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Introduction

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WHEN this conference was first planned, in late 1969, the national economic accounts were being subjected to considerable challenge. Gross national product, the principal output of the accounts, was under attack both as a goal of national effort and as a measuring rod of economic performance.

Some have deplored the pursuit of high growth in GNP as a goal, asserting that it distorts national priorities, does not improve or may even worsen the distribution of income, and irreparably damages the environment. Critics have asserted that countries with the highest levels of GNP are not necessarily the ones with the highest life expectancy, lowest crime rate, or cleanest air.

Critics have charged that as a measuring rod GNP gives incorrect indications of changes in welfare mainly because it fails to allow for the disamenities associated with industrial growth, particularly pollution of air and water. Some have also argued that even apart from not serving as an adequate index of welfare, which it was not designed to do, GNP fails to serve as an accurate index of economic growth, in large part because it does not include appropriate measures of economic performance of households and governments.

While these charges are not new, their recent intensification has come, interestingly enough, at a time when the U.S. national accounts have been enjoying the widest acceptance here and abroad by nearly all classes of users—and when the publication each quarter of the latest figures has continued to be prime news in the major newspapers and broadcast media in this country. These attacks, moreover, may have appeared to be crudely lacking in appreciation for the very substantial advances achieved by the U.S. Department of Commerce in recent years to widen the scope of the accounts and improve their detail and timeliness.

The present conference, held at Princeton in November 1971, brought together divergent points of view, including the professional users of the accounts and those responsible for their compilation. Thus, the con-

ference helped sharpen some of the issues and, it was hoped, pointed the way toward resolution of some of them.

Measurement problems were the direct concern of this conference, with policy goals only an indirect concern. As such it was reminiscent of an earlier Income and Wealth Conference held in November 1955.[1] Indeed, as Simon Kuznets observes in his "Concluding Remarks" to this volume, many of the problems raised in the conference are of long standing, having been brought to light, as we all know, in good part by Simon Kuznets himself. Both conferences were concerned with probing "truer" appraisals of performance, i.e., with improved definitions of *final* product, and both were concerned with seeking more useful and comprehensive accounting designs, i.e., with better modes of arrangement, sectoring, and classification. Nevertheless, the present conference differed in certain significant respects.

Indeed, the present conference reflected in good part the emergence of issues which were given relatively little attention in 1955. Thus, because of the greatly heightened concern with pollution, it gave far more explicit attention than the earlier one to the problem of assessing the impact of production and consumption on the physical environment. The subject of the allocation of time was new compared to the earlier conference, and so were some of the suggestions for and attempts at bold new imputations to measure nonmarket activities.

Generally speaking, by its emphasis on the welfare implications of the accounts, particularly nonmarket amenities and disamenities and on the possibility and consequences of capitalizing human capabilities, this conference gave far more attention than the earlier one did to the personal and household sector. Notwithstanding this concern with persons and households, little attention was given to the distribution of personal income and wealth.[2]

The present accounts seek to measure and summarize transactions for the entire economy, covering income and expenditures of businesses, households, governments, and other groups. In arriving at a measure of economic performance or net output of all of these transactions, the accounts total the final sales made mainly by the enterprise economy to other groups, principally households and governments for their consumption and to enterprises themselves for capital formation. Thus,

[1] The proceedings of that conference were published as *A Critique of the United States Income and Product Accounts,* Studies in Income and Wealth 22, Princeton University Press for the National Bureau of Economic Research, 1958.

[2] Two conferences on distribution have been scheduled to follow this one.

the scope of the measure of economic performance is confined in broad terms mainly to production for sale by enterprises.

Largely because this net output sum can be and is measured in "quantity" or constant price terms, the national accounts have a significant welfare dimension. The accounts can be used, for example, to determine whether the physical volume of goods purchased by consumers in one year is larger than in another year, and very importantly whether that increased volume has been obtained by working more hours or by achieving more output per hour. A determination can also be made of whether the added output as presently measured is currently more widely distributed among households than before. Finally, the accounts permit the determination of whether the stock of capital required by enterprises to produce this volume of goods has increased or not after allowance for capital consumption. Net national product (NNP) in constant prices rather than GNP thus becomes the measure of net economic performance in the present conceptual framework of the national economic accounts. In these respects, GNP and NNP do provide highly consequential measures of economic welfare and performance. But the conference sought to go beyond these measures. In seeking to broaden the scope of measurement of economic performance and possibly welfare, the conference raised essentially two sets of questions.

1. Should the measurement of economic performance extend significantly beyond the enterprise economy? For example, should it include households—their capital formation and their production? Should it also include an evaluation of environmental resources that reflects both their deterioration and improvement? And finally should the measure include the services supplied by government and not merely, as at present, the wages it pays?

