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Chapter Author: Alan Heston, Robert Summers

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13 Measuring Final Product Services for International Comparisons

Alan Heston and Robert Summers

Services, as distinct from commodities, have been the focus of great interest in recent years. In large part this interest is the result of the apparent growing importance of services in the economic life of nations. This, in turn, could be either because the demand for services is income elastic and, as national economies have developed over time, their real incomes have risen or because of an independent *secular* increase in service activity relative to commodity activity in national economies, possibly for supply-side reasons. Certainly, it is commonly believed that nations' productive activity involves services more now than in the past, as measured both by the proportion of the labor force producing services and by the proportion of total output that takes the form of services. No attempt is made here to explain different patterns of *production* of national outputs. Rather, this paper examines the output aspect of services in present-day economies, in both structural and secular terms.

In what follows, all attention is directed at *final product output*, and at comparative quantities of services relative to commodities produced and consumed in a wide variety of nations. The presentation will be divided between a discussion of the problems of measurement of services in an international context and a description of the empirical results derived from a combined cross-section and time-series analysis of service-commodity output composition. The nature of the evidence in this analysis bears more on intercountry comparisons than on intertemporal ones. That is, more reliable statistical light

Alan Heston is professor of economics and South Asia at the University of Pennsylvania. Robert Summers is professor of economics at the University of Pennsylvania.

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is cast here on the role of relative prices and national incomes in determining the composition of national outputs—services versus commodities—at a point in time, than on the perhaps more interesting secular changes taking place everywhere. The striking finding in this empirical work is that, contrary to the common view, the service share of total output does not go up with income. The key to this affront to the conventional wisdom is the introduction of service-commodity relative prices into the empirical investigation. It appears, but with less certainty, that the service share of output has gone up over time but not a great deal.

Services here are defined in the conventional way: they are nonstorable products that are consumed simultaneously as they are produced. The extreme heterogeneity of services makes quantity comparisons relatively difficult, both between countries and across time. In principle, interspatial and intertemporal comparison problems are equivalent, but in fact time-to-time comparisons are usually thought to be easier. Although on balance this is surely true, there are counterexamples involving particular services flowing from rapidly changing technologies.

The data underlying the work described here came from three benchmark studies of the United Nations International Comparison Project (ICP).[1] In section 13.1, immediately following, a brief review of the ICP work is given. Then section 13.2 presents a more detailed description of the methods the ICP used in quantifying services in the various countries participating in its benchmark studies. Section 13.2.1 lays out the ICP service taxonomy and methodology; 13.2.2 goes on to provide the flavor of the complexities of the comparisons; and 13.2.3 gives illustrations of some specific service comparisons. Then the cross-section and time-series analysis of the ICP data is presented in some detail in section 13.3. (In section 13.3.2 an expanded measure of services is discussed and integrated into the cross-section and time-series analysis. It is introduced in section 13.3 instead of 13.2 because it is outside the scope of the United Nation's ICP.) The paper closes in section 13.4 with a summary of results.

13.1 The United Nations International Comparison Project

The ICP has conducted a number of benchmark studies since 1970 in which substantial pricing surveys were carried out in many countries. Specifically, these surveys and the analysis following them were done for the years 1970 (16 countries), 1975 (34 countries), 1980 (60 countries), and 1985 (as many as 60 countries, but the results have not yet been published for all 60).

In each benchmark study a large number of *final* products, both goods and services, were defined in close detail and then priced where possible in each

1. ICP benchmark study references: 1970 (Kravis, Heston, and Summers 1978); 1975 (Kravis, Heston, and Summers 1982); 1980 (United Nations 1986).

of the countries participating in the study. The method of definition was a written specification, often supplemented by visual illustrations. These specifications have been built up across countries over the years and often are specific to certain world areas. The criterion that countries followed in selecting an item was that it be sufficiently widely available in the country that an adequate market existed to produce a meaningful price. This often meant that items would already be collected for a national intertemporal price index like a consumer price index (CPI), and then the problem was to obtain a national average price, a nontrivial problem in countries where price relatives over time are outlet specific. Where a national specification varied from the ICP specification, special pricing was required. Special pricing was also often necessary in benchmark countries where items in the CPI were changed infrequently, perhaps every five years or more. Usually, special pricing for the ICP was piggybacked onto existing surveys using the same sample of outlets.

By the nature of the problem of spatial comparisons, the sample of items priced will be different from the sample for time-to-time comparisons. In the latter case, if a particular nonseasonal specification is chosen for a country's CPI in a particular month on a probability basis that takes account of its importance in consumption, it is generally available in the sample in the following month also. However, that specification is not necessarily included in the CPI sample of a neighboring country, even if the consumption heading of the specification is equally important in the second country. In the ICP methods to date, there is a related problem of how prices of specifications are processed at the category or basic heading level. The basic heading level is where expenditure weights are available, and these are used in further aggregation of the category parities. The individual category parities are built up from the item prices of the different specifications within the categories. Typically, each benchmark country prices only a fraction of all the individual specifications, and country expenditure weights for the specifications are usually not available. In the course of its benchmark studies, the ICP has employed two statistical procedures to get category price relatives from the country item prices: the so-called country-product-dummy method (CPD), a regression procedure involving dummy variables as indicated in the name; and the E-K-S method, a rather ad hoc procedure with somewhat unclear stochastic properties, named for the last initials of its originators. The virtue of these methods is that they can be used to find category price relatives even when item prices are not available for every specification in every country. (For details, see Kravis, Heston, and Summers 1982, 88–89.) A sobering remark should be made about the statistical quality of the category parities developed in the ICP. With only a few exceptions, the ICP parities are likely to be of lower quality than the time-to-time indexes for the same categories as estimated in the OECD countries.

The ICP combined these various sets of country category price relatives with the countries' associated national currency expenditures on the products

using an aggregation algorithm, the details of which are not repeated here, to get for each country a set of different purchasing power parities (PPPs). These PPPs cover gross domestic product (GDP) as a whole and a variety of subaggregates built up out of about 150 detailed categories of final output that exhaust GDP. Alternatively, this algorithm can be thought of as a device for repricing each of the countries' quantities of its different products at a common set of international prices that are a weighted average of relative prices around the world.[2]

The present paper makes use of two kinds of country data extracted from the ICP benchmark studies: (1) estimates of quantities of final product services at various levels of aggregation (i.e., estimates of *real* expenditures on services, where the service quantities in all countries are valued at the same international prices); and (2) relative prices of services, expressed in the form of PPPs, at various levels of aggregation.

Incidentally, an important difference between *service output* and *service production* must be recognized. Comparisons of service and commodity *production* in different countries are very sensitive to the degree of vertical integration of producing enterprises in the countries, but this is not the case with the service and commodity *output* comparisons of the ICP. On the production side, any service-type production is counted as commodity production if the final product of the firm engaged in it is a commodity. If, however, the same service production is performed by a free-standing firm and sold to a commodity-producing firm, the activity is classified as service-producing activity. (E.g., If General Motors did all its accounting in-house, the production of its accounting department would all be classified as commodity production because General Motors produces commodities. However, if General Motors' accounting was done under contract by Price Waterhouse, the same accounting production would be classified as service production.) Grubel and Walker (1989) have noted that an increasing percentage of service employment is devoted to the production of intermediate product.

