
80	BAHRAIN	#	431	10000	12012	22901	9782	40.6	31.9	13.7	86.3	88.1	67.4	114.6	0.38	.	.	.	170.9	91.2
81	BANGLADESH	*	100590	700	908	2441	700	78.3	6.4	17.4	22.8	27.8	52.8	6.7	26	.	.	.	22.5	99.4
82	BURMA (Myanmar)	*	36943	659	811	1458	659	68.7	11.0	19.6	27.9	31.3	43.4	13.7	8.486	.	.	.	.	.
83	CHINA		1083887	2308	2669	3823	2472	54.4	29.6	16.1	13.9	14.4	20.1	5.4	3.722	.	.	.	28.8	100.0
84	HONG KONG		5674	13281	15029	25006	14014	66.2	17.1	13.1	68.6	62.3	126.7	32.7	7.806	.	.	.	266.8	.
85	INDIA		813990	786	955	20059	870	61.8	14.2	25.1	37.9	41.0	72.4	16.6	14.477	1545	25.4	48.4	16.4	98.9
86	INDONESIA		174832	1714	2102	4404	1822	58.9	23.0	17.3	24.7	26.9	27.9	12.7	1696	.	.	.	48.5	94.2

\* = 1985; # = 1986; † = 1987.

TABLE II  
(CONTINUED)

OBS COUNTRY	YR	POP	RGDPCH	RGDPEA	RGDPW	CGDP	CC	CI	CG	P	PC	PI	PG	XR	KAPW	KPDUR	KRES	OPEN	RGNP
87 IRAN	*	46005	3558	4524	12569	3558	59.5	19.3	19.2	84.2	85.1	111.3	62.8	91.061	.	.	.	.	.
88 IRAQ	*	15784	3508	4584	13001	3508	48.6	42.4	16.6	84.6	77.4	104.5	78.8	0.311	.	.	.	.	.
89 ISRAEL		4444	9412	11113	24249	10864	52.4	15.3	38.2	93.1	105.1	115.7	66.1	1599.2	19297	52.8	97.4	70.8	96.9
90 JAPAN		122433	12209	13579	24417	13645	56.5	27.9	10.6	171.2	173.8	216.1	128.9	128.15	49256	34.8	32.2	23.2	100.6
91 JORDAN		3937	2356	3103	10196	2684	68.6	14.8	29.4	43.4	48.2	87.3	35.6	0.372	.	.	.	.	136.6
92 KOREA, SOUTH (R)		42593	5156	6083	12275	5682	54.5	25.9	13.6	70.8	67.1	92.9	46.8	731.47	16659	28.0	18.5	73.0	98.6
93 KUWAIT	#	1791	13044	16306	33090	9644	60.9	23.8	20.2	99.1	87.8	102.8	127.6	0.292	.	.	.	.	101.1
94 MALAYSIA		16921	4727	5781	11945	5070	44.8	30.2	20.9	40.4	44.7	39.8	24.4	2.619	.	.	.	.	124.6
95 NEPAL	*	16687	729	930	1771	729	68.7	16.3	16.9	20.5	24.0	34.2	8.6	17.777	.	.	.	.	33.1
96 OMAN	*	1242	9833	12629	33830	9833	41.9	32.9	15.2	81.9	69.9	81.3	100.5	0.345	.	.	.	.	87.0
97 PAKISTAN		105677	1567	1999	5162	1790	57.6	6.0	37.5	20.2	25.8	70.1	6.6	17.555	.	.	.	.	33.4
98 PHILIPPINES		59686	1947	2424	5431	2168	64.1	13.4	22.3	30.3	34.6	44.5	11.1	21.1	2660	24.2	47.3	48.5	99.6
99 SAUDI ARABIA	*	11508	9541	12277	32246	9541	51.7	35.6	19.0	84.4	75.9	79.8	111.5	3.57	.	.	.	.	80.0
100 SINGAPORE	*	2558	10417	11869	21735	10417	47.3	37.8	6.6	79.2	67.6	88.3	102.7	2.2	.	.	.	.	103.6
101 SRI LANKA	†	16361	1959	2362	5259	2120	49.7	21.7	30.6	19.6	30.8	23.4	5.6	29.445	.	.	.	.	59.8
102 SYRIA		11667	4144	5472	16740	4460	66.4	15.1	19.6	28.7	31.1	36.0	20.5	11.225	.	.	.	.	26.4
103 TAIWAN		19904	5708	6629	13524	6528	52.1	19.1	18.3	93.1	92.9	118.2	69.8	28.17	.	.	.	.	.
104 THAILAND		54469	2879	3468	5532	3282	62.4	12.9	25.3	32.4	33.1	78.7	12.2	25.294	2859	27.7	23.4	70.7	98.3
105 UNITED ARAB E	*	1350	20529	24410	40577	20529	36.2	31.8	6.9	97.5	77.8	91.3	199.9	3.671	.	.	.	.	89.7
106 YEMEN, N-ARAB		8742	1562	2039	7431	1683	68.8	8.2	28.0	40.2	47.0	71.4	24.7	9.76	.	.	.	.	44.7
EUROPE																			
107 AUSTRIA		7563	11201	12326	23907	12353	54.8	28.1	16.6	136.1	138.9	146.9	125.1	12.348	28245	45.4	31.9	74.4	99.1
108 BELGIUM		9867	11495	12671	27481	13005	61.2	19.6	15.8	119.9	124.8	124.1	106.2	36.768	42670	23.1	46.1	133.9	98.7
109 CYPRUS		686	7858	9032	16828	8434	64.1	22.7	15.1	73.3	72.5	94.0	59.3	0.466	.	.	.	.	100.2
110 DENMARK		5133	12089	13263	21969	13607	49.9	17.5	28.0	153.9	166.2	179.3	123.2	6.732	30878	34.2	57.9	61.7	96.0
111 FINLAND		4944	12360	13673	24190	13980	50.5	28.0	21.8	152.2	163.2	167.2	118.1	4.183	46451	28.6	43.0	49.9	98.0
112 FRANCE		55873	12190	13598	27140	13584	58.9	22.0	18.9	125.1	128.2	134.5	110.5	5.957	38093	36.8	49.3	42.9	99.8
113 GERMANY, WEST		61049	12604	13643	26219	14621	54.0	20.8	17.5	135.3	137.1	152.7	130.9	1.756	38261	33.1	48.5	59.5	100.5
114 GREECE		10030	5857	6554	15366	6436	70.3	15.8	19.6	82.2	80.0	107.4	76.1	141.86	15310	26.4	76.2	52.5	98.6
115 HUNGARY		10604	5530	6169	11166	5924	58.7	25.2	14.9	44.6	46.5	50.6	29.6	50.413	.	.	.	.	72.9
116 ICELAND		249	13204	15160	24846	14875	65.8	20.0	15.4	161.2	151.5	181.3	178.4	43.014	.	.	.	.	69.5

