World Product and Income

International comparisons of real gross product

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United Nations International Comparison Project

PHASE III

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INTERNATIONAL COMPARISON PROJECT
COMPUTER TAPES

A computer tape containing the statistics presented in the basic tables of chapters 6, 7, and 8 of this volume for the thirty-four benchmark countries may be purchased from the International Comparison Unit, Department of Economics, 3718 Locust Walk (CR), University of Pennsylvania, Philadelphia, Pennsylvania 19104, U.S.A. The tape also provides the 1950–80 per capita GDPs of nearly 100 additional countries, which are presented in chapter 8 only in aggregations of regions and socioeconomic groups of countries. These latter data are also provided on microfiche that will accompany the tape.

Of the proportion which the product of any region bears to the people, an estimate is commonly made according to the pecuniary price of the necessities of life, which is never certain, because it supposes what is far from truth, that the value of money is always the same, and so measures an unknown quantity by an uncertain standard. It is competent enough when the markets of the same country, at different times, and those times not too distant, are to be compared; but of very little use for the purpose of making one nation acquainted with the state of another.

Samuel Johnson
A Journey
to the Western Islands
of Scotland
1775

Preface

The International Comparison Project (ICP) has been a far-flung cooperative effort involving many institutions and persons in thirty-four countries. The ICP was a joint responsibility of the United Nations Statistical Office, the World Bank, and the International Comparison Unit of the University of Pennsylvania. The major operational responsibility rested with the United Nations Statistical Office, whose director exercised general supervision over the development of the project. The immediate responsibility for technical guidance and supervision rested with the project director at the University of Pennsylvania, who divided his efforts between the work there and at the United Nations.

The World Bank provided essential financial support from its own resources and organized a consortium of contributors that included the bilateral aid agencies of Denmark, the Federal Republic of Germany, Norway, the Netherlands, and the United States. Hungary and the United Kingdom made technical experts available to assist certain developing countries participating in the ICP.

The responsibility for the collection, collation, and transmission of the required data for each of the participating countries was assumed principally by the following national statistical authorities:

AUSTRIA: Central Statistical Office
BRAZIL: Fundação Getúlio Vargas, Instituto Brasileiro de Economía
COLOMBIA: mainly the Departamento Administrativo Nacional de Estadística (DANE) and also the Centro de Estudios Sobre Desarrollo Económico (CEDE) at the Universidad de los Andes, and the Banco de la República
HUNGARY: Central Statistical Office
INDIA: Central Statistical Organisation of the Department of Statistics
IRAN: Economic Statistics Affairs Directorate of the Bank Markazi
JAMAICA: Department of Statistics
JAPAN: Office of Statistical Standards of the Administrative Management Agency, Statistics Bureau of the Prime Minister's Office, Economic Research Institute of the Economic Planning Agency, Ministry of Education, Ministry of Health and Welfare, Ministry of International Trade and Industry, Ministry of Transport and Society for Contractors Management Research
KENYA: Central Bureau of Statistics of the Ministry of Economic Planning and Development
MALAWI: National Statistical Office of the Office of the President and Cabinet
MALAYSIA: Department of Statistics
MEXICO: Subdirección de Investigación Económica y Bancaria del Banco de México, S.A.
PAKISTAN: Statistics Division of the Ministry of Planning and Development
PHILIPPINES: National Census and Statistics Office of the National Economic and Development Authority and other related government agencies
POLAND: Central Statistical Office
REPUBLIC OF KOREA: Statistics Department of the Bank of Korea and the National Bureau of Statistics of the Economic Planning Board
ROMANIA: Central Statistical Board
SPAIN: Instituto Nacional de Estadística
SRI LANKA: Department of Census and Statistics
SYRIAN ARAB REPUBLIC: Central Bureau of Statistics of the Office of the Prime Minister
THAILAND: National Statistical Office
UNITED STATES: Statistical Policy Division of the Office of Management and Budget in the Executive Office of the President, Bureau of Labor Statistics, and the National Income and Wealth Division of the Bureau of Economic Analysis of the Department of Commerce
URUGUAY: Banco Central del Uruguay
YUGOSLAVIA: Federal Statistical Office
ZAMBIA: Central Statistical Office.