13.2 Services in the ICP

This section gives a brief overview of the ICP's treatment of services in its benchmark studies. A broadened definition of services (augmented services) and accompanying empirical exploration is more naturally taken up in section 13.3.1 because that work was done outside the scope of the international comparisons of the United Nations.

2. The merits and drawbacks of the algorithm, originally devised by Geary (1958), have been debated at length in the ICP literature. Suffice to say for present purposes, the algorithm makes it possible to aggregate the price parities and real expenditures of category basic headings to any selected level. In the present case, the individual categories representing services can be aggregated into total economywide services, or all of the services included in consumption, or all of the services included in broad categories of consumption like recreation or education.

13.2.1 The Place of Services in the ICP

Of the ICP's 150-odd detailed categories of GDP, a little more than two-thirds are in Consumption, a little less than a quarter in Investment, and the remaining are in Government. The ICP follows the United Nations' System of National Accounts (SNA) convention in allocating all domestic capital formation expenditures to Investment, whether they are private or public. However, in a departure from the SNA, the ICP transfers all medical and education expenditures of government to the consumption categories covering the same activities. This is because in some countries most medical and education services are paid for by individual households as part of their consumption, and in others the equivalent payments are made out of the public purse. International comparisons of total spending on medical care and education are facilitated by ignoring the usual rule of grouping expenditures by who has paid for them.

All Investment is treated as spending on commodities. On the other hand, all *G*—that is, the public consumption part of government spending—is treated as spending on services. (In earlier treatments of this subject [Kravis, Heston, and Summers 1982, 1983], the government-purchases-of-commodities component of Government was treated as a commodity. Since then it has been judged that the contribution to welfare of government public consumption is more appropriately interpreted as the total stream of final services it provides. Empirically, this change does not affect the cross-section conclusions described below.) The rest of services are found in Consumption. In fact, about a third of the detailed categories of Consumption are services. Services are absent from the food summary heading (though food consumed in restaurants is a separate personal-service category) but show up in varying degrees in each of the other major consumption headings.[3]

13.2.2 Problems of Estimating PPPs for Different Kinds of Services

Priced Services

Service categories where prices can be found are relatively easy to deal with. Category price relatives are obtained using the CPD or E-K-S item processing methods referred to above. Some examples of the matching of specifications will now be described.

Auto repairs are a category of priced services that can be treated very much like the commodity categories. The specification of an engine tune-up defines explicitly what is included: the changing of oil and spark plugs; the list of parts that, if found defective, are replaced at no extra cost; and so on. In a comparison of tune-ups across outlets within a country there undoubtedly are price differences, some of which may be associated with quality differences

3. See appendix table 2–1 of Kravis, Summers, and Heston (1982, 69), for a listing of service and commodity categories used in the original analysis of the 1975 ICP service data and in the results reported in Kravis, Heston, and Summers (1983). In the present work, the classification system is the same except that government commodities here are classified as a service.

such as better testing equipment at large versus small repair garages. The problem in price collection for a national CPI is to sample appropriately the types of repair outlets so the temporal changes in repair charges at each type of outlet are properly weighted. The problem in international price comparisons is to hit on the specification of the service and the outlet type that holds constant, across countries, the quality differences in the service purchased. There is a trade-off between identity of outlet (see discussion of McDonald's, below) and the representativeness of the service provided. For example, foods from roadside stalls have been matched in portion size but are not necessarily identical. Two spiced barbecue meat items, like *sate* in Malaysia and *tikka* in Pakistan, even if not identical, may be matched. In the auto repair case, the outlet sample may be confined to garages where repairs are the principal function, with sales dealerships excluded.

In the case of restaurants, it might be thought that specifying the outlet may be more important than describing the entree. The *Economist,* which publishes international Big Mac price indexes, uses the McDonald's hamburger as a basis for estimating the purchasing power parity not only for food consumed away from home but for all consumption. However, the novelty of McDonald's in Tokyo and Moscow as compared with Peoria suggests that standardizing for chain outlets is a doubtful way to deal with the problem. Such chain pricing across countries may be too unrepresentative of the countries' own price structures. The ICP item specifications for food consumed away from home explicitly dealt with the character of outlets. In the case of a restaurant meal, restaurants located in hotels or with entertainment are excluded; they have to be air-conditioned if the climate requires it; and they have to have table service. There are additional specifications for outdoor food stalls, for cafeterias in work places, and for outlets selling alcoholic beverages and snacks.

An important difference between the treatment of priced services and commodities is that standardizing outlets is more important in the former case. For commodities, the ICP follows the principle that "a potato is a potato." That is, the country price of a potato is taken as the average over all outlets, which in some countries might range from a village market to an urban supermarket.

For priced services, then, a specification can be priced on a comparable basis in most, if not all, countries. In collecting such prices, careful account must be taken of the quality of the service, of course, but that is no different from the problem of controlling quality in pricing commodities. Services that are bought and sold, for which there are markets and prices, present special problems mainly in connection with outlet sampling. However, medical services are a major exception to the above statement. In general, for both medical and health services the ICP has moved over the years to pricing as many services as possible. One of the reasons for this is in fact the difficulty in making alternative comparisons. Before discussing priced medical services further, let us turn to nonpriced services.

Nonpriced Services

When dealing with services that are not actually bought and sold, an alternative approach is called for. Services where prices typically are not to be found (referred to in the ICP in monumental understatement as "comparison-resistant" services) turn up principally in the consumption categories in the areas of medical care and education. (Remember, through no coincidence, these are the categories that include the transferred government spending.) In addition, the compensation of government employees is classified as a comparison-resistant service. Inevitably, in areas where output prices are missing, one must fall back from final to intermediate products, or more typically to inputs. The recommendations to the ICP from consultants and from participants at ICP conferences have been that comparisons based on indicators closer to the final product are to be preferred to those based on inputs. The number of children completing a level of instruction or the number of bed days in hospitals is to be preferred to the number of teachers or the number of hospital beds. Because there was no agreed methodology in this area, the procedures used in the various ICP benchmark studies have changed. Previously published analyses (Kravis, Heston, and Summers 1983; Summers 1985) rely on the benchmark service data of 34 countries for 1975, and these are not strictly comparable with either 1970 or 1980. In the present paper, all service quantities have been reestimated to make them as comparable as possible across all three years.[4]

Differences between 1980 ICP Comparisons and Those of Earlier Years

The ICP comparisons for 1980 differed from the earlier ones in the treatment of health, education, and government expenditures. First, neither the treatment of the 1970 or the 1980 data made allowance for capital per worker in general government, as had been done for 1975 (Kravis, Heston, and Summers 1982, 142–43, 159). Here the 1970 and 1980 estimates of general government incorporate capital per worker adjustments, so they are now on the same basis as the 1975 estimates.