2. Should the measurement of economic performance of enterprises themselves be re-examined? For example, should the measure of business capital formation and depreciation be modified in significant ways?

The importance of these questions stems not so much from matters of conceptual curiosity as from reactions to major changes in the patterns and consequences of economic growth. Over a measurable period of several decades, households have undergone considerable change, as married women have increasingly devoted more time to paid work in enterprises and government and less in the home. Investment by persons and families in tangible capital equipment and in education has risen greatly, changing the pattern of time and expenditure allocated to work both in the market and at home and to investment and consumption.

The increase in the volume and variety of government services and in related capital investment has been a major feature of economic change in recent decades.

The changed distribution of effort among households, government, and enterprises devoted to satisfying wants has raised the question of whether sales of goods and services by enterprises per se can serve as an adequate measure of total economic output and income. Also, the marked shift in investment from enterprises to households and government has raised a similar question: whether a full measure of capital formation by society is adequately comprehended in a measure restricted largely to capital formation by enterprises.

Associated with such questions as the scope of production and of capital formation are the matters of cost and of final consumption. If costs or payments for using up resources are restricted to those paid for by enterprises, what then of losses of resources which everyone uses but no one individual or firm owns—such as the losses from using up clean air and clean water?

And what about enterprises themselves? With marked changes in tax laws permitting charge-offs on buildings and machinery that bear little relation to the rate of their economic usages; with enormous increases in outlays by business on research and development; with increasing expenditures devoted to abating pollution and to services typically provided by government such as education or job training, health plans, and police services—should not the costs of production, capital formation, and net output of the enterprise sector itself be re-examined?

GENERAL PROPOSALS FOR NEW FRAMEWORKS

Most of the main measurement issues are covered in a general way in the challenging paper by Thomas Juster and the forceful reactions by George Jaszi.

Juster's most important proposals are to include a capital account for the tangible or physical capital of households and government and for the intangible capital of households and enterprises; to develop a new accounting for environmental pollution and its abatement; and to undertake a major extension in the accounts for the nonmarket activities of households organized around the allocation and evaluation of householders' time.

The proposal to establish an account for tangible capital held by households and governments met little opposition, at least on conceptual

grounds. Jaszi points out that official work has been underway to establish such accounts, particularly for autos and household durables. He warns, however, that serious problems, especially for government capital, still remain unsolved, such as what items of equipment and construction should be covered, how to value and depreciate them and what service lives to assume.

Among the most intensively discussed questions were those that pertained to control of the environment, in part because this was also the most prominent public issue for the conference. The issue is of considerable consequence for measurement of economic performance since expenditures for pollution control are expected to become a large portion of total national expenditures,[3] and to exert a substantial influence on prices, real output, and productivity.

Juster argues that recognition should be given in economic measurement to the fact that air and water are assets, and that the benefits from them have been seriously diminished by economic production and consumption. But he recognizes that solving the difficulties of calculating a regular measure of these benefits or damages seems highly remote if not impossible. Most of the discussion on the environment is concerned with how to treat expenditures for pollution abatement. The question at issue is: do these expenditures add to net output or do they simply offset a deterioration that otherwise would have occurred? In Juster's view, they are simply an offset and should not be included in a measure of real output, at least in a measure which is welfare-oriented. In Denison's view, which Jaszi favors, they should be considered as an addition to real output.[4] They should certainly be added in according to Jaszi if the expenditure is by consumers—and they are so added presently in the accounts. If the expenditure is by business they are now counted as intermediate but Jaszi suggests that this treatment might need to be reconsidered.

In Denison's view, the subtraction or deflation of a consumer expenditure for an antipollution device, say an emission filter in an automobile, implies, falsely, that we would be no better off with the antipollution device than without it. The expenditure should therefore be counted as final rather than intermediate product. Robert Solow, in his comments, however, makes the point that essentially the same argument

[3] See the paper by Herfindahl and Kneese, Table 1, in this volume.

[4] See Edward Denison, "Welfare Measurement and the GNP," *Survey of Current Business,* January 1971. A reprint of the article was distributed to conference participants as a background paper because of its direct pertinence to the subject of the conference.

can be made about any intermediate product. Replacing or repairing worn-out machinery, for example, makes us better off than if we did not make such replacements.

The idea of excluding from GNP expenditures the so-called regrettable necessities drew considerable debate. Most of the controversy arose because of opposition to attempts to orient GNP toward a measure of welfare. But it also stemmed conceptually from the proposal to extend the concept of production to include household production and of capital to include human capital. So long as expenditures could be identified as inputs to production (whether in households or business) or as serving only to maintain capital intact rather than to augment the capital, Juster argues that such expenditures should be treated as intermediate rather than final output. For example, time and money spent to travel to work or expenditures for drugs to combat illness serve respectively as inputs to production or to maintain human health intact.