The Statistical Office of the European Communities supplied the data for its nine members: Belgium, Den-

mark, France, the Federal Republic of Germany, Ireland, Italy, Luxembourg, the Netherlands, and the United Kingdom.

Many persons in the above-mentioned agencies and others made important contributions in providing the data and serving as critics and advisers. At the risk of slighting some whose contribution has not come to the attention of the central staff, the help of the following is gratefully acknowledged: Josef Schmidl, Reinhold Schwarzl, and Christa Voigt of Austria; Laura Kingston and Angelo de Souza of Brazil; Roberto Pinella of Colombia; Ivan Kovacashazi, Peter Pukli, Szabolcs Ráth, György Szilágyi, and Mihály Zafir of Hungary; M. S. Avadhani, Uma Roy Choudhury, Lalit Mohan, Ram Murti, Suraj Prakash, Ved Prakash, S. X. Sharma, and Pritam Singh of India; R. Booth, G. Gunter, A. McKenzie, and D. Walton of Jamaica; Zin Murage, Mariana Ouma, and Parmeet Singh of Kenya; Kwok Kwan Kit and Wong Tat Fook of Malaysia; Aftab Ahmadkhan, Nasim M. Sadiq, and Mohammad Yusof of Pakistan; Lilia H. Constantina and Tito Mijares of the Philippines; Ewa Cwil, Wieslawa Drözdź, Jan Gawronski, Eugenia Krzeczkowska, Aleksandra Kudrewicz, Anna Orlinska, and Antoni Stolarek of Poland; Chae Hwa Lee of the Republic of Korea; W. S. M. Fernando, W. A. A. S. Peiris, and D. S. L. Weeratunga of Sri Lanka; Farid El Boustani of Syria; Prakorb Juangbhamich and Prapan Vonkhorporn of Thailand; Jose R. E. Noguez of Uruguay; and D. Miljkovic and Zoran Plavac of Yugoslavia. The regional commissions of the United Nations have also been very helpful in contacts with the participating countries.

The assistance of Maria Köszegi of the Central Statistical Office of Hungary in the fieldwork in Kenya and Zambia is gratefully acknowledged. Angus Fell did work for the ICP in Sri Lanka and Robert Oswald in Jamaica, Kenya, Malawi, and Syria on behalf of the U.K. Ministry of Overseas Development.

Methodological issues were clarified in discussions with a number of persons not already mentioned, including Sultan Ahmad, Lazlo Drechsler, John Edelman, Hans-Dieter Faerber, Dino Gerardi, Paul Isenman, Hugo Krijnse Locker, A. Kundu, Yoshimasa Kurabayashi, Frank Orlando, Vittorio Paretti, and Lawrence H. Summers. Thanks are due to Colin Clark, a pioneer in the field of international comparisons, for his comments on the treatment of services (see Chapter 5) and also for calling attention to the quotation from Samuel Johnson. Peter Hill and Robin Marris made some particularly valuable suggestions that influenced the final text in a variety of ways, and general discussions with a number of colleagues in the Department of Economics at the University of Pennsylvania were very helpful.

Two conferences held during the gestation period of Phase III made possible a sharing of ideas with many international comparison experts holding diverse views. The Rockefeller Foundation very kindly made its conference center at Bellagio, Italy, available for one of these conferences, and Estudios Conjuntos sobre la Integración Económica Latinamericana (ECIEL) and the Fundação Getúlio Vargas served as hosts in Rio de Janeiro, Brazil, for the other.

It is appropriate to acknowledge once again the contribution of the agencies and people who were indispensable in the preparation of Phases I and II, for the present report builds on the previous ones. From the standpoint of presentation the texts of the previous reports have been freely drawn upon in order to make this volume reasonably complete and freestanding.

Statistical assistance in the work of the central staff was provided by Chad Leechor, Peter Trupia, Alex Carpio, Roshan Trakru, and Alfonso Uong. Myrtle Campbell performed the secretarial duties for the ICP group in the United Nations Statistical Office. The same functions at the University of Pennsylvania were performed by Kathleen Conway, who typed the manuscript in its successive versions with remarkable patience and speed. Robert McPheeters provided liaison with the World Bank.