Second, in comparing health services in 1980, price comparisons were carried out for the services of dentists and physicians outside of hospitals. For hospitals, salary comparisons were used for hospital personnel, and commodity price comparisons from other basic headings were used for other hospital

4. The treatment of hospital and other health expenditures for 1980 was an improvement over the earlier phases, but it is not possible now to get 1970 and 1975 estimates on a comparable basis. The necessary price data and expenditure classifications are not available for the earlier years. However, the quantitative importance of these conceptual differences for health are likely to be small compared with the errors that might be introduced by attempting to put all years' estimates on the same basis.

The treatment described in the text for education produced a reconciliation for 1970 and 1975 with 1980 that gave estimates that differed for education from published estimates (and therefore SNA government). The revised estimates are generally lower than the published estimates for low-income countries.

expenditures. In the earlier benchmark studies, the classification of health expenditures was a bit different and so reduced strict comparability somewhat.

Third, the education expenditure classifications in 1980 were much closer to the earlier phases than those for health. Fortunately, for 20 core countries, data were available for 1980 both on the 1980 basis (using teacher salaries for parities) and on the basis used in earlier phases, where parities were derived by dividing expenditures by quantities of teachers and pupils. Consequently, it was possible to adjust the 1970 and 1975 education estimates to put them on a basis comparable to 1980.

In the areas of general government and education, these problems have their analogues in the procedures used for obtaining constant-price national accounts series. If input measures are used in time-to-time deflation, it is necessary to make some assumption about differences in productivity of employees over time. This is equivalent to the problem faced by the ICP when it uses teachers as proxies for educational output in its comparisons of education across countries. A judgment about differences in teacher productivity across countries is required. Similarly, if one draws on measures closer to output, like completed grades of school, the question of quality of education must be resolved.

13.2.3 Some Specific Service Comparisons Problems across Countries

Illustrations of international comparisons of service quantities are given here for three situations: the treatment of health and education categories; the use of inputs in making government comparisons; and the use of hedonic pricing in making rent comparisons.

Health and Education

Standardizing the quality of labor input is not enough to assure that comparability is achieved. Rural physicians in India may see patients every two to five minutes in a typical day and produce large improvements in the health status of their clientele. On the other hand, doctors in a richer country may see many fewer patients but provide much more thorough evaluations. Despite the difficulty of controlling final output quality, the ICP has moved to pricing final comparable medical services, wherever possible, instead of comparing numbers of practitioners.

Although it is possible to specify health procedures, comparisons across countries based on them is still subject to wide margins of error and possible bias. Consider an appendectomy, which is an item that the ICP prices. Although the backup facilities of the hospital in which the operation takes place do not enter into the physician's fee for an appendectomy, it seems probable that more of the fee in a rich country is used to pay for office facilities or enhanced training than is the case in poorer countries. One conclusion appears to emerge from examining priced services. If medical procedures are priced across countries, the derived quantity of medical services is significantly less

than those obtained from a direct quantity comparison of physicians (Kravis, Heston, and Summers 1982, 159). Thus, moving toward the pricing of medical services is a step in the direction of better quantity comparisons. Still, a particular medical service fee may buy higher quality service as one moves to higher-income countries. This would mean that quantity estimates in low income countries are biased upward.

Many price comparisons for medical services are possible, but this is not the case for general government or education. In these areas, and in medical care in 1970, the ICP worked with either input prices or input quantities. In some cases, input quantities, somehow standardized for productivity (e.g., the number of board-certified physicians or high school teachers with particular advanced degrees), provide a clue to output quantities (the number of tonsillectomies or the number of taught children). By pairing off the derived output quantities Q with corresponding category expenditures E, output prices P can be inferred from the relationship $P = E/Q$. What initially may appear to be an impossible task becomes merely Herculean when one realizes that relative country service prices are needed rather than absolute ones.

Generally, indirect comparisons of input quantities have been preferred to direct comparisons of input quantities. For example, rather than compare numbers of teachers to obtain input quantities, salaries of teachers with different experience and training levels have been collected. These salary ratios for primary and secondary school teachers, when divided into total teacher compensation for each group, provide indirect quantity comparisons of inputs that better control for input quality. Where quantity comparisons have been relied on, an attempt has been made to allow for capital per worker differences that appear to be systematically related to level of income across countries. In the comparisons reported here, the allowance made for 1975 (Kravis, Heston, and Summers 1982, chap. 5) has also been used for 1970 and 1980. This had not been done in the original reports. In general, these adjustments have been in the direction of raising the estimates of quantities of services in richer countries compared with estimates based simply on quantities of inputs. Whether the adjustments are adequate is discussed further below.

Treatment of Government Services

The ICP used 25 job specifications from the International Labor Organization to make compensation comparisons by skill level in the various countries. Wages and salaries, including all benefits paid by employers, were requested from all participating countries for as many of the specified occupations as were common in their government services. The simplest approach then was to assume that a secretary in a government office, or a truck driver transporting government publications, was equally productive in all countries. If this assumption is adopted, then appropriately weighted averages of the ratios of salaries for various jobs between countries becomes the purchasing power parities for government services. Needless to say, there has been much dis-

cussion about how to best compare government services, but for a fairly homogeneous group of countries like the European Community, the equal productivity assumption was adopted for 1975. Should it be adopted in world comparisons?

The few studies that have been done on trends in the government sector for currently industrialized countries suggest some rise in productivity over time. (A full discussion appears in Kravis, Heston, and Summers 1982, chap. 5.) Furthermore, the information on capital per worker in government that the ICP was able to collect from a few participating countries, suggests the hardly surprising conclusion that a secretary in Japan has more inputs to work with than his or her counterpart in India. In the comparisons presented here, the methodology of the 1975 benchmark study was adopted, and an adjustment was made for capital per worker in general government. This allowance was based on the apparent rise in capital per worker associated with higher per capital GDP. For countries with real GDP per capita between 30 percent and 50 percent of the United States, the productivity per worker was lowered 15 percent, and for countries less than 30 percent of the United States GDP per head, the adjustment was 30 percent. This had the effect for the latter group of making the ratio of the quantity of government services 70 percent of what was obtained simply by dividing expenditure ratios by salary ratios.

The methodology used in 1970 and 1980 was somewhat different from the 1975 one, so the comparisons for those years were adjusted to make them conform to the 1975 method. Anticipating a striking empirical finding in section 13.3, below, about how service shares compare across countries, it should be noted here that the direction of this adjustment operates against the flat-share finding. That is, using the 1975 method *reduces* the service share of the poor countries relative to the rich and so has the effect of increasing the slope of the relationship between service share and GDP per capita.