In this view such expenditures are analogous to business expenditures on current account, say, either for fuel or supplies, or for repair and maintenance of physical equipment and plant. Their only difference, it might be argued, is that they pertain to human or household production or capital rather than to business production or capital.

Jaszi turns a good deal of his fire against the concept of "regrettable necessities" and against the proposal for a major extension of the accounts to include imputations for the nonmarket activity of households. No meaningful line can be drawn, in his view, between expenditures that are for their own sake and those which are means, inputs, or regrettable costs to achieving direct satisfaction. Jaszi raises similar objections to Juster's suggestion that the allocation of household time be classified so as to separate hours which are truly outputs from those which represent inputs. He also questions whether a meaningful value can be placed on nonmarket time, most particularly leisure time.

Robert Eisner in commenting on the Jaszi-Juster exchange sides with the view that the present classification of outlays by households, governments, and business firms should be re-examined to determine which more precisely reflect expenditures on current and which on capital account, i.e., to delineate more sharply those which contribute to future income and those which contribute to present consumption. Thus, Eisner would have business firms capitalize R and D expenditures, and not count them as current costs. He urges that the reckoning of depreciation of business plant and equipment be made on an "economic" rather than internal-revenue basis as at present, and also favors count-

ing consumer durables as investment, since the stream of services they yield over time is as much consumption if provided in the home as by the business establishment.

Jaszi reminds participants that efforts have been underway in his office to incorporate several proposals to modify the accounts, including: the aforementioned estimation of stocks of consumer durables, the substitution of a measure of "economic" rather than tax-related depreciation of business capital, and the planning for development of an information base for identifying the major sources of environmental pollution and of expenditures to abate such pollution.

Nancy and Richard Ruggles, in addition to proposing changes in the conceptual design of the accounts, reaffirm their steadfast interest in greatly increasing the detail of economic information for the study of consumer and business behavior at the level of the decisionmaking units. For several years they have actively pursued their mission to win support for developing this detail from much of the economic and social information gathered in the various record-keeping practices of society.

There is a growing recognition that all sorts of information now gathered for government administration or statistical purposes for individuals, households, and governments could be utilized much more efficiently. In their paper, the Ruggleses recommend, first, extending further the efforts to merge data from different record sets and surveys, for example, income data from tax returns with demographic data from Census surveys. This need not be done for all individuals or even for an identifiable sample. It could be done "synthetically" or statistically by creating a synthetic record for each unit in the combined data set. The term "synthetic" is used because it would be done for a statistically created unit rather than by matching records for the same individuals.[5] With this procedure the identity of individual reporting units cannot be disclosed.

The Ruggleses also recommend, second, aggregating these microdata sets within a consistent national accounting framework. Among other gains, this would provide a much improved basis for simulation of the effects of government policies. For example, the integrated microrecords, by allowing for the differing responses by different individuals and firms to changes in tax laws or social security legislation, could enable

[5] See, for example, Edward C. Budd, "The Creation of a Microdata File for Estimating the Size Distribution of Income," *Review of Income and Wealth*, December 1971. Budd explains the techniques of *statistical* matching he used in merging microdata files from various sources to improve income data by type of income and income recipient.

an estimation of effects on federal revenues and expenditures or national consumption and savings which could be much more accurate than if the simulation were done on the basis of national accounting aggregates alone. Fairly detailed simulations are of course now being made with the IRS Tax Model or with the Current Population Survey. But the Ruggleses recommend a fairly extensive merging of such files with other records and an integration with the National Income Accounts.

After aggregation to national totals, and in order to keep the household sector as identifiable as possible, the Ruggleses recommend that households be set up as a separate sector apart from nonprofit institutions, and that these institutions, plus the business and government enterprises, be combined into a new enterprise sector.

Their third recommendation is to provide, to the extent feasible in the microdata sets and at aggregate levels, information on household and government capital formation, capital gains, investment in education, and research and development outlays by business. These data would provide the basis for new capital accounts for business, households, and governments as recommended by Juster, and by others, principally Kendrick and Eisner.

In commenting on the Ruggleses' paper, Edward Denison agrees on the importance of developing synthetic microdata sets for economic analysis, but he seriously questions whether the microdata sets will aggregate to the national economic accounts as readily as the Ruggleses seem to suggest. As Denison states, totals from the former are on a combined basis while those from the latter are on a consolidated basis. Denison also disagrees on the desirability of separating nonprofit institutions from households, and "diluting" the analysis of productivity change by including these institutions with business enterprises. Perhaps the ideal solution is to attempt to have a separate sector entirely for nonprofit institutions.