Contents

WORLD PRODUCT AND INCOME

International Comparisons of Real Gross Product

1

Introduction and Summary of Results

THIS VOLUME REPORTS ON THE THIRD PHASE of the United Nations International Comparison Project (ICP). The main results, summarized in this chapter, provide comparisons of real gross domestic product (GDP) per capita for thirty-four countries in 1975. Quantity and price comparisons are given also for personal consumption, capital formation, and public consumption. In subsequent chapters, still further subdivisions of final expenditures on GDP are estimated. These new 1975 benchmark estimates considerably expand the Phase I set covering six countries in 1967 and ten countries in 1970 and the Phase II set covering six additional countries in 1970 and all sixteen in 1973.

Because the benchmark studies provide estimates of detailed components of GDP, they afford insights into comparative economic structure. For example, they show the extent of country-to-country price differences in investment goods and other components of GDP, thus making possible a comparison of the shares of investment goods and other components of GDP in real (price-corrected) terms. A variety of structural relationships involving both quantities and prices are explored at various points in this report. In particular, one of these relationships is exploited to obtain estimates—admittedly approximations—of real GDP per capita for nearly all the countries of the world in 1975 in order to get estimates of real incomes of regions of the world. Finally, some demand analysis applications of the results are presented in the last chapter.

In addition, estimates are provided, on an approximate basis, of real GDP per capita for the thirty-four countries annually for the period 1950 through 1980 in addition to the three available benchmark years, 1970, 1973, and 1975.

The Nature of the Study

The ICP was established at the end of the 1960s to fill an important gap in the world's statistical system. The two previous decades had witnessed a rapid development of national-income accounting all over the world. Great progress had also been made toward standardization of the accounting methods followed by various countries. However, conversion of GDP and other national-accounts estimates of the different countries to a common currency in such a way as to make them directly comparable was not possible. Intercountry comparisons of national-accounts aggregates based on exchange rates as the conversion factors were known from limited earlier studies[1] to deviate substantially from comparisons based on the purchasing power of currencies.[2]

Exchange Rates and Real Purchasing Power

Indeed, Phases I and II of the ICP showed that the purchasing power of the currency of low-income countries relative to that of very high-income countries is often two or three times as great as the exchange rate would indicate. Unfortunately, a twofold or threefold overstatement of the number of currency units required to match the purchasing power of the currency of a high-income numéraire country will lead to a correspondingly large understatement of the low-income country's relative real income.

1. Clark (1941), Gilbert and Kravis (1954), and Gilbert and associates (1958).

2. Even the casual observations of travelers verified this. See, for example, Keynes (1930), vol. 1, p. 100.

Income or product comparisons among the high-income countries based on the use of exchange rates are subject to smaller but still notable margins of error. Furthermore, a substantial degree of spurious variability has crept into exchange-rate–derived comparisons under the flexible exchange-rate system adopted in the early 1970s. Year-to-year changes in exchange rates between major currencies of 20 percent or more have been observed.[3] Since most of these large changes have been unrelated to the relative movements of the real national product of the countries concerned, exchange-rate conversions necessarily have at times given quite erroneous measures of the relative real products of pairs of countries.

For countries at all income levels, exchange rates not only obscure the true quantity relationships for GDP as a whole; they also distort certain kinds of structural comparisons. These distortions arise because the deviation of purchasing power parities from exchange rates is not uniform for all kinds of goods. In the price structure of low-income countries, for example, capital goods tend to be more expensive relative to consumer goods than is the case in high-income countries. Exchange-rate conversions thus tend to exaggerate the relative proportion of GDP that is taken in the form of capital goods in poor countries.

The Need for the Comparisons and Their Antecedents

International comparisons of real product and currency purchasing powers are desired for a variety of analytical and policy purposes, at both the national and international levels. They are indispensable, for example, in understanding economic growth, and in helping national economic planners to assess past economic performance and future expansion paths. Their utility is attested to by the many international organizations and countries that have attempted to produce on a relatively small scale and only for selected years their own estimates of per capita income comparisons.

Before the start of the ICP, a number of such efforts had been made, including those by the U.N. Statistical Office, the Organisation for European Economic Co-operation (OEEC),[4] the Council for Mutual Economic Assistance (CMEA),[5] the World Bank, the Economic Commission for Latin America (ECLA),[6] and a number of governments, including those of Canada, the Federal Republic of Germany, Japan, the Soviet Union, and the United States. Some pioneering work in comparisons between socialist and market economies was carried out as well under the auspices of the Conference of European Statisticians (1968).