\* = 1985; # = 1986; † = 1987.

TABLE II  
(CONTINUED)

OBS COUNTRY	YR	POP	RGDPCH	RGDPFA	RGDPW	CGDP	CC	CI	CG	P	PC	PI	PG	XR	KAPW	KPDUR	KRES	OPEN	RGNP
117 IRELAND		3574	6239	7302	15546	7022	51.6	17.7	18.1	114.1	112.2	149.4	100.4	0.656	22741	39.4	66.1	119.0	88.1
118 ITALY		57470	11741	12919	29201	13001	61.5	22.0	17.0	110.9	111.7	134.4	88.5	1301.6	32968	32.7	67.5	36.6	99.3
119 LUXEMBOURG		370	13933	15257	33259	14293	61.4	23.1	13.7	124.3	116.1	151.3	133.6	36.768	.	.	.	205.1	135.4
120 MALTA		345	6802	7718	16392	7436	64.8	24.5	19.3	71.4	73.1	95.5	56.5	0.331	.	.	.	166.1	104.7
121 NETHERLANDS		14760	11468	12641	28050	12684	60.0	17.5	17.6	121.9	121.2	150.2	107.8	1.977	.	.	.	105.0	99.6
122 NORWAY		4205	14976	16553	30103	13819	49.0	30.7	21.0	156.7	166.6	164.1	133.5	6.517	50932	23.4	33.9	71.9	97.8
123 POLAND	†	37664	4086	4672	7928	4189	53.8	33.0	12.6	40.6	48.7	39.8	15.9	265.08	.	.	.	41.1	95.4
124 PORTUGAL		10162	5321	6050	11583	5984	58.6	22.2	25.8	68.6	77.1	105.9	32.5	143.95	.	.	.	78.8	98.0
125 SPAIN		38997	7406	8380	20398	8253	61.8	22.8	16.7	105.8	108.0	123.5	83.5	116.49	26221	25.4	84.4	40.0	98.9
126 SWEDEN		8357	12991	14219	25330	14941	51.5	18.6	27.8	145.3	149.9	172.7	120.9	6.127	25256	33.0	51.7	63.3	98.1
127 SWITZERLAND		6545	16155	17654	33080	17763	62.5	32.3	5.1	159.0	147.7	171.3	318.0	1.463	.	.	.	71.6	105.2
128 TURKEY		53772	3598	4369	8507	3904	65.3	19.3	14.8	33.7	33.8	47.8	17.4	1422.4	.	.	.	46.1	97.0
129 U.K.		57019	11982	13251	24725	13060	64.7	18.7	20.8	110.8	109.6	143.3	88.5	0.562	22600	44.0	33.2	50.5	100.2
130 YUGOSLAVIA	†	23411	4628	5241	10191	4857	48.3	32.5	17.6	58.6	52.4	42.7	98.8	737	.	.	.	46.2	97.5
OCEANIA																			
131 AUSTRALIA		16506	13321	15043	28490	14529	59.6	24.5	16.9	102.6	100.3	115.8	99.9	1.28	29829	41.9	39.1	34.4	96.0
132 FIJI	†	722	3353	4114	10090	3593	59.6	13.7	24.6	44.6	48.4	45.9	29.6	1.224	.	.	.	82.2	96.8
133 NEW ZEALAND		3339	9864	11151	21609	11308	60.5	19.2	16.8	105.4	104.2	140.0	81.5	1.553	.	.	.	53.4	96.1
134 PAPUA N. GUINEA		3804	1696	2129	3603	1885	55.6	21.3	25.6	49.1	51.7	67.3	35.7	0.875	.	.	.	94.4	94.1
135 SOLOMON IS.		304	2282	.	2444	66.4	22.1	22.9	27.3	28.6	54.3	35.6	20.83	.	.	.	.	165.6	99.7
136 TONGA	*	97	2135	.	2135	74.2	23.5	18.2	29.6	41.3	54.0	20.7	1.304	.	.	.	.	102.2	103.2
137 VANUATU	*	137	1973	.	1973	54.0	27.0	26.2	43.7	48.8	54.2	43.0	106.03	.	.	.	.	123.4	103.2
138 WESTERN SAMOA		168	1744	.	1887	66.6	17.5	29.6	35.8	48.9	68.6	19.4	2.08	.	.	.	.	95.3	99.7

\* = 1985; # = 1986; † = 1987.

To give the reader a glimpse of the country *dynamics* lying behind the Table II entries, Table III provides growth rates for selected variables and time periods. Note that symbols in the YR column indicate the terminal year of the period 1980–1988 if data for 1988 are not available.