Comparisons of Rental Value of Housing

In the ICP countries, house rents range from 3 percent to 15 percent of total consumption expenditures, so it is a particularly important sector to measure correctly. First, what is needed is an estimate of the national average rent for each of a large number of kinds of dwelling units. The general procedure is to ask countries to provide national average rents for as many as 60 specifications or cells (the number in 1975), where the key variables identifying a unit are age, floor area, presence of electricity, water, central heating and air-conditioning, and the existence and amount of indoor plumbing. Most countries could supply cell weights as well from recent housing censuses.

The rents were obtained from special surveys, regular household surveys, or special rental questionnaires. When available, detailed rent files were collected from countries, and hedonic regressions were estimated. Monthly rent for an unfurnished unit without utilities appeared on the left-hand side, and the variables defining the cells mentioned above, plus some location variables,

were on the right. Generally, the fit of these equations was satisfactory (see Kravis, Heston, Summers 1982, 54–59), so by allowing for location it was possible to estimate a national average rent.

Rents that are controlled or subsidized present major problems. An indication of the problem could be seen in a regression covering countries with rent controls: when length of occupancy was included as an independent variable, its slope coefficient was significantly negative. However, a main purpose of the ICP is to make quantity comparisons, so, if the rent total in the national accounts include rental payments for controlled units, clearly the ICP price should be the controlled rent. One exception was made when the amount of rent subsidy was known to be very large, more than one-third of rental payments. In such a case (e.g., Hungary), an estimate was obtained of the full social cost of the rental unit, and both the rents in consumer expenditures and the rent used for the ICP comparison were increased to represent the social costs.

Using 1975 data, an attempt was made to validate the ICP procedures by comparing the indirect quantity estimates they produced with independent quantity estimates derived from United Nations housing survey data on rooms per capita and housing stock amenities. The ICP indirect quantity estimate (the ratio of total housing expenditure to the ICP rental PPPs) was regressed in log-linear form against the United Nations direct rooms per capita variable after the latter was adjusted to take account of the amenities. For what it is worth, the estimated intercept and slope coefficient differed insignificantly from 0 and 1.0, respectively, and the adjusted R^2 was .70. Although these results were encouraging, substantial noise remained in the regression.

13.3 The Intercountry "Demand" for Services

This section presents the principal findings from a cross-section regression analysis of the 1970, 1975, and 1980 ICP service data sets. The word "demand" in the title of the section is meant to conjure up all the economist's notions of what to think about in explaining differences in the shares of services in countries with different incomes and price structures. The quotation marks in the title are there to alert the reader that questions of demand-versus-supply identification are not really resolved. (Such quotation marks will not be repeated. However, in what follows, terms like elasticity should always be interpreted with caution.) Section 13.3.1 is a digression on the main theme of this paper. It contains a discussion of the differences between services as measured in the ICP and services as recorded in a number of countries' national accounts. Section 13.3.2 discusses the concepts of services, including a new *augmented* services measure, that are used in the empirical work here; and section 13.3.3 follows with new, detailed demand results based on the 1980 service data. Finally, section 13.3.4 presents an integrated analysis of the 1970, 1975, and 1980 data sets.

13.3.1 ICP Services versus National Accounts Services

Before dealing in detail with services as defined within the ICP, we briefly set out a few observations on the relationship between ICP services and services as they are reported in the national accounts. For six countries, it is possible to compare the growth in real services implied by two ICP benchmark comparisons with the countries' own national measures of service growth. (Only six of the countries that have been in more than one benchmark study between 1970 and 1980 also regularly publish price indexes for services and commodities.) Because most national measures are based on SNA concepts, as contrasted with the ICP concept where medical care and education expenditures of Government are transferred to Consumption, comparisons are confined to services covering all of GDP. The growth rate of real service expenditure for an ICP country between two benchmark years is given by the change in its volume of services at a common set of international prices. In general, the results are quite uneven across the six countries.[5]

Section 13.1, above, commented on the difference between real services as recorded in countries' *production* accounts and real services as recorded in their final product accounts. Growth rates for the former concept have been compared with growth rates for the latter, where it was possible. Of course, as was remarked, real service growth measured on the production side need not be the same as the growth measured from the final expenditure side. Using the growth rates of measures of service final product implied by estimates from successive ICP benchmark studies, the growth rates of these two service measures were compared for 14 countries for 1970–75 and 1975–80, and for an additional 10 countries for one or the other of these periods. Not surprisingly, there were large differences between the growth rates, particularly for low-income countries. No systematic patterns stood out, but this appears to be a fruitful avenue of research to pursue further.

13.3.2 The Empirical Definition of Services

At the empirical level, the commodity-service distinction is easy to deal with if detailed categories are designated as either commodities or services. For ease of reference, when a category is treated uniquely as either a service

5. The two growth rates were quite close for the United States: the national growth rate for 1970–75 was 9.5 percent, and the ICP growth rate for the same years implied by the 1970 and 1975 benchmark studies was 12.2 percent; the corresponding growth rates for 1975–80 were 11.0 percent and 12.6 percent. The growth-rate match was not nearly as good for the five other countries. The 1970–75 comparisons that could be made for Italy, Japan, and the United Kingdom gave an average national growth rate of 19.8 percent; the corresponding ICP average was 35.5 percent. For 1975–80, when Austria and Denmark figures were also available, the same averages were 15.8 percent and 43.2 percent. In all cases, the growth rate in services implied by the ICP benchmark treatments was higher than the national growth rates, and usually substantially higher. It appears that, if any of these countries had been chosen as the ICP numeraire instead of the United States, the observed growth-rate disparities would have been smaller. This is because their national service price indexes were rising more rapidly than their GDP deflators, compared with the United States. This point will be discussed again when the regression equations are examined.

or a commodity, we use the phrase "services narrowly defined." One is left uneasy about this definition because the magnitude of distribution services included in the expenditure figures on apparel, food, and most other consumption items is likely to vary with the country's income level. Some critics have noted that expenditures on, for example, yellow onions take no account of whether they were sold by a producer in a village market, by a street vendor in a city, or by a sales clerk in a specialty shop. The onion sold in the city has a great deal more transport and trade services embodied in it than does the village onion, but remember the ICP's principle that a potato is a potato. Similarly, the service element in the sales of the street vendor is probably much more rudimentary than that of the specialty shop. It should be said, however, that there is not complete agreement on this point. Across countries, one may well get more labor time from sellers in the street than from sales persons in specialty shops, and this may even occur in the same city. Apart from the ambiguity about the direction of the effect, some difficulties remain with an empirical definition of narrowly defined services, because no account is taken of the differential time and place utilities that may be embodied in an onion sold in different outlets in different countries.

Dan Usher (1968, 154), has dramatically illustrated the quantitative importance of transport and trade margins within and between countries in examining the case of rice in Thailand and in the United Kingdom. He put the cost of distributing rice from farmer to urban consumer in Thailand in 1965 at under 15 percent of the farm price; the distribution cost of the same rice from its port of entry in the United Kingdom to consumer was approximately 90 percent of the c.i.f. price. The United Kingdom transport and trade margins were 15 times the Thai ones!