In addition, estimates were made by individuals, many of them in the public domain. Virtually all the private estimates and some of the official ones were based on armchair calculations. Estimates for which fieldwork was done varied widely in the intensity and quality of the effort. Although many of these came closer to the truth than the simple conversion at official rates of exchange, a more solid and consistent basis for the estimates was clearly needed. The studies were so varied in time and method that they resulted in an incomplete jigsaw puzzle of comparisons. No useful worldwide system of consistent, reliable comparisons covering a substantial number of countries was produced. More than that, no uniform framework was laid down that could be used as the basis for an expanded and continuing coverage of countries over time.

The Methodological Tasks of the ICP

The first task of the ICP was to establish methods that could be used for a system of comparisons of real product and income embracing all the countries of the world. This presented many new challenges.

One challenge arose from the great diversity of countries with respect to levels of income and development and systems of economic organization. Simple methods used in some of the predecessor comparisons could not be readily applied to such a heterogeneous set of countries. It was clear, for example, that price comparisons among all these different countries could not be based on a single common list of items. A list limited to precisely defined items in common supply everywhere would be too small to represent adequately the final expenditures of many or even most countries.

It was considered essential that the system be completely evenhanded among the countries in the sense that the country selected as the reference country would be no more than a numéraire. That is, comparisons between any pairs of countries would be the same regardless of which country was taken as the reference country. This requirement would not be satisfied, for example, by some methods in which one country is

3. The yen-dollar exchange rate, for example, declined by 22 percent between 1977 and 1978. Exchange-rate conversions yielded Japan–United States per capita GNP indexes of 69.6 in 1977 and 88.5 in 1978. Since Japan's real GNP per capita grew by 4.7 percent and that of the United States by 3.6 percent during the two years, one or both of the per capita ratios must be far off the mark as a measure of relative GNP per capita.

4. Now the Organisation for Economic Co-operation and Development (OECD). The OEEC works include Gilbert and Kravis (1954) and Gilbert and associates (1958).

5. See Drechsler (1966).

6. U.N. Economic Commission for Latin America (1967), pp. 107–42.

selected as the base country and every other country is compared with it.

It was also desired to establish a unique cardinal scaling of the countries with respect to real-income levels. This could not be achieved by the kind of binary comparisons that were the main focus of the previous studies (namely, those in which each comparison is made independently between a pair of countries). In general, a set of binary comparisons in which each country is compared directly with each other country is unlikely to possess the property of transitivity. That is, except under special conditions, $I_{j/k}$ will not equal $I_{j/l}$ divided by $I_{k/l}$ where $I_{j/k}$ is a price or quantity index for the jth relative to the kth country and l is a third country.[7] To satisfy this transitivity requirement, a method generating multilateral comparisons—those in which all the countries are treated as being interdependent—had to be used.

There was also a need to derive comparisons not only for the national-income aggregate, GDP, but also for its main components, such as capital formation and further subdivisions, such as producer durable goods and construction.

The outcome that was sought, therefore, was a matrix in which the various components of final expenditures on gross domestic product (food, clothing, construction, equipment, producer durable equipment, and the like) are listed on the rows and the countries in the columns. The figures in the cells then are values that are directly comparable along any row. (That is, for any expenditure category, one country's real quantity relative to another's is given by the ratio of the first country's cell entry to that of the second country.) In addition, the entries are directly comparable within a column so the sum of entries for a country over any selected subset of components is the correct real aggregate for the subset. (This combination of properties is referred to below as matrix consistency.)

The Content of the ICP Reports

The second main task of the three initial phases of the ICP was to make a start in providing actual comparisons. First ten, then sixteen, and now thirty-four countries have been covered.

As with the first two reports, this one combines a report on methodological work with actual comparisons. In the Phase I report, *A System of International Comparisons of Gross Product and Purchasing Power,*[8] the conceptual bases of product and of prices and quantities were laid out, the nature of the data inputs and the method of organizing them were described, and the index number problems were set out. The reasons were given for adopting the aggregation methods employed. The ten countries in this phase had different social systems and were at different levels of development and in different geographical regions: Colombia, France, the Federal Republic of Germany, Hungary, India, Italy, Japan, Kenya, the United Kingdom, and the United States. The reference date was 1970.