Douglas Hartle in his comments requests a clearer conceptual framework for deciding what, besides national accounting-type data, should be recorded in microdata sets. Hartle seeks a microrecord which might embody the concept of maximizing an individual's net worth, broadly defined. Toward this end, Hartle proposes a balance sheet and net worth statement for each person, presumably on a sample basis, showing the present value of expected lifetime benefits and costs which might be estimated as associated with certain assets and liabilities. The assets would include, in addition to marketable assets, human capital

and claims specific to the person and to his group or community. The categories proposed require a wide range of imputations concerned with social advantage and disadvantage. They extend well beyond the measurement of economic performance per se, into that of society as a whole. Hartle's highly imaginative proposal contains no clear clues, however, for implementation.

Abraham Aidenoff in his general comments describes the exploratory attempts by the United Nations to integrate social and economic statistics by combining social indicators on the conditions of the population, say health and education, with data on the resources expended by establishments providing the services of health, education, etc., to the population, and with information on the distribution of income and wealth.

HOUSEHOLD AND BUSINESS SECTORS

Subsequent papers contain more intensive examinations of certain of the issues discussed earlier. In regard to the household sector, the papers deal with highly specialized issues, rather than with the sector as a whole. One such issue, and a major one in the conference, relates to the valuation of nonmarket time of households. How are the activities of housewives, students, and social service volunteers to be valued? Many hours of many people are devoted to such nonmarket activities, the time devoted to such activities has changed markedly, and these activities more often than not represent substitutes for services performed by enterprises and other organizations that pay wages. As evident in the Nordhaus-Tobin paper, discussed later, the calculation of the level and change of total economic effort is substantially altered if nonmarket activities are included.

Two problems need to be solved in this reckoning: how many person-hours are devoted to such activities and what price per hour should be used in the different nonmarket activities? Is the average wage rate, for example, a useful basis for such an evaluation?

Reuben Gronau addresses himself to the latter question. In one of the few empirical studies in the conference, he attempts to deal with the problem of estimating the value of housewives' time based on a survey of labor force participation of Israeli women. By comparing married women who do and do not work in the market (standardized for income of husband, age and education of wife, and presence of children under three years of age), Gronau derived estimates of the value of

time of housewives that turned out to be approximately the same as the average wage rate of women who worked.

Gronau basically sought to determine why some married women work for market pay and others stay at home. Are the ones who work for wages poorer homemakers, on the average, than those who stay at home, or are they simply better wage earners? The women who remain housewives have a higher value of time than the average wage of working women with similar market qualifications if the first assumption is true and lower if the second. The two alternative assumptions give rise in Gronau's paper to two estimates, an upper one based on the first assumption and a lower one based on the second. Using the Israeli data on labor force participation of women and their wage rates Gronau found that the two estimates did not differ markedly, a finding which suggested to him that the average wage rate was a reasonable proxy for the value of a housewife's time.

Gilbert Ghez applauds Gronau's ingenious attempt to obtain estimates of the value of time of married women who stay at home, using essentially only data on labor force participation and the average wage rate to accomplish this. Ghez's comments on Gronau's paper should be viewed mainly as suggestions for future research rather than as complaints, given the limitations Gronau faced of inferring from the sample survey of Israeli conditions. Ghez does suggest, however, a number of interesting and sometimes rather subtle factors which might be further researched and which could influence the choice married women face between working at home and working for wages. Ghez's own research on the allocation of time and consumption over the life cycle, for example, leads him to suggest that the choice between working now or later in life or spending time at home now or later could be affected by "a positive rate of interest . . . [and] changes in nonmarket productivity" with age. These factors, according to Ghez, can give rise to variations in the price of time independently of the presence or absence of children.

Dan Usher's paper is concerned with how to go about giving economic recognition to what he believes to be one of the most important dimensions of individual welfare: life expectancy. He grants that a value for increased life expectancy should not be imputed in the standard economic accounts, which are concerned largely with marketed output. In a welfare-oriented measure, however, Usher believes that such an imputation makes a good deal of sense.

Usher calls attention to large increases in life expectancy in recent

years in most countries, particularly for the developing countries. In consequence of these increases in longevity per se, individuals have been given the prospect of an increase in total permanent or lifetime income and consumption.

Under the present reckoning of economic performance, a decline in welfare occurs if per capita GNP falls because of an increase in population relative to GNP. Suppose, however, that the relative increase in population occurred solely because of a decline in the death rate. Would the decline in per capita GNP resulting from increased longevity give the correct welfare indication? Common sense would suggest that the individuals concerned would feel better off because of the increased prospect of longer life per se. How should this increased longevity per se be valued? Usher is careful to distinguish the concept he seeks from others which, for this purpose, should not be used. He narrows the concept down to the question: "How much would I pay to avoid a small probability of my death?"