But here is a slippery slope. Once one begins to worry about the service components of some of the commodity detailed categories, where is the stopping point? We do not offer a conceptual answer, but at an empirical level, it appears to us that transport and trade margins are of sufficient interest to warrant at least examining whether our results are sensitive to the inclusion or exclusion of these elements from the definition of services. To clarify, under our standard service-commodity dichotomy, in the case of a strictly service category like local transport, the total expenditure is 100 percent services. No serious thought has been given to reallocating to overall commodities the possible commodity component of some of the service categories (like gasoline, in the local transport example). However, for categories of expenditures designated as commodities, an attempt has been made to remove the component of those expenditures that may be attributed to transport and trade. The term "augmented services" is used when allowance has been made for transport and trade margins. Note that modifying services to allow for transport and trade makes the definition of services from the expenditure side closer to the definition from the production side that includes all trade and transport in services.

How can this be done? One approach would be to survey outlets in each country—those selling food, apparel, appliances, housewares, and so on, and also those selling capital equipment—to learn what trade and transport resources were directly involved in the movement of their goods from producer to the consumer point of sale. Although this type of information would be fairly easy to obtain from organizations like retail trade associations in the United States or a number of western European countries, it would involve much more effort in the rest of the ICP countries. Still, this could be a fruitful line of inquiry. We report here on the use of input-output relations to estimate the trade and transport components. This is a less satisfactory approach, but one still to be regarded as a useful beginning. A significant difficulty is that the trade and transport margins in the input-output accounts refer to purchases by intermediate as well as final users. Furthermore, the overlap of expenditure and production categories is often very rough, so there is some arbitrariness in the selection of the input-output categories that match the various ICP expenditure categories. In addition, detailed input-output tables are not available for all 60 of the countries in the 1980 benchmark study. In view of the roughness of the approach, it did not seem worthwhile to use even all the individual country tables that were available. As a compromise, the technical coefficients of the input-output tables for only six countries were used to represent all of the countries in the 1970, 1975, and 1980 benchmark studies.[6]

Application of the input-output coefficients to expenditure data yields augmented services in national currencies, but what is needed is the value of augmented services measured in international dollars. If trade margins were 10 percent for poultry in national currencies, a plausible approach would be to increase the total services in international dollars by 10 percent of the poultry international dollar expenditures—that is, increase both the national currency and international dollar total by the same percentage. This treatment assumes that the relation of the prices of services in trade margins are the same as the relation of prices of poultry in all countries. This is certainly contrary to fact because the ratio of service prices to commodity prices rises systematically as one moves from low- to high-income countries. The method that has been adopted is to modify the trade and transport margins to reflect this. The international dollar service total of each country has been divided by the ratio of the country's price level of priced services to its GDP price level. The price levels of priced services have been used because these estimates are less controversial than the nonpriced ones,[7] and because both trade and transport are priced services.

6. Input-output tables were used from the following countries (listed in ascending order of affluence): India, Indonesia, Korea, Israel, the United Kingdom, Japan, and the United States. Six income categories were defined on the basis of the incomes of these seven countries, and the relevant input-output coefficients of the representative countries were assigned to all countries within their income group. We believe the direction of error, if any, in this assignment of trade and transport coefficients, would be to increase the share of services of the high-income countries relative to the low-income countries.

7. See the comments above about comparison-resistant services.

The difference between narrowly defined and augmented service shares is discussed below. Table 13.1 presents estimates of each for 60 countries in 1980.

13.3.3 The 1980 Cross Section

This part of the analysis focuses on the *real* share of services of 60 countries in 1980, where *real* means that all quantities in all countries are valued at 1980 international prices. The 1980 cross section has been chosen for emphasis because it has the largest number of benchmark countries so far completed and because the commodity-service breakdown for these countries has not previously been published. For easy reference, these countries are arrayed in table 13.1 in increasing order of real GDP per capita. Two levels of aggregation are considered: the share of all service categories in all GDP and the share of consumption services in Consumption. These shares are given in real (SS^{GDP} and SS^{C}) and nominal (S^{GDP} and S^{C}) terms, where the latter is based on valuations at national prices. The real shares for GDP and C are given in table 13.1 for both the narrow and broadened (augmented) definition of services.

Column (8) gives the GDP service share in national prices measured from the production side. It is probably best compared with S^{GDP}, given in column (5), the service share in national prices from the final product side. The production share is usually much larger than the final product share. Two of the five exceptions are centrally planned countries for which the comparisons are not really appropriate; the production-side estimates of Poland and Hungary are based on Material Product Accounts that do not match the SNA final product accounts. In the other three cases (Ethiopia, Nigeria, and Israel), the column (5) entries only slightly exceed the column (8) entries. The conclusion that should be drawn from the column (8)–column (5) comparison is that the production classification does not mesh well with final expenditures. Nor should one attempt to infer levels or trends in expenditures from levels or trends in employment or value added. (Because the production numbers in table 13.1 are based on a simple ten-sector production breakdown, it is conceivable that a more detailed analysis of services from the production side would show production and expenditure estimates to be more comparable.)

Figures 13.1 and 13.2 provide visual images of the relation between service shares and output per capital in 1980. The first depicts a scatter diagram of the share of all services and GDP per capita; the second is restricted to shares of Consumption services and Consumption per capita. In both cases the per capita aggregate is *real* in the sense of being measured in international prices. Points corresponding to real, narrowly defined service shares (i.e., both the numerator and denominator are expressed in international prices, and the service concept does not include the transport and trade components of commodities) are clearly distinguished from points corresponding to nominal shares (where both the numerator and denominator are expressed in national prices). The regression lines best fitting the two sets of points have been drawn in. In

Table 13.1 **Share of Services in Consumption and GDP, and GDP per capita: 60 ICP Countries, 1980**