In the report on Phase II, *International Comparisons of Real Product and Purchasing Power,*[9] some clarifications and minor modifications of the methodology were presented, and it was shown that the extension of the system to six more countries (Belgium, Iran, the Republic of Korea, Malaysia, the Netherlands, and the Philippines) could be absorbed into the interdependent system without major disturbances to the relationships among the countries covered earlier. Comparisons for 1970 and 1973 were presented for the sixteen countries.

The present report follows the pattern of the earlier ones in describing methods and procedure as well as presenting the detailed empirical results. As with the previous volumes, some extensions of the estimates to other years and applications of the results to demand analysis are included. In addition, some tentative estimates of regional and global aggregates are given for real GDP. A more detailed guide to the materials in this report will be found at the end of this chapter.

ICP Methods in Brief

A summary of ICP procedures is provided here for the reader who does not wish to delve into the fuller treatment presented in Chapters 2 through 5.

The Approach

The basic methodological approach of the ICP is to obtain quantity comparisons by means of price and expenditure comparisons. Expenditures (E), prices (P), and quantities (Q) are linked together in the familiar identity $E = P \cdot Q$. It follows that for any pair of countries, j and k, with respect to commodity i,

$$(1.1)\quad \frac{E_{ij}}{E_{ik}} = \frac{P_{ij}}{P_{ik}} \cdot \frac{Q_{ij}}{Q_{ik}}, \quad \text{so} \quad \frac{Q_{ij}}{Q_{ik}} = \frac{E_{ij}}{E_{ik}} \div \frac{P_{ij}}{P_{ik}}.$$

7. As will be seen below, however, binary comparisons can be further processed to produce transitive comparisons. The number of comparisons would be astronomical if there were one for each pair of countries ($n\,[n-1]\,/\,2$ where n is the number of countries). There are 561 pairs arising from the 34 countries included in the present study.

8. Kravis, Kenessey, Heston, Summers (1975).

9. Kravis, Heston, Summers (1978a).

Thus the quantity ratio can be estimated either directly or indirectly through the ratio of E_{ij}/E_{ik} to P_{ij}/P_{ik}. Direct quantity comparisons—that is, direct estimates of Q_{ij}/Q_{ik}—are difficult to make for many kinds of goods. The ICP category women's clothing, for example, is so heterogeneous that quantity data for each type and quality are difficult to obtain. Also the quantity ratios (Q_{ij}/Q_{ik}) for individual types and qualities can be expected to exhibit wide dispersion relative to the corresponding price ratios. Hence, primary reliance has been placed on indirect estimates of the quantity ratio. Expenditures for detailed categories were available from national accounts data or could be otherwise derived. In addition, direct price comparisons are easier to obtain than quantity comparisons, and the sampling variance of the quantity ratios derived from them will be smaller than that of the direct quantity ratios.

The Data

The comparisons are based on data supplied by the countries on prices and expenditures for 151 "detailed" final-expenditure categories. For a few categories quantity data were supplied either in lieu of prices or as supplementary information. To ensure comparability, the data supplied by the countries were tailored to the precise definitions of the ICP. Each country was asked to classify its final expenditures on GDP into the 151 standard categories.[10] The individual commodities and services for which prices were furnished were selected from ICP lists in which each item was described explicitly. To ensure that the price comparisons related to comparable qualities, the written specifications were supplemented by correspondence, exchanges of samples, and inspections of items in shops by visiting experts.

Multilateral Comparisons

In Phase III, as in the previous phases, both binary and multilateral comparisons have been produced. The Phase III binary methods (some of which differ from traditional binary procedures) are described and their results are presented in Chapter 7. The present chapter summarizes only the multilateral methods and results.

The multilateral comparisons are more appropriate for the general purposes of international political economy than the binary comparisons. For example, transitive comparisons are required by aid donors, whether national or international entities, that want to use relative incomes of potential recipients to determine the allocation of grants or soft loans. Similarly, allocating the burden of the financial support of international organizations requires a unique scaling of all countries rather than comparisons of particular pairs. Analytical studies, particularly those seeking insights into economic development, are often based on cross-section data that require comparative real-product figures for a large number of countries.[11] For these and other situations in which many countries must be considered in relation to each other, the telling disadvantage of binary comparisons is that they will not, if carried out in the traditional way, define a cardinal scaling of countries with respect to real GDP per capita that is independent of the choice of the base country.