Usher discusses the acute difficulties of imputing a value of life, considering the great variation among persons as to the amount they would be willing to pay for avoiding a small probability of death. While this variation raises philosophic questions about putting a higher value on the life of a rich versus a poor man, Usher nevertheless does suppose there is a unique price corresponding to a set of national mortality rates and a level of total permanent consumption, as there would be if society were "one individual writ large." This price would only apply at an aggregate level.

Usher finds that the rate of growth of real income in Canada from 1926 to 1968 is significantly increased if it is inclusive of an imputation for the average increase in life expectancy. On the basis of his preferred estimates, the effect of the imputation for increased life expectancy is to raise the annual growth rate by about half a per cent per year—from about 2.3 per cent without the imputation to 2.8 per cent.

Robert Willis presents an illuminating discussion of the complex questions of income and utility raised in Usher's paper. He contrasts Usher's concept with the more conventional one and shows how Usher's emphasis on *lifetime* utility could help deepen the conventional one. Willis is impressed with the sizable effect the longevity imputation has on the Canadian growth rate and suggests that it may be too high.

Willis points out that Usher began his theoretical model with the injunction, "Ignore the fact that men live in families and that families are imbedded in communities of people who are concerned with each

other's being." Since the increase in life expectancy—particularly pronounced for underdeveloped countries—has been mainly in the decrease in infant mortality, shouldn't this increase in utility be assigned to the parents rather than, as Usher does, to their offspring? If so, the imputation for increased longevity would be reduced since this gain in lifetime consumption would be less for parents than for their offspring.

Usher's paper may not in the first instance result in the widespread development of a major new imputation in present economic accounting, but it does raise one of the more profound philosophic questions concerning the meaning of income to the individual and to society. It gives pause to any easy answer to the question of a possible trade-off between increasing per capita GNP and lengthening the life span.

In moving from the household to the private sector as a whole, Laurits Christensen and Dale Jorgenson present a major proposal for developing a new simplified system of accounts for both flows and stocks. Their paper provides for a consistent set of accounts for production, income, and expenditure, and for capital accumulation and its period-to-period revaluation, all in current and constant prices for the period 1929–69. Estimates are presented for the private sector including households by extending their "enterprise" activities from investment in housing, as presently treated in the accounts, to investment in consumer durables. In their concluding section Christensen and Jorgenson propose extensions of the capital accounts to include investment in human capital and in research and development. A number of other major extensions are also suggested in their presentation.

Several key measures of economic performance are derived from the authors' presentation of the data: output in constant prices, output per unit of capital and labor input, and an interesting new concept which Christensen and Jorgenson call "standard of living," and which they calculate as the ratio of expenditures to factor income, each in constant prices. This ratio is equivalent to a ratio of the price of total factor income to the price of expenditures. If the price of income of both capital and labor rises relative to those of commodities and services, then the purchasing power of that income rises, and, by definition, so does the "standard of living." It is a broader concept of standard of living than one based solely on real wages.

In his comments on the Christensen and Jorgenson paper, John Kendrick particularly commends them for presenting both income *and* wealth accounts consistent with one another, and providing such consistency in current and constant dollars. He encourages them to extend their system

beyond the private economy, suggesting also that for purposes of productivity analysis a clearer separation would be desirable between businesses on the one hand and households and nonprofit institutions on the other. In this way, productivity analysis of the business sector could be kept "clean" of the imputations needed for the household and institutional sectors. In connection with the accounts in constant prices, however, Kendrick questions the deflators at a number of points.

Robert Eisner raises the question of what formula to use in measuring the decline in value of a given capital good, a perennial question. In Eisner's view, the long-run solution to this vexing problem is to undertake major empirical work to illuminate the actual path of depreciation. In the meantime, he advocates the use of a straight-line depreciation path, not a geometric one, as he alleges Christensen and Jorgenson have used. The authors reject Eisner's criticism on the ground that what was employed in the paper was a geometric decline in a *cross section* ("across vintages") not "over time," as Eisner assumed was done.

It is hoped that this technical question, which has important implications for how the U.S. capital stock should be valued, can be further illuminated by showing how in fact the behavior of a geometric decline "across vintages" differs from that "over time."

THE PUBLIC SECTOR

If the welfare dimension of a national measure of economic and social performance is to have any substance, a major portion will perforce relate to our capability for appraising the quantity and quality of services provided by governments. But nowhere is measurement of performance more difficult than for services and especially the services of the public sector. The cost of welfare-oriented public sector services including those for income support, education, health, housing and community development, and manpower training—the so-called "human resource" programs —have risen dramatically in the last decade to approximately $110 billion or 45 per cent of the total federal budget for fiscal 1973. Some believe this allocation of funds is far too small; others, that it is excessive. Most agree that we cannot be sure which of these judgments is correct since we cannot in fact measure its real value. The same argument goes for other public outlays, whether for defense, the largest part of the budget, space, general government, or various international programs. What is the fundamental difficulty—lack of a measure of "prices," or lack of a measure of the "physical" content of the service?