Country	Income (GDP per capita) (1)	Share in Consumption: Nominal (S^C) (2)	Share in Consumption: Real (SS^C) Narrow (3)	Share in Consumption: Real (SS^C) Augmented (4)	Share in GDP: Nominal (S^{GDP}) (5)	Share in GDP: Real (SS^{GDP}) Narrow (6)	Share in GDP: Real (SS^{GDP}) Augmented (7)	Production, 1980 National Prices (8)
1. Ethiopia	275	31.3	53.7	60.5	39.0	60.4	65.7	38.1
2. Mali	381	21.7	26.3	33.7	33.2	48.0	53.2	53.2
3. Tanzania	421	14.5	27.4	37.9	20.4	26.5	45.4	45.0
4. Malawi	485	23.9	32.0	40.7	34.3	44.3	51.8	51.9
5. India	499	20.3	34.6	41.2	22.7	27.9	38.3	37.5
6. Madagascar	672	21.0	33.4	44.2	30.1	43.0	53.1	62.8
7. Kenya	792	36.0	45.7	51.8	37.9	48.2	54.4	48.5
8. Zambia	791	19.1	20.7	27.7	32.8	41.9	48.2	47.9
9. Senegal	935	22.4	20.5	26.3	37.6	41.7	47.1	50.6
10. Pakistan	938	21.1	39.8	49.4	26.3	40.2	49.9	47.4
11. Zimbabwe	1,119	36.6	43.3	50.3	42.6	49.0	55.4	50.0
12. Indonesia	1,140	26.7	30.1	41.8	22.7	27.9	38.3	34.3
13. Honduras	1,159	34.5	39.6	45.1	33.8	38.6	45.9	47.6
14. Nigeria	1,189	21.0	28.0	36.7	21.3	29.3	37.2	19.6
15. Cameroon	1,215	28.0	35.0	42.0	28.2	39.9	47.1	45.5
16. Sri Lanka	1,291	20.8	45.8	64.8	22.9	40.7	60.0	52.5
17. Ivory Coast	1,430	30.5	30.3	37.9	34.3	43.3	51.5	46.0
18. Bolivia	1,524	29.3	28.6	33.5	31.1	33.6	38.8	46.8
19. El Salvador	1,576	30.8	46.3	53.3	31.6	46.8	54.6	51.5
20. Morocco	1,578	26.4	30.1	40.4	34.6	43.0	52.7	59.8
21. Philippines	1,617	27.7	41.4	45.5	23.8	38.3	43.3	38.9
22. Botswana	1,641	31.5	41.6	52.8	33.7	41.5	52.8	49.7
23. Dominican Rep.	1,861	29.4	38.0	42.9	27.1	34.5	41.2	53.2
24. Paraguay	1,991	38.4	38.3	42.3	33.8	36.9	42.0	49.2
25. Guatemala	2,083	36.9	43.6	48.8	35.5	42.7	48.7	54.0
26. Tunisia	2,330	32.8	30.7	35.3	31.6	35.4	40.9	31.6
27. Korea	2,394	30.4	35.0	39.5	27.3	29.8	36.2	45.1
28. Peru	2,594	30.0	33.5	37.3	27.2	32.0	37.1	46.7
29. Ecuador	2,604	27.1	36.7	40.3	26.9	30.8	36.0	51.6
30. Colombia	2,635	36.5	38.8	43.4	33.6	35.8	41.2	52.4
31. Panama	2,794	36.2	41.1	44.0	34.4	36.8	40.7	71.1
32. Costa Rica	3,237	31.0	42.9	47.4	34.1	42.2	47.8	67.4
33. Poland	3,403	28.6	40.1	43.9	28.6	36.8	40.8	22.3
34. Chile	3,515	40.8	45.7	47.6	38.7	34.9	37.1	55.6
35. Brazil	3,568	30.9	27.2	29.8	28.2	23.8	26.9	54.9
36. Portugal	3,581	33.3	41.4	44.7	32.9	42.0	45.7	70.5
37. Argentina	3,717	26.5	25.8	28.7	28.0	22.4	26.0	51.6
38. Yugoslavia	3,743	30.8	37.7	41.3	27.3	34.1	38.1	60.6
39. Hungary	4,038	32.5	39.4	42.4	25.5	31.6	35.3	24.4
40. Greece	4,233	38.5	36.2	38.7	37.7	34.7	37.6	54.7
41. Ireland	4,686	42.7	43.6	49.3	42.3	42.5	48.6	51.9
42. Uruguay	4,805	28.2	31.6	34.5	32.2	29.4	32.8	58.9

Table 13.1 (continued)

Country	Income (GDP per capita) (1)	Share in Consumption: Nominal (S^C) (2)	Share in Consumption: Real (SS^C) Narrow (3)	Share in Consumption: Real (SS^C) Augmented (4)	Share in GDP: Nominal (S^{GDP}) (5)	Share in GDP: Real(SS^{GDP}) Narrow (6)	Share in GDP: Real(SS^{GDP}) Augmented (7)	Production, 1980 National Prices (8)
43. Spain	5,247	35.3	31.3	37.3	33.1	29.8	35.5	51.5
44. Venezuela	5,533	32.1	40.9	43.7	26.7	33.8	37.5	60.2
45. Hong Kong	6,436	41.1	31.0	34.3	29.2	25.3	29.6	68.9
46. Israel	6,847	54.7	53.3	57.9	60.7	59.5	63.3	60.0
47. Japan	7,660	53.2	52.1	54.7	38.5	33.9	37.9	53.4
48. Austria	7,743	48.4	48.5	51.7	40.4	41.5	45.4	47.4
49. United Kingdom	7,807	50.1	49.0	51.8	47.3	48.8	51.6	63.5
50. Italy	7,912	39.6	42.3	46.4	36.4	38.2	42.5	53.3
51. Finland	8,109	42.3	44.2	47.5	36.3	33.2	37.3	51.3
52. Denmark	8,558	46.8	46.8	50.3	46.8	46.6	50.5	66.5
53. Netherlands	8,576	43.0	35.7	39.1	39.5	33.6	37.8	64.1
54. Belgium	8,599	45.6	40.8	44.1	42.0	37.7	42.1	57.0
55. France	8,942	43.8	39.9	43.2	39.1	35.3	39.4	56.6
56. Luxembourg	9,003	43.5	41.2	44.6	39.3	36.3	40.8	62.3
57. Germany	9,060	45.3	38.2	41.4	41.5	35.7	39.5	48.9
58. Norway	9,894	40.4	45.4	49.2	34.2	36.7	40.7	58.9
59. Canada	11,148	54.2	44.0	46.9	44.9	36.5	40.3	64.4
60. United States	11,998	52.4	43.7	46.4	48.7	40.8	44.1	65.2

figure 13.1 the positive slope of the dashed line, the regression line for S^{GDP}, shows that the nominal service share of GDP clearly rises with per capita GDP. In sharp contrast, the slope of the solid line, the SS^{GDP} regression line, is slightly negative. Why is the SS^{GDP}-income relation essentially flat when the S^{GDP}-income relation is not? Equivalently, why are the SS^{GDP} points in the scatter diagram nearly always above the corresponding S^{GDP} points for low income countries and below for high income ones? (Of the 44 countries with per capita GDPs less than half that of the United States, 35 real shares are above the nominals; of the 16 with per capital incomes more than half the United States, 11 real shares are below the nominals.) The explanation lies in a strong ICP finding, the systematic pattern of rising relative service prices with per capita income. (See, e.g., Kravis, Heston, and Summers 1982, 191–95.) As a consequence, the nominal share in low-income countries understates the real share, and it overstates the real share in rich countries.

The regression patterns for consumption in figure 13.2 are almost but not quite the same as those in figure 13.1. The SS^C slope is not negative, but it is again smaller than the slope of the S^C regression. The reason, of course, is the same as in the GDP regressions: relative service prices rise with per capita income.