Aggregation

The aggregation of purchasing power parities (PPPs) or price-level comparisons[12] in the multilateral comparisons was carried out in two stages. First, at the detailed category level, reported prices for individual items—each conforming to an ICP specification of a good or service falling within the category—were combined to obtain a PPP for each country. Second, these categories' PPPs were averaged to obtain the PPP applicable to various levels of aggregation, such as food and consumption and the overall PPP for GDP.

The need for special multilateral methods at the detailed-category level arises because all items in each category were not priced in every country. Any effort to establish a completely common list for so heterogeneous a set of countries would lead either to the pricing in some countries of items that were not in common use or to so short a list as to make it unrepresentative.

To deal with the fact that the typical tableau of item prices (items on the row stubs and countries in the column headings) has missing entries, the country-product-dummy (CPD) method was developed. CPD is a multiple regression method that uses all the prices available to produce transitive price comparisons that are independent of the choice of base country. It may help to provide an intuitive insight into the method to point out that if the tableau of prices were complete, it would (apart from certain weighting considerations)

10. The classification is given in the appendix to Chapter 2.

11. For ICP purposes, a real product is a final product (that is, something that is bought for own use by the purchaser and not for resale) that is valued at common prices in two or more countries. Valuation at common prices makes it possible to interpret the relative values (real products) as relative quantities.

12. Each country's PPP can be converted into a price-level comparison (with the price level of the numéraire country equal to 100) by dividing it by the exchange rate (own currency per unit of the numéraire currency) and multiplying by 100.

produce a category PPP equal to the geometric mean of the ratios of the country's price to the numéraire country's price.

The PPPs directly obtained from the CPD method are used to derive notional quantities by dividing the PPPs into the expenditures. The method of summing the notional quantities of the detailed categories into higher level aggregates turns on the use of a set of "international prices" for the various categories. The international price for a category is defined as a quantity-weighted average of the detailed category PPPs after they have all been made commensurate by being divided by their respective country PPPs over GDP.

The international prices are used to value the category quantities of each of the countries in international dollars so that the category quantities can be added together to get total GDP or any subaggregate. The international prices and aggregate PPPs have been simultaneously estimated by use of a procedure devised by R. C. Geary and amplified by S. H. Khamis. The ICP inputs for the Geary-Khamis formulas are (1) the category PPPs for the various countries, obtained mainly by the CPD method, and (2) all the category quantities of the countries obtained by dividing these PPPs into the appropriate category expenditures of the countries.

If the quantity weights used in computing the international prices were simply the category quantities of the ICP countries, the international prices and therefore the estimates of per capita GDPs would depend fortuitously on which countries happened to be in the ICP set. If the ICP countries were unrepresentative of all the countries of the world, this would adversely affect the ICP results. Therefore, weights are used that give each ICP country an effect in the calculation of international prices that reflects the prevalence throughout the world of countries with a similar economic structure.

It should be added that an international dollar has the same purchasing power over the U.S. GDP as a whole as the U.S. dollar. However, its purchasing power over individual categories is different because that is determined by the structure of international prices. The price and quantity relationships among the countries would be the same if some other country were taken as the numéraire country, though the results would be scaled differently and would be described in terms of international pounds, international marks, or the like.

The Problem of Regionalization

An important methodological issue had to be faced for the first time because Phase III involved as many as thirty-four countries. It relates to choosing between the best possible comparisons of countries within a given region (regional comparisons) and the best possible comparisons of countries regardless of location (universal comparisons).[13] The issue arises out of a familiar problem in price and quantity index number construction. In comparing two situations, whether separated in time or space, the valuation of the quantities characterizing either of the situations at prices other than own prices introduces a conceptual difficulty: since each country adapts its quantities to its own existing price structure, its quantities would not be the same if it were confronted with any other set of prices, including those of the other situation. Valuation at other than own prices tends to inflate the aggregate value of the bundle of goods because no allowance is made for the substitutions in quantities toward the goods that are relatively cheap in the other price structure.

The practical importance of this issue is not large when the two situations are very similar, as, for example, in a quantity comparison between two adjoining years for a given country. In international comparisons its significance is likely also to be small for comparisons between countries that have similar relative prices and quantities, but it may loom large in comparisons between countries that have widely divergent price and quantity structures.