Mancur Olson in his paper argues that the main difficulty lies in the

inability of government to determine what the physical output of the service really is. It is this difficulty, in Olson's view, which results in the alleged inherent inefficiency in government. Olson dismisses various other explanations for alleged inefficiency, for example, that government decisions are not "governed" by competitive markets. To Olson the clue to the difficulty lies in the "collective" nature of public goods where the physical aspects cannot readily be divisible into measurable units and where the distribution of benefits and costs are exceedingly difficult to trace. The solution in his view lies in developing "social indicators." In that way a move toward "output-type" measures of social conditions would get started. Olson also recommends conducting experiments to determine consumer demand functions as a means of obtaining "market" evaluation of public services.

Charles Schultze argues that the problem is not in our inability to identify the physical content of the particular government service to be rendered but in the price per unit to assign to it. From his perspective as former director of the Bureau of the Budget he probably could recall that the acute difficulty in allocation decisions was not in understanding what a given service was intended to do but whether that service or some other "equally persuasive" one represented a better buy for the Budget dollar. In fact, the problem of defining benefits has both a physical volume and price dimension, inextricably related, and elusive for society to appraise. Olson and Schultze in their exchange of views serve to indicate the great difficulties involved in quantifying these dimensions.

The difficulties of determining real output of the educational system are surveyed by Alice Rivlin. Rivlin discusses six alternative approaches and finds them all wanting, mainly for two reasons: first, the quality of education varies greatly from school to school, which lessens the usefulness of measures such as those based on years of schooling, on number and types of courses taken, degrees obtained, etc.; second, as has been often noted, the students and their family background may play a large role in student performance, which belies in good part the significance of measures based on test scores. Differences in such scores over time or among schools may significantly reflect changes in the school population or in the way that population is mixed rather than in the improved use of resources by the schools themselves. Rivlin concludes that the search for performance measures is worthwhile but should not necessarily be done in the context of the national economic accounts, given the present state of the arts. She implies that we should "live with" input measures, but with more provision for differences in various classes of manpower

in the schools, recognizing that no input measure, however detailed by class of input, can by itself measure productivity of education.

Burton Weisbrod, in commenting on both the Olson and Rivlin papers, suggests that in many service areas, such as Medicare and recreation, governments are often not so much concerned with the efficiency with which resources are allocated for the given activity as a whole as with "distributional efficiency." The government in some cases will set a zero price in order to insure equality of access—at least as far as price effects can provide such equality. He then raises the interesting point that a given output in the aggregate differently distributed may in fact imply a different aggregate value. He does not, however, indicate how different values may be placed on different distributions of a given aggregate.

Ernest Grove in his characteristic style takes issue sharply with Olson and suggests that the problems of government inefficiency lie in the inherent nature of bureaucratic organization itself. He argues for more individual responsibility and, with Ralph Nader, urges that the professional employee should feel a "duty to dissent" but be "protected by an organization of his peers, by his professional society, and by law that requires due process and substantial justice."

Zvi Griliches raises the general question of the difficulty of measuring the contribution of investment in research to economic growth, particularly the calculation of the *social* rate of return of such investment.

Nestor Terleckyj calls attention to the joint character of public and private inputs in contributing to varied outputs, and of various outputs contributing differently to social welfare goals. Based on studies he is undertaking in goals analyses he urges the use of a matrix both of public and private inputs (represented by the quantities of specific goods and services) and of outputs (represented by the change in selected indicators of well-being). For example, if the data were available, such a matrix might show the marginal contribution to longevity associated with given activities aimed at curtailing smoking or reducing obesity, contingent on the existence of other activities.

AMENITIES AND DISAMENITIES OF ECONOMIC GROWTH

While positions differed markedly on whether GNP should or should not measure welfare there seemed broader agreement that some attempts should be made to provide some measures of the positive and negative consequences of economic production and consumption. Such a measure need not seek to put plus or minus values on every economic activity.

It could attempt to deal with a few major matters of social concern such as the costs of environmental control or of urban congestion on the negative side and, say, of leisure presumably on the positive side. The paper by Orris Herfindahl and Allen Kneese and that by Wassily Leontief analyze in greater detail than discussed in the earlier papers the measurement issues connected with environmental control. William Nordhaus and James Tobin present a bold attempt to put values on several positive and negative consequences of economic growth in their measure of economic welfare.