### *B. Changes in the World Income Distribution*

A simple illustration of what can be done with PWT5 is presented in Table IV. The table tracks over time the shares of world output accruing to countries in various geographic regions and in different income tiers.<sup>16</sup> The “world” of this table consists of 119 countries for which PWT5 entries are available back to 1960. The relative stability of the shares of the poor and rich over the 27 years shows through clearly. Both went down a little, while the share of the middle income countries went up sharply.

The shares are shown for two different measures of income: (i) CGDP, where each country’s national-price GDP is converted into dollars using its PPP; and (ii) an alternative dollar GDP where each country’s national-price GDP is converted into dollars using its exchange rate. This is to show the sensitivity of judgments about the world’s income distribution to the choice of income measure. The table makes clear that it really makes a difference if exchange rates are used rather than PPPs. The share of world income received by the developing nations of Africa, Asia, and Latin America is significantly understated when exchange rates are used to add together the incomes of different countries. Note that over time changing patterns of exchange rates not matched by changing PPPs make it appear that the income share of the poorest nations has halved between 1960 and 1988 when, as noted above, in fact it has remained almost the same.

### *C. Caveats about the Use of PWT5*

As was said in the Introduction, PWT5 is envisioned as one more step in the creation of a System of *Real Accounts*, a companion to the SNA but not at all a replacement for it. (The reader should be reminded that the SNA can be recovered from PWT5. Therefore, there is no need to use PWT5 entries simply because they are more conveniently available than SNA numbers. Note again, however, that the recovered constant-price series for multiple benchmark countries are the World Bank numbers as modified by the PWT5 reconciliation process described in subsec-

16. A more detailed but somewhat less up-to-date analysis of the world income distribution is given in Summers, Kravis, and Heston [1984].

TABLE III  
 GROWTH RATES FOR 1960-1973, 1973-1980, 1980-1988: GDP, GDP PER CAPITA,  
 AND GDP PER WORKER: 133 COUNTRIES

AFRICA	1960-1973			1973-1980			1980-1988			YR
	GDP	GDP Pop	GDP W	GDP	GDP Pop	GDP W	GDP	GDP Pop	GDP W	
1 ALGERIA	4.3	1.7	3.3	8.7	5.5	5.3	1.8	-1.3	-1.8	
2 ANGOLA	4.0	1.8	2.5	-5.6	-7.9	-8.2	0.5	-2.0	-1.2	*
3 BENIN	2.9	0.3	1.3	2.0	-0.6	0.0	1.7	-1.4	-0.4	
4 BOTSWANA	10.4	7.3	8.6	10.8	6.9	7.6	6.8	3.3	3.3	#
5 BURKINA FASO	.	.	.	4.4	2.1	2.6	5.2	2.5	3.2	
6 BURUNDI	0.8	-0.7	-0.5	3.7	1.6	2.3	4.6	1.7	2.4	
7 CAMEROON	5.0	2.8	3.3	8.5	5.2	6.9	4.0	0.8	2.1	
8 CAPE VERDE IS.	1.0	-1.5	-1.6	7.6	6.2	6.5	6.9	4.8	3.3	*
9 CENTRAL AFR. R.	1.7	0.1	0.7	1.5	-0.6	0.3	0.9	-1.6	-0.5	
10 CHAD	0.7	-1.1	-0.8	-2.2	-4.2	-3.9	3.0	0.7	1.2	*
11 COMOROS	.	.	.	.	.	.	.	.	.	
12 CONGO	5.8	3.3	3.8	5.4	2.3	3.2	5.6	2.2	3.7	#
13 EGYPT	5.9	3.5	3.8	11.1	8.4	8.8	4.3	1.5	1.6	
14 ETHIOPIA	4.3	1.7	2.0	3.5	0.8	1.5	1.8	-0.5	0.1	#
15 GABON	9.1	7.2	8.5	6.7	1.9	5.8	6.3	1.6	5.6	*
16 GAMBIA	6.3	3.8	4.2	3.7	0.3	1.7	4.6	1.2	3.4	*
17 GHANA	2.6	0.2	0.9	0.9	-1.0	-1.5	1.8	-1.6	-0.9	
18 GUINEA	1.3	-0.3	-0.2	4.1	2.0	2.3	2.5	0.3	0.9	*
19 GUINEA-BISS	4.3	3.9	.	-1.5	-6.2	.	4.6	2.6	.	
20 IVORY COAST	7.7	3.7	4.7	5.7	1.4	3.0	0.0	-4.0	-2.6	
21 KENYA	6.7	3.0	3.3	4.2	0.4	0.6	3.4	-0.8	-0.1	
22 LESOTHO	7.8	5.6	6.2	11.5	8.8	9.4	2.1	-0.6	0.1	*
23 LIBERIA	4.5	1.7	2.0	2.8	-0.3	0.2	-1.9	-5.0	-4.0	#
24 MADAGASCAR	2.0	-0.4	0.0	1.0	-1.6	-1.1	-1.2	-4.3	-3.1	
25 MALAWI	5.2	2.5	3.0	3.7	0.7	1.4	2.1	-1.5	-0.5	
26 MALI	0.3	-2.1	-1.3	5.3	3.1	3.5	1.5	-0.9	-1.0	
27 MAURITANIA	3.9	1.6	2.0	2.4	-0.0	0.7	0.5	-2.1	-2.2	
28 MAURITIUS	2.9	0.9	0.2	7.4	5.6	4.8	4.7	3.7	1.7	
29 MOROCCO	6.9	4.2	4.5	6.8	4.4	3.2	3.3	0.6	0.0	
30 MOZAMBIQUE	5.2	2.9	2.9	-3.7	-6.2	-7.2	-1.4	-4.0	-3.4	
31 NIGER	3.4	0.8	1.2	5.6	2.6	3.6	-0.5	-3.5	-2.8	
32 NIGERIA	4.4	1.8	1.6	3.6	1.1	0.5	-2.2	-5.3	-4.7	
33 RWANDA	3.4	0.4	0.8	6.6	3.1	3.4	2.6	-0.7	-0.2	
34 SENEGAL	2.2	-0.2	-0.6	3.9	1.1	0.6	2.0	-0.8	0.1	
35 SEYCHELLES	.	.	.	.	.	.	-2.1	-2.8	.	#
36 SIERRA LEONE	5.3	3.7	4.4	-0.6	-2.7	-1.6	-0.9	-3.2	-2.0	†
37 SOMALIA	2.4	-0.9	0.2	3.7	1.0	-0.1	2.0	-0.9	0.2	
38 SOUTH AFRICA	5.3	2.9	2.8	3.2	0.9	1.9	1.8	-0.5	-1.0	
39 SUDAN	1.6	-0.7	-0.3	5.9	2.7	3.2	0.5	-2.5	-2.3	
40 SWAZILAND	8.4	5.1	6.4	4.6	1.5	2.5	-0.2	-3.4	-2.3	*
41 TANZANIA	6.5	3.2	3.7	6.4	3.0	3.5	3.0	-0.5	0.2	
42 TOGO	7.1	4.2	4.6	5.7	3.1	3.5	0.0	-3.3	-2.2	
43 TUNISIA	5.5	3.5	3.7	7.0	4.5	3.2	2.3	-0.2	-0.7	
44 UGANDA	4.6	0.9	1.0	-5.7	-8.1	-8.1	16.8	13.3	13.7	*
45 ZAIRE	5.4	3.2	3.9	-3.7	-6.8	-5.5	3.3	0.2	1.0	
46 ZAMBIA	4.0	1.0	1.3	-2.6	-5.5	-5.1	0.6	-2.8	-2.5	
47 ZIMBABWE	5.5	1.8	2.1	5.4	2.4	2.5	2.2	-1.3	-0.6	