It has sometimes been inferred from this that the best possible quantity comparisons between a pair of economically similar neighbors should involve only the price structures of the two countries themselves. Similarly, it has been suggested that when countries in a region are economically similar, the best possible quantity comparisons among themselves would exclude other countries.[14]

The validity of these conclusions depends on the purpose the comparison is intended to serve. If all that is desired is a comparison between a pair of countries, say, France and the Federal Republic of Germany without regard to any other countries, then, indeed, only the French and German price structures should

13. Because this methodological issue did not arise in the earlier phases, it is treated more fully here than other technical matters. The reader less interested in methodology may proceed to the next section.

14. In practical work, the choice of the specifications to be used in the price comparisons also is an important consideration. The larger the number of countries included and the more heterogeneous they are, the less the list of specifications can be tailored to represent the goods bought in any one country. The use of specifications, prices, and expenditures conforming closely to those of a given country is referred to as meeting the criterion of "characteristicity." See Chapter 3.

be taken into account. But if the comparison is desired in the context of the European Economic Community, then a Communitywide price structure, not just those of France and the Federal Republic of Germany, is relevant.

A TWO-STAGE APPROACH. Partly because there are some regional groupings for which there is a desire or need for intraregional comparisons, it has been suggested that the worldwide system of comparisons should be built up in stages: first, comparisons should be made between regions. The worldwide system of comparisons would leave unchanged the between-country relationships established by the regional comparisons and would link the countries of one region to those of other regions through comparisons of the regions.

Such a two-stage approach has its obvious attractions. There are regional organizations (for example, the Economic Commission for Latin America) and subregional organizations (for example, the European Economic Community) that have already produced for their member countries indexes that could be incorporated into a world system without altering the relationships among the members. Such a system would have great practical advantages, since the U.N. Statistical Office's very large burden of preparing the comparisons could be shared with regional organizations.

Unfortunately, a two-stage system has compelling disadvantages. The quality of comparisons within regions is improved at the cost of the quality of comparisons between countries in different regions. The results for each pair of countries will depend on the regional classification. A comparison of Japan and France, for example, in a worldwide system built up from intraregional comparisons, would be influenced on each side by the price and quantity structures of the other countries in the region of each.

Another decisive objection to a two-stage procedure is that it is impossible to achieve full consistency between the regional and interregional results. It is possible to distribute a region's total real GDP over the countries in the proper intraregional proportions, and then to allocate the GDP for each country to detailed categories in accordance with the intraregional multilateral comparison. But when the real expenditures for a category are then added across the countries, the regional total will not match the corresponding total given by the interregional comparison. If, however, the expenditures for each category given for the region by the interregional comparison are allocated to the countries according to the proportions indicated by the regional comparison, the relative GDPs of the countries, each obtained by summing the category expenditures, will not be the same as those produced by the regional comparisons. Thus the comparisons between countries in different regions are inevitably compromised.

A ONE-STAGE APPROACH. An alternative is to follow a one-stage or universal approach—that is, to ignore regions and treat all countries symmetrically.

As was noted above, for some purposes this involves some disadvantages for comparisons involving close neighbors that have similar economic structures. In a universal approach, the comparison for such a pair would be influenced by the price and quantity structures of distant and very different countries. The comparison between France and Italy, for example, would be affected by the prices and quantities of, say, Japan and Thailand, and also by the specifications chosen by these two distant countries. This is in marked contrast to a France-Italy binary comparison, involving only the weights and specifications of the two countries. It differs also from a France-Italy comparison based on a regional multilateral comparison for Europe alone. To be sure, the France-Italy comparison here would not be tailored to just these two countries in the choice of weights and specifications, but the other countries would be more similar to France and Italy than would be the countries in the world at large. The strength of this objection concerning extraneous influences is diminished, however, by the fact that the more similar France and Italy are, the more likely it is that the exotic weights of extraregional countries will have similar effects on the valuation of the quantities of the two countries and thus leave the comparison between them relatively undisturbed.