These relations were reexamined using 1970 and 1975 data, and the same

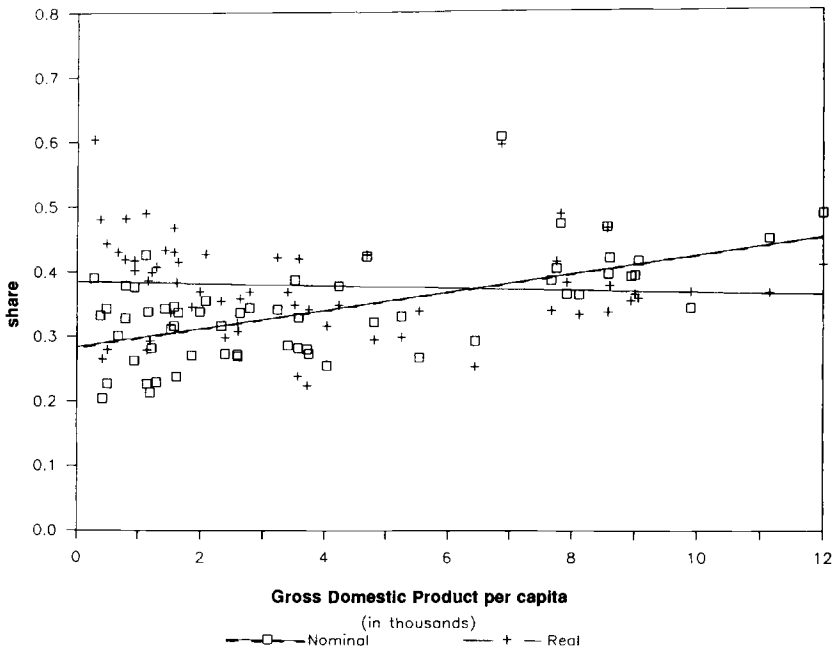

Fig. 13.1 Service share of GDP versus GDP per capita (nominal and real shares; 1980)

$$\text{Nominal share} = \underset{(0.012)}{0.291} + \underset{(0.002)}{0.012}\ \text{GDP per capita (in thousands)}$$

$$\text{Real share} = \underset{(0.014)}{0.397} - \underset{(0.002)}{0.003}\ \text{GDP per capita (in thousands)}$$

Note: Real service share is based on the narrow concept of services.

conclusions were reached. The flat relationship between the real service share in GDP, narrowly defined, and GDP per capita is not just peculiar to 1980. Furthermore, the same story about real Consumption service shares rising much less with Consumption than the nominal shares also holds for 1970 and 1975.

The relative prices of services play two roles here in producing these results. First, they are used in converting the nominal shares into real shares, because repricing services in international prices instead of national prices is essentially an exercise in equalizing relative service prices. Second, one would expect that the relative price of services to have a cutting edge in determining which countries had larger real service shares and which had smaller. Economists looking for explanations of variability in the real share would immediately think of the relative price of services as well as country income for their demand regressions.

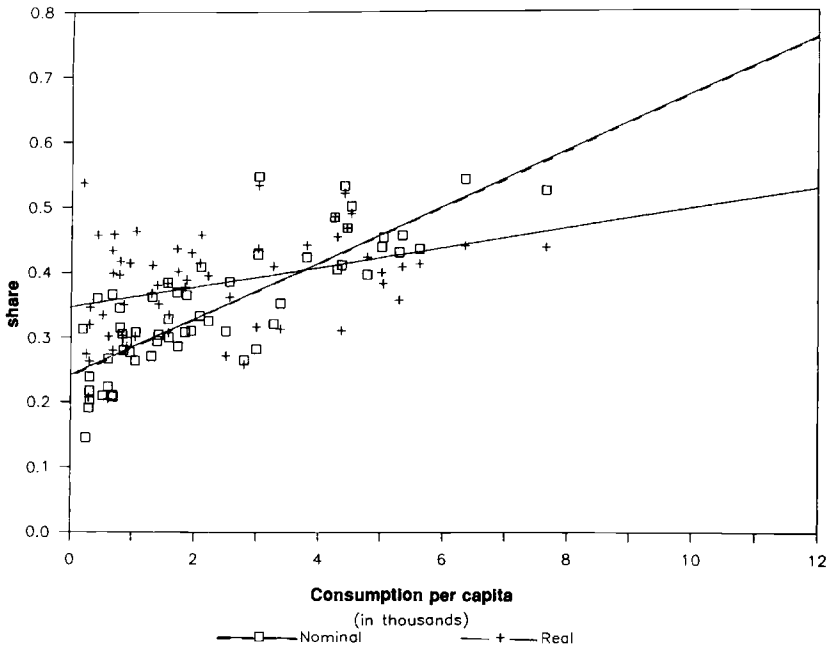

Fig. 13.2 Service share of consumption versus Consumption per capita (nominal and real shares; 1980)

Nominal share = 0.246 + 0.035 Consumption per capita (in thousands)
(0.011) (0.003)

Real share = 0.347 + 0.013 Consumption per capita (in thousands)
(0.015) (0.004)

Note: Real service share is based on the narrow concept of services.

13.3.4 Comparing Results in the Various Benchmarks

The explanation provided by price and income is examined in a set of equations where the left-hand-side variable is the log of the share of real services in Consumption or GDP and the right-hand-side variables are the log of real per capita Consumption or GDP and the log of relative prices of services in consumption or GDP. With cross sections for 1970, 1975, and 1980, the three benchmarks can be pooled if the variables are restated in a common year's international prices. However, the pooled sample is unbalanced, and the constant-price procedure is subject to error. Therefore, the separate results of the three benchmarks, based on current international prices, will be reported first. The results appear in table 13.2.

Table 13.2 shows that the major differences between 1970, 1975, and 1980 are that the price elasticities take on larger negative values over time, though

Table 13.2 **Service Share, Income, and Price Relationships: Estimates Based on the 1970, 1975, and 1980 ICP Benchmark Data (log-linear regression results)**

Service Concept & Aggregation, by Year	Coefficients & Standard Errors (S.E.)	
	Price (S.E.)	Income Variable (S.E.)
Narrowly Defined:		
Consumption:		
1980	−.623 (.124)	1.179 (.028)
1975	−.118 (.181)	1.122 (.050)
1970	−.108 (.184)	1.106 (.037)
GDP:		
1980	−.368 (.184)	1.003 (.036)
1975	.004 (.149)	.980 (.041)
1970	.095 (.192)	.963 (.038)
Augmented:		
Consumption:		
1980	−.704 (.119)	1.116 (.024)
1975	−.373 (.170)	1.068 (.039)
1970	−.253 (.143)	1.046 (.026)
GDP:		
1980	−.501 (.182)	.981 (.030)
1975	−.109 (.150)	.958 (.033)
1970	−.044 (.195)	.940 (.033)

Notes: Price is the purchasing power over services in Consumption or GDP, relative to the purchasing power over all Consumption or GDP; and income is per capita real Consumption or real GDP. The variables are expressed in current international dollars of the year indicated. Augmented services include the trade and transport components of commodities as well as narrowly defined services. ICP Consumption includes public expenditures on education and health. The number of observations in each of the three cross sections is 1970: 16; 1975: 34; and 1980: 60.

the differences are probably not statistically significant. The income elasticities are not statistically different from each other for either definition of services or for GDP or consumption. There is a consistent pattern that the income elasticities rise slightly over the three benchmarks, but only the elasticities in the Consumption equations for 1980 differ from unity at the 1 percent level of significance. Note how the price and income elasticities associated with the augmented services compare with those of the narrowly defined services. Modifying the definition of services to include trade and transport margins leads to elasticity estimates that are slightly smaller for income and larger for price (accompanied by smaller standard errors). It was expected that the greater amenities of distribution in the rich countries would tilt positively the flat-share relationship found for narrowly defined services. The finding, however, is that any new tilting is down rather than up! The many problems encountered in attempting to capture the trade and transport amenities with the input-output tables makes idle any speculation on just why this happened.