\* = 1985; # = 1986; † = 1987.

TABLE III  
(CONTINUED)

CENTRAL & NORTH AMERICA	1960-1973			1973-1980			1980-1988			YR
	GDP	GDP Pop	GDP W	GDP	GDP Pop	GDP W	GDP	GDP Pop	GDP W	
48 BAHAMAS	.	.	.	.	.	.	3.6	1.6	.	†
49 BARBADOS	4.6	4.2	4.0	3.2	2.8	0.5	-2.6	-2.9	-4.0	*
50 CANADA	4.8	3.1	1.9	3.8	2.6	0.7	3.2	2.1	1.9	
51 COSTA RICA	6.6	3.4	3.0	5.1	2.6	1.2	1.7	-0.6	-1.1	
52 DOMINICA	.	.	.	.	.	.	.	.	.	
53 DOMINICAN REP.	6.8	3.9	4.3	4.3	1.7	1.1	2.0	-0.3	-1.3	
54 EL SALVADOR	5.9	2.6	2.4	2.6	0.4	-0.4	0.3	-1.1	-2.7	
55 GRENADA	.	.	.	.	.	.	.	.	.	
56 GUATEMALA	5.3	2.2	2.8	5.3	2.5	3.1	0.7	-2.1	-2.1	
57 HAITI	1.0	-0.6	-0.2	5.0	3.1	4.0	-0.5	-2.2	-2.4	
58 HONDURAS	5.2	2.0	2.5	6.3	2.8	3.1	2.9	-0.6	-0.9	
59 JAMAICA	6.0	4.4	4.8	-2.4	-3.7	-5.2	0.8	-0.6	-2.0	†
60 MEXICO	6.8	3.4	3.6	6.6	3.7	2.1	0.4	-1.8	-2.7	
61 NICARAGUA	6.7	3.8	3.7	-0.4	-3.2	-3.2	-0.8	-4.1	-4.4	#
62 PANAMA	8.1	5.0	5.0	4.9	2.5	2.4	2.8	0.6	-0.1	#
63 ST. LUCIA	.	.	.	.	.	.	2.4	0.5	.	†
64 ST. VINCENT & GRE	.	.	.	.	.	.	6.3	4.8	.	#
65 TRINIDAD & TOBAGO	4.5	2.6	3.0	9.4	7.8	7.0	-6.7	-8.2	-8.9	
66 U.S.A.	4.0	2.7	2.1	2.1	1.1	-0.2	3.3	2.3	2.1	
SOUTH AMERICA										
67 ARGENTINA	3.9	2.3	2.6	1.8	0.1	0.8	-0.3	-1.7	-1.4	
68 BOLIVIA	5.7	3.2	3.7	3.5	0.9	1.4	-1.0	-3.7	-3.7	
69 BRAZIL	10.0	7.1	6.6	6.5	4.0	3.0	2.0	-0.2	-0.2	†
70 CHILE	3.9	1.8	2.0	2.6	1.1	0.2	1.3	-0.4	-1.1	
71 COLOMBIA	5.9	3.0	3.1	4.8	2.8	2.2	2.7	0.9	0.0	
72 ECUADOR	5.8	2.8	3.1	9.2	6.0	6.3	1.0	-1.8	-2.0	
73 GUYANA	3.3	1.1	0.8	1.4	0.4	-2.3	-4.3	-4.9	-6.9	
74 PARAGUAY	4.6	2.0	1.9	10.7	7.3	6.9	2.3	-0.9	-0.7	
75 PERU	5.9	2.9	3.5	3.2	0.4	-0.2	0.8	-1.4	-2.0	
76 SURINAME	6.0	3.7	4.3	3.3	4.4	2.8	-1.3	-3.5	-3.6	*
77 URUGUAY	1.0	0.2	0.3	4.4	4.1	4.2	-1.3	-1.8	-1.9	
78 VENEZUELA	6.5	2.7	3.1	7.1	3.4	2.1	0.0	-2.7	-3.3	†
ASIA										
79 AFGHANISTAN	1.9	-0.4	-0.1	1.7	-0.8	0.2	3.0	0.4	2.3	*
80 BAHRAIN	.	.	.	7.5	2.6	-1.0	2.4	-1.2	-2.6	#
81 BANGLADESH	1.5	-1.0	-0.1	5.9	3.1	3.7	3.7	0.8	0.9	*
82 BURMA (Myanmar)	4.5	2.2	2.4	5.3	3.2	3.0	5.2	3.2	3.2	*
83 CHINA	4.6	2.3	2.3	5.3	3.7	2.8	9.2	7.8	6.8	
84 HONG KONG	9.6	7.0	5.8	8.8	5.9	4.2	7.6	6.0	5.3	
85 INDIA	2.5	0.2	0.9	2.3	-0.0	0.5	5.0	2.8	3.0	
86 INDONESIA	.	.	.	9.1	6.7	6.8	4.4	2.3	2.0	
87 IRAN	7.8	4.3	4.6	0.1	-2.9	-3.0	8.7	5.0	5.2	*
88 IRAQ	5.5	2.2	2.4	12.7	8.8	8.3	-7.5	-10.7	-10.8	*
89 ISRAEL	9.2	5.6	5.5	3.2	0.8	0.4	3.0	1.3	0.8	
90 JAPAN	9.8	8.7	8.2	3.9	2.7	3.1	3.6	3.0	2.7	
91 JORDAN	4.5	1.4	2.0	9.4	6.9	8.3	2.8	-1.0	-1.5	
92 KOREA, SOUTH (R)	9.3	6.7	6.1	6.9	5.2	4.2	8.3	6.9	5.7	
93 KUWAIT	3.8	-4.7	-3.6	-4.6	-10.4	-11.1	-5.0	-9.1	-10.2	#