Partly for this reason, the disadvantage of the universal approach for intraregional comparisons is small compared with the disadvantage of the two-stage approach for comparisons of countries in different regions. That is, estimates of the relative incomes of two countries within the *same* region will, when computed on a universal basis, differ from the estimates when computed on a regional calculation. But they will differ to a lesser degree, on the average, than the estimates for two countries in *different* regions when computed by the universal and regional approaches. The fact that the universal procedure is better for interregional comparisons while intraregional comparisons are altered less by the universal approach adds to the attractiveness of universality.

THE ICP PROCEDURE. The ICP has opted for a procedure that is essentially universal. The Geary-Khamis

formula referred to above is applied to all thirty-four countries, yielding a complete set of price and quantity comparisons for GDP and its subaggregates. However, an element of regionalization enters the ICP procedure at the preceding stage when the price inputs for the Geary-Khamis calculation—a PPP for each of the 151 detailed categories for each country—are prepared. The CPD method, described above, was applied in two stages. In the first stage, for each category CPD was applied to the countries of each region. Then through use of the appropriate regional CPD regression equations, all holes in the price tableaux of all the detailed categories were filled. The estimates of the missing prices were thus based on data of countries similar to the countries with the holes. These "augmented" price tableaux were then used in a thirty-four–country CPD, and the resulting PPPs were the inputs for the Geary-Khamis calculation.

The decision to adopt a universal approach, though based largely on technical considerations, is also congenial to the responsibilities of a statistical office functioning at the center of the world statistical system. It is natural for such an office to attempt to produce the most general kind of comparisons—comparisons that treat all countries in an evenhanded way. The important governmental and analytical uses of the international comparisons that such an organization is expected to produce usually cut across regional lines.

The Main Results

Table 1-1 shows the 1975 GDPs of the thirty-four Phase III countries first in national currencies, then in U.S. dollars after conversion by means of exchange rates, and finally in international dollars (I$). Only the last set of figures applies a common measuring rod—a set of international prices—to the quantities constituting the GDPs of the various countries.

GDP in U.S. Dollars

The reader's attention is invited first to the "nominal" (exchange-rate–converted) figures (columns 3 and 4), since comparisons of this type are most usually cited. According to this measure, the GDP of all but five of the countries was less than 10 percent of that of the United States, and for thirteen of the countries it was less than 1 percent. After the United States, Japan had the highest GDP, about one-third of that of the United States, followed by the Federal Republic of Germany and France, the former with more than one-quarter of the U.S. GDP and the latter with more than one-fifth.

GDP in International Dollars

Of course, the raison d'être of the ICP is to go behind these comparisons of nominal GDPs. Comparisons relying on exchange rates do not explicitly reflect the differing relative purchasing powers of the currencies over all goods and services. They apply quite variable measures of value to the quantities in each country's GDP. The ICP comparisons, however, are obtained by applying a common set of prices, representative of the world price structure, to the quantities of the commodities and services entering into each country's final expenditure on GDP. The quantities valued in international dollars are comparable from country to country for GDP as a whole or for any given subaggregate.

What difference does it make whether the GDPs are in exchange-rate–converted U.S. dollars (column 3) or in PPP-converted international dollars (column 5)? The answer is an important theme of this volume. A glimpse of one facet of the answer can be obtained simply by comparing columns 3 and 5 for the African countries that have low incomes and for the European countries that have high incomes. The ratio of the PPP-converted GDP to the exchange-rate–converted GDP, referred to as the exchange-rate–deviation index, averages 2.00 for the three African countries and 1.13 for the fifteen European countries. There is a clear tendency for the international-dollar figures to be relatively higher for low-income countries. That is, the exchange-rate–converted figures tend to understate the real GDPs of low-income countries relative to high-income countries. (The international-dollar figure for the United States is standardized to be the same as its U.S. dollar figure.)

The key data in Table 1-1 are transformed to per capita terms in Table 1-2. It is in this form that the data will be presented in most of the tables of this volume. For explaining variations of the exchange-rate–deviation index and for most other purposes, it is more useful to consider international comparisons of GDP per capita rather than aggregate GDP. Of course, the ratio between any country's real GDP and its exchange-rate–converted GDP is the same whether expressed in terms of the aggregate figures of Table 1-1 or in terms of the per capita figures of Table 1-2.

The most striking feature of Table 1-2 is the wide diversity in income levels, several countries having real per capita GDPs less than 7 percent that of the United States (column 6). The differences in real terms are, however, considerably smaller than those indicated by the exchange-rate conversions (column 4).