Herfindahl and Kneese in a highly comprehensive paper examine three problem areas: the possibility of modifying GNP or NNP to measure the benefits and costs associated with pollution and its abatement; models specifically designed to measure the effects of alternative strategies of production, consumption, and pollution control; and information systems of a highly specialized nature which would help in the design and detailed administration of pollution control schemes.[6]

In reviewing the problems of measurement within a national accounts framework, Herfindahl and Kneese conclude with others that the comprehensive evaluation of changes in the flow of services of clean air, water, and space seems to present a hopeless task, even though that calculation might appear to be necessary for welfare determination. However, some systematic accounting of expenditures to control or defend against pollution appears to be mandatory considering the prospect of huge and rising outlays for this purpose. While no one disputes this accounting need, the question is: how should this accounting be done?

The authors concede, perhaps with some reluctance, that the official definitions in the national accounts should not be changed. They recommend nevertheless the regular preparation and publication of series showing the expenditures for control of waste products arising from production and consumption by industry, government, and consumers. This information could be used, according to the authors, to interpret changes in GNP or NNP associated with expenditures for environmental control. They could provide the basis for supplementary adjustments to GNP and NNP, listed by the authors, to satisfy different points of view on whether pollution control does or does not contribute to the output of final product.

[6] Orris Herfindahl died on December 16, 1972, in Nepal, while on a hiking expedition in the Himalayas. The paper reflects the keen interest and concern he had for the natural environment.

Herfindahl and Kneese warn, however, that accurate information on these expenditures may be exceedingly difficult to obtain. The separate identification of abatement expenditures, they indicate, cannot be very precise in such cases as when a new plant or process is introduced which among many other innovations also happens to cut down on pollution emissions.

The authors then proceed to examine in considerable detail four types of models designed to measure the benefits and costs of environmental control: a national input-output model, as formulated by Leontief; regional and interregional input-output models; a materials-balance model; and the Russell-Spofford model.

They discuss in some depth the limitations of each approach, partly conceptual and partly lack of data. They point to the present lack of detailed information on such matters as the marginal response (often nonlinear) of costs—direct and indirect—and of various benefits sought; the damages, say to health, of different degrees of pollution; the effect that the control of emissions to one environmental medium may have at the expense of increased discharge to another; and the features of pollution abatement often unique to small geographic areas. National models by definition cannot cope with unique regional problems; input-output models which are regional do not encompass all materials flows within the complexities of ecological systems; while the materials-balance model, although it seeks to account for all materials flows has not yet been fully linked to economic models. The Russell-Spofford model seeks the widest applicability in scope and concreteness of all the ones described.

In a final section, Herfindahl and Kneese highlight the fact that the development of an information system needed to integrate environmental aspects (physical, chemical, biological, medical aspects) with economic ones—all for purposes of monitoring, analyzing, and administering pollution control programs—is bound to entail an extraordinary effort. Nevertheless, they recommend that such efforts be undertaken presumably because their cost is still likely to be small compared to the great urgency and magnitude of the environmental pollution problem.

William Vickrey, among the first to advocate use of the price system to further welfare objectives in controlling socially undesirable effects of production and consumption, suggests that pollution control per se need not always be very costly when such control helps also to check other diseconomies. This appears possible, at least in the case of the auto-

mobile, if the imposition of user charges to reduce the cost of traffic congestion and of accidents were also to be coupled with the imposition of charges to reduce the pollution resulting from such congestion.

Wassily Leontief, who in recent years has introduced applications of input-output to the analysis of environmental pollution and its abatement, presents a schematic and instructive table of interindustrial flows expanded to include the generation and elimination of pollution. With such a table, adequately detailed, it should be possible to compute the costs of an additional unit of output of any good and of any eliminated unit of the net output of each major pollutant. Basic features of this approach are appraised in the Herfindahl-Kneese paper.

One of the main questions of the conference was how a reasonably broad assessment of the amenities and disamenities of economic growth would compare with actual GNP or NNP? Would the nation show the same growth rate?

To arrive at an answer, Nordhaus and Tobin seek a comprehensive measure of the annual real consumption of households, or a "measure of economic welfare" (MEW). This is in contrast to GNP or NNP which, in their view, are measures of *output,* and are the relevant measures both for short-run stabilization policy and for assessing the economy's long-run performance as a productive machine. In aiming at a *consumption* measure, MEW also differs from an index of happiness, since it does not attempt to say whether today's U.S. consumer with all his goods and services is any happier than his less affluent counterpart of years past or of some other country.

The authors aim at a more modest measure of welfare, though bold enough, by making the following main adjustments to GNP or NNP: they include values for what in their judgments are major contributions to direct consumption, not now counted, chief of which are imputations for leisure and for nonmarket activities, and exclude values which do not contribute to direct consumption, the most important of which are expenditures for national defense, and a "disamenity" correction for the "costs of urbanization"—or the added costs associated with the crowded and other unpleasant conditions of city living.