\* = 1985; # = 1986; † = 1987.

TABLE III  
(CONTINUED)

ASIA	1960-1973			1973-1980			1980-1988			YR
	GDP	GDP Pop	GDP W	GDP	GDP Pop	GDP W	GDP	GDP Pop	GDP W	
94 MALAYSIA	6.8	3.9	3.8	8.5	6.0	4.6	3.5	0.8	0.6	
95 NEPAL	2.2	0.2	1.0	4.6	1.9	2.8	3.9	1.2	1.6	*
96 OMAN	.	.	.	.	.	.	16.2	10.9	10.5	*
97 PAKISTAN	4.9	1.9	2.6	4.4	1.3	1.6	7.3	4.0	4.2	
98 PHILIPPINES	5.5	2.5	2.9	6.0	3.2	3.5	1.9	-0.5	-0.6	
99 SAUDI ARABIA	9.7	5.8	5.7	6.9	1.6	1.2	-7.8	-11.5	-11.6	*
100 SINGAPORE	8.8	6.4	5.3	7.6	6.1	3.1	6.1	4.9	4.1	*
101 SRI LANKA	2.0	-0.1	-0.1	3.9	2.1	1.5	4.6	3.1	3.0	†
102 SYRIA	6.9	3.5	4.4	13.0	9.2	9.2	0.7	-2.8	-2.8	
103 TAIWAN	10.5	7.5	7.5	8.4	6.3	4.6	6.7	5.3	3.6	
104 THAILAND	7.0	3.8	4.0	6.8	4.2	3.9	5.9	3.8	3.5	
105 UNITED ARAB E.	.	.	.	14.0	-1.5	-4.0	-4.4	-9.7	-9.1	*
106 YEMEN, N-ARAB	.	.	.	12.5	9.3	11.5	5.2	2.4	2.3	
EUROPE										
107 AUSTRIA	5.0	4.4	5.5	2.9	2.9	2.1	1.9	1.9	1.3	
108 BELGIUM	4.8	4.3	4.4	2.4	2.2	1.5	1.2	1.1	0.6	
109 CYPRUS	7.5	7.0	6.4	2.8	2.4	1.5	5.1	3.9	3.9	
110 DENMARK	4.4	3.7	3.1	1.6	1.3	0.3	2.0	2.0	1.5	
111 FINLAND	4.9	4.4	4.0	3.0	2.6	2.2	3.2	2.7	2.4	
112 FRANCE	5.7	4.6	4.8	2.6	2.1	1.7	1.6	1.1	0.8	
113 GERMANY, WEST	4.4	3.5	4.0	2.1	2.2	1.6	1.6	1.7	1.2	
114 GREECE	7.9	7.3	7.7	3.2	2.1	2.4	1.3	0.8	0.8	
115 HUNGARY	.	.	.	5.8	5.4	6.3	1.2	1.3	1.1	
116 ICELAND	5.0	3.5	2.3	6.2	5.1	3.3	2.5	1.4	0.9	
117 IRELAND	4.9	4.2	4.5	3.2	1.7	2.0	0.7	0.1	-0.9	
118 ITALY	5.1	4.4	4.9	4.2	3.8	3.8	2.3	2.0	1.6	
119 LUXEMBOURG	4.0	3.1	3.7	1.7	1.2	0.2	2.9	2.7	2.6	
120 MALTA	4.6	4.8	3.1	10.6	8.7	8.4	3.3	4.0	2.2	
121 NETHERLANDS	5.2	3.9	3.6	2.9	2.1	1.4	1.5	1.0	0.2	
122 NORWAY	4.5	3.7	2.9	5.2	4.7	3.1	3.2	2.9	2.4	
123 POLAND	.	.	.	.	.	.	0.3	-0.5	-0.4	†
124 PORTUGAL	6.9	6.9	6.3	3.8	2.3	1.2	2.4	2.1	1.5	
125 SPAIN	7.7	6.6	7.2	1.8	0.7	1.0	2.2	1.6	1.0	
126 SWEDEN	4.0	3.3	2.7	1.7	1.4	0.6	2.3	2.2	1.9	
127 SWITZERLAND	4.5	3.0	3.0	0.3	0.4	0.0	2.0	1.7	1.4	
128 TURKEY	6.1	3.5	4.6	4.4	2.0	2.6	4.6	2.3	2.4	
129 U. K.	3.2	2.7	2.7	1.1	1.1	0.6	2.9	2.7	2.4	
130 YUGOSLAVIA	6.1	5.1	5.2	6.2	5.2	5.3	0.8	0.1	-0.2	†
OCEANIA										
131 AUSTRALIA	5.2	3.1	2.6	2.7	1.3	0.4	3.1	1.6	1.4	
132 FIJI	5.8	3.1	2.4	4.0	2.0	1.0	-0.7	-2.6	-2.9	†
133 NEW ZEALAND	3.8	2.1	1.7	0.3	-0.5	-1.7	1.8	0.9	0.1	
134 PAPUA N. GUINEA	6.6	4.3	4.7	1.6	-0.9	-0.3	1.6	-1.0	-0.5	
135 SOLOMON IS.	.	.	.	.	.	.	6.4	2.7	.	
136 TONGA	.	.	.	.	.	.	.	.	.	
137 VANUATU	.	.	.	.	.	.	.	.	.	
138 WESTERN SAMOA	.	.	.	.	.	.	-0.1	-1.1	.	