What is strikingly consistent among 1970, 1975, and 1980 is that, when the relative price of services is taken into account, there is virtually no change, or a small decline, in the share of services in GDP as GDP per capita goes up; and there is a consistent but small rise in the consumption service share as consumption per capita goes up. One is tempted to conclude from this that, contrary to Wagner's law and much-received doctrine on the increasing role of government, the real share of government declines slightly with income but that this decline is matched by a rise in the service share of consumption. Overall this produces the relatively flat share of real services in GDP.[8] This question is further explored in the presentation of the pooled regression equations.

Pooled Demand Regressions

The basic similarity of the equations across the three benchmarks invites a pooling of the data of the three cross sections to run single demand regressions, one for GDP and one for Consumption, which would incorporate all 110 (probably not independent) country observations. Such a regression has the efficiency gain that goes with a larger number of observations, but more importantly, it provides an opportunity to estimate any secular change in service demand over the 1970–80 period that cannot be explained by changes in prices or income. The pooled regression requires that all the share, price, and income data be expressed in the international prices of one of the years. Doing this requires the use of a national service price deflation index for one or several of the countries. In fact, most countries do not have a deflator for consumer expenditure on services, but service price deflators for Consumption and Government were obtained for Italy, Japan, the United Kingdom, and the United States.

Running the pooled regression with the four different sets of national deflators gave the following results: For Consumption, the price and income elasticities (with their standard errors in parentheses) were -0.397 (0.084) and 1.153 (0.020) regardless of the country national deflator. For GDP, the elasticities depended on the national deflator, but the price elasticities only varied between -0.104 (0.103) and -0.187 (0.102); the income elasticities varied narrowly as well, between 0.998 (0.023) and 0.967 (0.023). The price and income elasticity estimates were quite insensitive to which country's national service price index was used, but the estimates of the secular change in service shares was not.

Time dummies for 1970 and 1980 in the Consumption and GDP regressions show how the 1970, 1975, and 1980 intercepts compared. The coefficients of these dummy variables were estimated using each of the four country inter-

8. Note that two parts of government, health and education, are transferred to Consumption in the ICP definition used here. The conclusion, therefore, with respect to the real share of government is exclusive of those two categories.

temporal service price indexes. The smallest and largest coefficients among the four sets for both GDP and consumption are as follows (estimated standard errors are given in parentheses): For 1970–75, the coefficients for GDP varied between −0.080 (0.047) and 0.056 (0.047); for consumption, between −0.042 (0.048) and 0.233 (0.048). For 1975–80, coefficients for GDP varied between −0.088 (0.031) and −0.025 (0.032); for consumption, between −0.002 (0.034) and 0.002 (0.036). In every case the extreme estimate was associated with the Japanese deflator. (The estimated trend between 1970 and 1980 was negative for the consumption service share except when Japan's service deflator was used. However, for GDP the estimated 1970–80 trend was positive using service deflators for two of the four countries, Japan and the United States.) The deflators available were all from relatively high-income countries. It is unclear whether the trend figures would display a different pattern if service deflators for some developing countries had been available. This would certainly be an interesting question to examine. Unfortunately, the potential errors of measurement in country service price deflators make estimating secular change with ICP benchmark data perilous at this time. Methods are being explored to develop time-to-time deflators between ICP benchmarks that are base country invariant, and these approaches should allow a more fruitful examination of this question.

13.4 Conclusion

This paper reports on the examination of a set of data from the U.N. ICP that bears on expenditures on final-output services around the world. A variety of conceptual and measurement problems that affect comparisons of expenditures on services across countries were considered. The problems arising from specifying a common quality for a service that is to be priced in many countries of widely differing incomes were discussed. Specifying a common quality is even more difficult when the service itself is not priced in the marketplace, so output quantities must be estimated on the basis of inputs. Unpriced services, in education and general government primarily, are particularly vexing in this regard. An exploratory attempt to transfer commodity trade and transport margins to the service category was described, along with empirical results of introducing such an augmented-service concept into demand regressions. A number of reasons were also discussed why expenditures on final product services might have a different trend from services measured from the employment and production side.

The study explored further an earlier finding, developed from the 1975 ICP data, that service shares did not rise with income. In cross sections examined here on data for new countries and new years, estimated income elasticities were still in the 1.1–1.2 range for Consumption, and often less than 1.0 for GDP. The service flat-share conclusion, so at odds with common perception,

was verified for other country sets and other years, and for a broader definition of services. (Elsewhere the authors have shown that very similar flat-share results are also found within countries. When national expenditure surveys for 1980 for the United States and 11 European Communities were analyzed, no significant connection between the service share and income at the household level was found (see Heston and Summers 1988).

The question of whether there has been a secular rise in the share of services in national output—apart from changes induced by income or price changes—was also investigated, with the ICP cross sections providing mixed findings. This work required the use of country service price deflators, and those available did not give uniform empirical conclusions. Between 1970 and 1980 whether the secular change as registered by the ICP data was up or down depended on which country's deflator was used.

The weight of evidence certainly supports the contention that expenditure shares on services have displayed very little to moderate secular trend and there has been very little rise with respect to income. In part, this probably is because the concept of services is not an entirely tidy one. Although many expenditure categories, like entertainment, may be elastic with respect to income, the same entertainment desires can often be satisfied by either service or commodity purchases. (See Summers 1985, 42–44.)

A question might be raised whether our conclusions flow from the way the underlying data are used to derive service prices. To the extent the ICP underestimates the relative quality of services in high-income countries, it overstates the quantity of services in low-income countries. If such a systematic effect existed, would it modify the flat-share finding? At first glance one would think the answer is yes, but on reflection this may be less obvious for the following reason: the quality of commodities must also be held constant across countries in the ICP comparisons. To some extent this may be easier to accomplish because of branded products and fairly standard technical characteristics of some commodities. However, it would be necessary to show that systematic underestimates of quality differences across countries of different income levels were much larger for services than for commodities for such an effect to modify the flat-share finding. Were they? Maybe. Maybe not.

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