Since MEW is calculated on a per capita basis, a quantitatively significant and subtle adjustment is also made to GNP for what the authors term the "growth requirement." The explanation for this starts with NNP. By allowing for capital consumption, NNP should indicate that level of consumption which could be extended indefinitely into the fu-

ture. But Nordhaus and Tobin assert that NNP fails to do so. They seek to prove that in order to maintain consumption at a constant level on a per capita basis the capital stock must grow at a rate equal to that of the population. The "growth requirement" then is an estimate of the cost, over and above capital consumption as presently calculated for NNP, necessary to maintain a rate of growth in the capital stock equal to the rate of growth in population. This is a difficult concept and dependent upon restrictive assumptions concerning technological change but it results in a sizable adjustment, amounting in 1965 to 16 per cent of GNP.

Nordhaus and Tobin find that with their admittedly tentative numbers the corrections in level are very substantial—more than twice the official level of NNP. The annual rate of growth of MEW, however, is slower, 1.1 per cent for MEW as against 1.7 per cent for NNP per capita over the period 1929–65. These figures are based on their preferred variant of MEW.

Perhaps the most interesting inference drawn by the authors is their answer to the question posed by the title to their paper, that growth is not obsolete, that zero economic growth is far too crude a response to removing the disamenities of positive economic growth, and that better solutions lie in developing economic incentives to innovate and utilize more salubrious technologies.

Largely because the imputation for leisure dwarfs all other imputations in the Nordhaus-Tobin paper (it is one-half of total MEW or exceeds total NNP in 1965) the discussion focused largely on the imputation for leisure.

Edward Denison questions the fundamental approach to valuing leisure time at a price equal to the hourly wage: either that of the base year, as in variant A of the Nordhaus-Tobin paper, or the wage rate in each year adjusted for changes in commodity prices, as in variant C.

Denison argues that the conceptually appropriate hourly wage for valuing leisure time should equal the difference between the utility of that hour of free time which a person would be most willing to give up (his hour with least utility) and the disutility of the most onerous hour passed in gainful work (the hour with the greatest disutility). Hence, one approach for arriving at a value of the marginal nonworking hour would be to *subtract* from the hourly market wage the disutility of the marginal working hour. That resulting value might of course be only a very small fraction of the hourly market wage.

Denison directs other criticisms to the "correction" for leisure time.

He also alerts future imputers to the fact that the large variance in working time—from zero to more than 45 hours per week—requires recognition of the nonlinear change in the value of time in relation to a given decrease in working hours. The value of one hour of nonworking time will differ, he warns, if obtained with a decrease from 45 to 44 as compared to a drop from say 10 to 9 hours per week.

John Meyer calls attention to interesting differences in direction between MEW and NNP, expressing his "feeling" that on the whole when the two diverge MEW is not necessarily superior as a welfare indicator to NNP. In particular, he believes that the decline in NNP in the 1929–35 period gives a more accurate measure of change in welfare than MEW, which is stable or slightly rising over that time span. An improved measure of human capital, indicating more of its deterioration during the early 1930s and its improvement after 1947, would in Meyer's view strengthen MEW for measurement of economic welfare. Meyer also makes a number of suggestions for refining the calculation of MEW, especially the adjustments for the disamenities of urbanization. This latter suggestion is also stressed in the comments by Fred Singer.

Nordhaus and Tobin agree on the need to refine the calculations regarding urbanization. On the matter of leisure, they concur that many unanswered questions are involved in determining the number of hours and their value—both empirical and conceptual. Questions of fact concerning the number and composition of hours of leisure and nonmarket activities remain to be determined in future studies of the allocation of time. These points as well as a number of highly intricate questions of concept are examined in the closely reasoned replies by Nordhaus and Tobin.

CONCLUDING REMARKS

Simon Kuznets in his concluding remarks reminds us all that many of the issues raised in this conference—of the dividing line between economic and noneconomic, productive and unproductive, of distinguishing between costs and returns—have been the foci of discussions in various forms for some two centuries.

For Kuznets this re-emergence in new guise of some of the perennial problems of economics relates in good part to the effects of and concern with economic growth. The high rates of growth obtained in recent years in many countries have brought about deep changes in the condition of life in the home, in industry, and in the cities and towns. To comprehend these enormous shifts, Kuznets calls for new experimental scholarly

research, as exemplified by the Nordhaus-Tobin exploratory effort. He sees research efforts such as those on human capital, on deeper analyses of real income distribution, on measures of the long-run sustainable growth path, and on the "final" goals of economic output as best done outside of government. With this characteristic forward look from Simon Kuznets the conference was brought to an end.