\* = 1985; # = 1986; † = 1987.



TABLE IV  
THE DISTRIBUTION OF WORLD INCOME  
INCOME SHARES OF GROUPS OF COUNTRIES: 1960, 1970, 1980, 1988

Panel A						
Percent of world output received by countries in five regions						
Year	Measure	Africa	Latin America	Asia	Europe	Canada & the U.S.
1960	CGDP	4.3	7.9	24.9	29.7	33.2
	Exch. rate	3.3	5.6	16.4	28.8	45.9
1970	CGDP	4.2	8.8	27.1	29.3	30.6
	Exch. rate	3.0	6.0	18.6	30.7	41.7
1980	CGDP	4.8	11.1	30.2	26.7	27.2
	Exch. rate	3.9	8.0	22.6	36.1	29.4
1988	CGDP	4.0	8.9	35.6	24.4	27.1
	Exch. rate	2.1	4.6	28.1	33.3	31.9
1980	Population (%)	12.4	9.2	60.8	11.0	6.6
Panel B						
Percent of world output received by four income tiers						
Year	Measure	Lowest	Lower middle	Upper middle	Industrialized	
1960	CGDP	17.2	9.3	5.5	68.0	
	Exch. rate	10.1	6.7	4.9	78.3	
1970	CGDP	15.4	11.0	5.6	68.0	
	Exch. rate	8.0	6.8	4.4	80.8	
1980	CGDP	15.7	14.2	7.2	62.9	
	Exch. rate	6.9	8.5	6.9	77.7	
1988	CGDP	20.6	12.9	6.1	60.4	
	Exch. rate	4.9	6.4	4.9	83.8	
1980	Population (%)	59.0	15.5	6.0	19.5	
	No. of countries	39	37	17	26	

tion III. B. above and in Appendix B.) It is envisioned that researchers in a variety of fields will find PWT5 helpful in answering many kinds of questions, but by no means all. Comparisons of real quantities across countries nearly always call for comparisons of countries' national-currency expenditures. Most

such comparisons require that the country expenditures be converted to a common currency, and this is nearly always best done if the conversion factors used are appropriate PPPs for the countries. They may be overall PPPs for GDP, or PPPs for a lower aggregation like, say investment. (Or a special-purpose PPP may be needed, like one specifically designed to help in the comparison of military expenditures in different countries.)

But in each of these cases, the fact that relative prices are not the same in different countries is not critically important. Where differences in relative prices make a difference in particular comparisons, they should not be ignored. In most international comparisons of effort, national prices are what count. After all, residents of a country face their own prices, not international prices. For example, consider country savings rates. They are normally directed at measuring a country's effort to set aside currently available output in order to augment future production. They should be calculated on the basis of domestic prices. That is, if the share of GDP devoted to capital formation is the form the country's saving takes, the share calculation should be based on domestic prices rather than international prices.

One more observation: it was argued strongly in subsection II. C that the exchange rate is a poor substitute for a PPP in comparing countries' national outputs. But the exchange rate *is* the right number to use in comparing different countries' capital flows. The terms on which residents of one country can buy goods from another country are defined by the country's exchange rate, not by its PPP. In general, a country's international transactions, quantified in its own currency units, are best compared with those of other countries' transactions via exchange rates rather than PPPs.

A detailed comparison is presented in Appendix B of growth rates of GDP per capita calculated on the basis of a number of different sets of prices. That analysis is motivated by a desire to understand the empirical differences between growth rates based on national and international prices. (That is, a need to see how growth rates embedded in an SRNA differ from those of the SNA.)<sup>17</sup> This is not the place for a discussion of the merits of using

17. The reader should be reminded that "international prices" here are average world prices of final goods and not the actual "one-price" values prevailing around the world. Most discussions of whether world prices or national prices should be used in measuring growth are concerned with this latter comparison. (See, for example, Bhagwati and Hansen [1972].)

one set of prices or another in appraising countries' growth performance. It is sufficient here to make a few observations to guide researchers calculating growth rates from PWT5. Growth rates based on international prices can differ significantly from those based on national prices; but when they do, it is nearly always the case that relative prices within the countries have changed substantially over the growth rate period.

Consider two measures of a country's national growth rate between 1960 and 1988, the first based on 1960 national prices and the second on 1988 national prices. The difference between them, the Laspeyres-Paasche spread, would be ignored by most researchers not primarily concerned with index numbers (except Gerschenkron). Unfortunately, if the Laspeyres-Paasche spread is large, substantive conclusions can be affected by the choice of which is used. Normally, the one that is at hand is the one that is used, without much concern for the size of the spread or concern about which is the right one to use. In the light of this, the strong finding in comparing national and international price growth rates is of some interest: the differences between the two are rarely significant unless the Laspeyres-Paasche spread is large. (Appendix B provides more detailed information about this.)

## VI. CONCLUSION

The conclusion of the article laying out PWT4 [Summers and Heston, 1988], quoted from the conclusion of the article laying out PWT3 Summers and Heston [1984]. We resist now the temptation to end this description of PWT5 by quoting from the PWT4 conclusion. Nothing said there was turned upside down subsequently, and in fact we think there are more grounds now for optimism about a quasi-official SRNA coming into existence in the future. The main encouragement comes from the fact that after 1990 the underpinning of the table, the ICP benchmark studies, will be extended to give us fresh readings on previously included countries and first-time benchmark readings on some important countries about which our information is still uncomfortably casual. The Penn World Table has certainly been growing bigger. With the continued cooperation of users, we shall soon learn the extent to which it is also getting better.

## APPENDIX A.1: VARIABLE LIST

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1. POP	Population
2. RGDPCH <sup>a</sup>	Real GDP per capita (1985 international prices; Chain index)
3. <i>c</i>	Real Consumption (% of RGDP; 1985 international prices)
4. <i>i</i>	Real Gross Domestic Investment (private and public) (% of RGDP; 1985 international prices)
5. <i>g</i>	Real Government (public consumption) (% of RGDP; 1985 international prices)
6. RGDP <sup>b</sup>	Real GDP per capita (1985 international prices; Laspeyres Index)
7. RGDPTT <sup>c</sup>	Real GDP per capita adjusted for changes in the terms of trade (1985 international prices for domestic absorption; current prices for net foreign balance)
8. <i>y</i>	CGDP/CGDP <sub>US</sub> (current international prices)
9. CGDP	Real GDP per capita (current international prices)
10. <i>cc</i>	Real Consumption (% of CGDP; current international prices)
11. <i>ci</i>	Real Gross Domestic Investment (private and public) (% of CGDP, current international prices)
12. <i>cg</i>	Real Government (public consumption) (% of CGDP, current international prices)
13. <i>P</i>	Price level of GDP (%) (PPP of GDP)/(Exchange Rate) <sup>d</sup>
14. <i>PC</i>	Price level of Consumption (%) (PPP of Consumption)/(Exchange rate) <sup>d</sup>
15. <i>PI</i>	Price level of Investment (%) (PPP of Investment)/(Exchange Rate) <sup>d</sup>
16. <i>PG</i>	Price level of Government (%) (PPP of Government)/(Exchange Rate) <sup>d</sup>
17. <i>ExR</i>	Exchange Rate <sup>d</sup>
18. RGDPEA	Real GDP per equivalent adult (1985 international prices)
19. RGDPEW	Real GDP per worker (1985 international prices)
20. KapW <sup>e</sup>	Capital stock per worker (1985 international prices) (Kap1W + Kap2W + Kap3W)
21. KPDUR	Producers Durables (% of KapW) (1985 international prices)
22. KNRES	Nonresidential Construction (% of KapW) (1985 international prices)
23. KOTHER	Other Construction (% of KapW) (1985 international prices)
24. KRES	Residential Construction (% of KapW) (1985 international prices)
25. OPEN	Openness (exports + imports)/(CGDP) (current international prices)
26. RGNP	Real Gross National Product (% of CGDP) (current international prices)
27. IPri	Gross Domestic Private Investment (% of gross domestic investment in current international prices)

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a. RGDP2 in PWT4.

b. RGDP1 in PWT4.

c. RGDP3 in PWT4.

d. PPP: Purchasing Power Parity relative to the U. S. dollar. Exchange Rate relative to the U. S. dollar.

e. Note that Residential Construction is not included in KapW.

## APPENDIX A.2: COUNTRY LIST

Country	Variables			Benchmark years	Quality rating
	1-19, 25,26	27 <sup>a</sup>	20-24		
<b>Africa</b>					
1 Algeria	60-88				D
2 Angola	60-85				D
3 Benin	59-88			85	D+
4 Botswana	60-86			80,85	C
5 Burkina Faso	65-88				D
6 Burundi	60-88				D
7 Cameroon	60-88			80,85	C-
8 Cape Verde Is.	60-85				D
9 Central Africa. Rep.	60-88				D
10 Chad	60-85				D
11 Comoros	85				D
12 Congo, Peop. Rep.	60-86			85	D+
13 Egypt	50-88			85	D+
14 Ethiopia	50-86			80,85	D+
15 Gabon	60-85				D
16 Gambia, The	60-85				D
17 Ghana	55-88				D
18 Guinea	59-85				D
19 Guinea Bissau	60-88				D
20 Ivory Coast	60-88			80,85	C-
21 Kenya	50-88	*		70,75,80,85	C
22 Lesotho	60-85				D
23 Liberia	60-86				D
24 Madagascar	60-88			80,85	D+
25 Malawi	54-88			75,80,85	D+
26 Mali	60-88			80,85	D+
27 Mauritania	60-88				D
28 Mauritius	50-88			85	D+
29 Morocco	50-88			80,85	C-
30 Mozambique	60-88				D
31 Niger	60-88				D
32 Nigeria	50-88			80,85	D+
33 Rwanda	60-88			85	D+
34 Senegal	60-88			80,85	C-
35 Seychelles	76-86				D
36 Sierra Leone	60-87			85	D+
37 Somalia	60-88				D
38 So. Africa	50-88	*			C-

APPENDIX A.2  
(CONTINUED)

Country	Variables			Benchmark years	Quality rating
	1-19, 25,26	27 <sup>a</sup>	20-24		
39 Sudan	55-88				D
40 Swaziland	60-85	*		85	D+
41 Tanzania	60-88			80,85	C-
42 Togo	60-88				D
43 Tunisia	60-88			80,85	C-
44 Uganda	50-85				D
45 Zaire	50-88				D
46 Zambia	55-88			75,80,85	D+
47 Zimbabwe	54-88	*		80,85	C-
<i>Asia</i>					
48 Afghanistan	60-85				D
49 Bahrain	73-86				D
50 Bangladesh	59-85			85	C-
51 Burma (Myanmar)	50-85				D
52 China, P.R.	60-88				D
53 Hong Kong	60-88			80,85	B-
54 India	50-88	*		70,75,80,85	C
55 Iran	55-88	*		70,75,85	C-
56 Iraq	53-85				D
57 Israel	53-88			80	B
58 Japan	50-88		80-88	70,75,80,85	A
59 Jordan	54-88				D
60 Korea, Rep. of	53-88			70,75,80,85	B-
61 Kuwait	60-86				D
62 Malaysia	55-88			70,75	C
63 Nepal	60-85			85	D+
64 Oman	80-85				D
65 Pakistan	50-88			75,80,85	C-
66 Philippines	50-88			70,75,80,85	C
67 Saudi Arabia	60-85				D
68 Singapore	60-85				C
69 Sri Lanka	50-87			75,80,85	C-
70 Syrian Arab Rep.	60-88			75	C-
71 Taiwan	50-88				D-
72 Thailand	50-88	*		75,85	C-
73 U. Arab Emirates	70-85				D
74 Yemen	69-88				D

APPENDIX A.2  
(CONTINUED)

Country	Variables			Benchmark years	Quality rating
	1-19, 25,26	27 <sup>a</sup>	20-24		
<u>Europe</u>					
75 Austria	50-88	*	80-88	75,80,85	A-
76 Belgium	50-88	*	80-88	70,75,80,85	A
77 Cyprus	50-88				C
78 Denmark	50-88	*	80-88	75,80,85	A-
79 Finland	50-88	*	80-88	80,85	A-
80 France	50-88	*	80-88	70,75,80,85	A
81 Germany, Fed. Rep.	50-88	*	80-88	70,75,80,85	A
82 Greece	50-88		80-88	80,85	A-
83 Hungary	70-88	*		70,75,80,85	B
84 Iceland	50-88				B+
85 Ireland	50-88	*	80-88	75,80,85	A-
86 Italy	50-88		80-88	70,75,80,85	A
87 Luxembourg	50-88	*	80-88	75,80,85	A-
88 Malta	54-88				C
89 Netherlands	50-88	*	80-88	70,75,80,85	A
90 Norway	50-88	*	80-88	80,85	A-
91 Poland	80-87			75,80,85	B
92 Portugal	50-88			80,85	A-
92a Romania	75			75	D
93 Spain	50-88	*	80-88	75,80,85	A-
94 Sweden	50-88	*	80-88	85	A-
95 Switzerland	50-88				B+
96 Turkey	50-88			85	C
97 United Kingdom	50-88	*	80-88	70,75,80,85	A
98 Yugoslavia	60-87			75,80,85	B
<u>Central and North America</u>					
99 Bahamas	77-87				D
100 Barbados	60-85			85	C
101 Canada	50-88	*	80-88	80	A-
102 Costa Rica	50-88	*		80	C
103 Dominica	85				D
104 Dominican Rep.	50-88			80	C
105 El Salvador	50-88			80	C
106 Grenada	85				D
107 Guatemala	50-88			80	C
108 Haiti	60-88				D

## APPENDIX A.2

(CONTINUED)

Country	Variables			Benchmark years	Quality rating
	1-19, 25,26	27 <sup>a</sup>	20-24		
109 Honduras	50-88			80	C
110 Jamaica	53-87			75	C
111 Mexico	50-88			75	C
112 Nicaragua	50-86				D
113 Panama	50-86	*		80	C
114 St. Lucia	77-87				D
115 Trinidad & Tobago	50-88				C
116 United States	50-88	*	80-88	70,75,80,85	A
117 St. Vincent	77-86				D
<u>South America</u>					
118 Argentina	59-88	*		80	C
119 Bolivia	50-88			80	C
120 Brazil	50-87			75,80	C-
121 Chile	50-88	*		80	C
122 Colombia	50-88			70,75,80	C
123 Ecuador	50-88			80	C
124 Guyana	50-88				D
125 Paraguay	50-88			80	C
126 Peru	50-88			80	C
127 Suriname	60-85				D
128 Uruguay	50-88			75,80	C-
129 Venezuela	50-87			80	C
<u>Oceania</u>					
130 Australia	50-88	*	80-88	85	A-
131 Fiji	60-87				D
132 Indonesia	62-88	*		80	C
133 New Zealand	50-88			85	A-
134 Papua New Guinea	60-88				D
135 Solomon Is.	80-88				D
136 Tonga	85				D
137 Vanuatu	85				D
138 Western Samoa	79-88				D

a. An asterisk in this column indicates that IPri is available for some set of years. A blank indicates it is not available at all.



APPENDIX A.3:  
COMPARISON OF COVERAGE OF VARIOUS VERSIONS OF THE PENN WORLD TABLE

	Mark 1	Mark 2 <sup>a</sup>	Mark 3	Mark 4	Mark 5
No. of market economies	119	—	115	121	134
No. of centrally planned economies	—	—	9	9	5
Years covered <sup>b</sup>	1950–1977	—	1950–1980	1950–1985	1950–1988
No. of variables <sup>c</sup>	10	—	11	17 <sup>d</sup>	27 <sup>d</sup>

a. Mark 2 was never published.

b. Not all countries are covered for the full periods.

c. Before Mark 5, all variables were available for all countries except for CPEs. Data limitations make it impossible to extend the variable coverage of Mark 5 to all countries.

d. Mark 4 All CPEs: Only population and GNP per capita.

Mark 5 5 CPEs: All variables (1 CPE: One year only).

Sources. See note 1.

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