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ON THE MEASUREMENT OF ECONOMIC AND SOCIAL PERFORMANCE

F. Thomas Juster

Introduction

Although most economic concepts remain a mystery to the majority of even well-informed laymen, the "Gross National Product" has become part of our everyday vocabulary. The widespread use of this concept, both at professional and popular levels, attests to the fact that GNP is generally thought to be a simple, unambiguous, and comprehensive measure of economic performance. But what has always been recognized by professionals is now beginning to be recognized by others: that the GNP is neither simple, nor unambiguous, nor comprehensive; and that it is not necessarily a good measure of economic performance.

The National Bureau, and, in particular, Simon Kuznets, played a major role in developing a conceptual and empirical framework for the measurement of national income and output. The structure of the U.S. National Income Accounts was largely the creation of Milton Gilbert and his colleagues at the U.S. Department of Commerce, while the present system of accounts in the U.S. has been greatly influenced by George Jaszi. Kuznets' work tended to focus more on the normative aspects (what should be included in real national output and has total output grown or declined?), while Gilbert, Jaszi, and their colleagues have tended to focus more on the behavioral aspects (what economic activities have firms, households, and governments actually engaged in).¹

Many of the conceptual problems raised in the course of developing the

¹The concept and measurement of aggregate income and output are discussed in several National Bureau publications. In particular, see Simon Kuznets, *National Income and Its Composition, 1919-1938*, 1941, Vols. I and II. Also, Kuznets, *National Product in Wartime*, 1945.

The structure of the U.S. accounts in their formative stage is discussed in Volume 10 of *Studies in Income and Wealth*, 1947. The framework underlying the U.S. National Income Accounts system is discussed in Jaszi's "The Conceptual Basis of the Accounts: A Re-examination" in *A Critique of the United States Income and Product Accounts*, Vol. 22 of *Studies in Income and Wealth*, 1958.

U.S. system of National Income Accounts (let us call them simply the "accounts") were never satisfactorily resolved but simply ceased to be discussed, and the conventions adopted by the Department of Commerce gradually came to be accepted by both producers and users of the data. But the early problems still remain, others that were not well understood then are better understood now, and still others that have always been widely recognized have become more important in a quantitative sense.

Our present system of accounts represents the application of two principal criteria to the measurement of economic activity: first, that output is best defined to include only goods and services bought and sold in the market; second, that a few selected nonmarket activities should be included in output because they are analytically indistinguishable from closely related market activities. The latter criterion is designed to prevent shifts of functionally identical activities from the market to the nonmarket sector, or vice versa, from changing measured output.² In short, the existing income and product accounts focus on the measurement of economic activity in the market, supplemented by imputed measurements for a few nonmarket activities with a close correspondence to market activities.

Sources of Dissatisfaction with GNP Accounts

National income statisticians have always expressed dissatisfaction with various aspects of the present system of accounts, but their discontent has not resulted in much change in practice—possibly because no one thought that the results would really look very different if the accounts were adjusted to reflect various suggested changes, and partly because many of the suggestions could not easily be implemented empirically. Both of these arguments have become less compelling in recent years, and there have been a number of studies aimed at providing the empirical groundwork for a restructured set of accounts that incorporate conceptual changes which many have long thought to be desirable.³

The current disaffection pertains to a number of specific areas: (1) the treatment of nonmarket activities; (2) the way in which output is classified between consumption and investment; (3) the widespread use of input costs

² To illustrate, homeowners do not actually pay rent to themselves for housing services, while renters buy housing services in the market. Thus the market criterion would count the services of rental housing as output, but not the services of owner-occupied housing. But such a treatment is so clearly incongruous that the builders of the accounts long ago decided in favor of imputing a value for the services of owner-occupied housing, using the rental price of equivalent housing to measure the flow of services. Over the years a substantial array of similarly motivated imputations have been included in the accounts as part of measured output. Imputations are made for the value of food consumed on farms, for the value of checking account services rendered by banks, etc.

³ The recent study by Richard and Nancy Ruggles (*The Design of Economic Accounts*) suggests a number of alterations in the conceptual framework of the accounts, and provides some empirical estimates. Both John Kendrick and Robert Eisner have been directing NBER research projects designed to provide empirical estimates of economic activities that are presently excluded from the accounts. These range from the imputed cost of students' time and the value of free consumption provided by business firms to employees, to the impact of capital gains on both aggregate income and income distribution.

to measure the amount of output; and (4) the adequacy of the accounts as a measure of social and economic welfare. In technical terms, these can be thought of as problems relating to the measurement of output in current prices (the first and to some extent the second), problems relating to the deflation of current price output (the third and in part the fourth), and problems relating to the analytical functions to be served by the accounts (the second and fourth).

For nonmarket activities, the problems cover income-producing activities that are omitted from the accounts as well as excluded activities that produce negative benefits. Use of the market criterion for defining output means that a secular shift in activity from the market to the nonmarket sector, or vice versa, will tend to produce a growth rate for measured output that is either too high or too low. For example, if an increasing fraction of housewives enter the labor force, the growth of measured output will tend to be biased upward because paid jobs constitute output but housewives' activities do not. If young people tend to stay longer in school and thus do not enter the labor force until they are older, and if, as a result, "student hours" grow more rapidly than labor force hours, the growth rate of measured output will contain a downward bias because student "work" is not considered to be output. And an increase in environmental deterioration over time would not show up as a decline in real output because the flow of benefits from the environment is not counted as output to begin with.⁴

The second area (the distribution of output between consumption and investment) has long been a source of concern to national income statisticians. The accounts do not even claim to measure total investment, since they count as investment only additions to the stocks of business capital assets and residential housing. All other output is either intermediate product (coal into steel) or consumption. Yet households possess a very large stock of durable goods (in addition to housing) which yield future services and thus constitute capital assets; governments possess an increasingly large stock of capital assets in the form of schools, highways, etc.; business firms accumulate assets in the form of knowledge acquired through research and development, an activity which has grown substantially in the postwar period and, if included, would now constitute an appreciable fraction of total business capital outlays; and investment in humans (schooling, to take the obvious case) is not only a rapidly growing form of capital outlay but one that probably represents the largest single component of total investment in the economy. Yet we continue to use a system of accounts that fails to recognize these forms of capital accumulation as investments.⁵

⁴ Programs designed to reduce environmental deterioration—investment in pollution control, for example—are quite apt to show up as increased real output, as indeed they should if the benefits from the program exceed the costs. However, the level of output would still be overstated relative to the level in past years when there was no need for pollution control because there was less pollution.

⁵ Some rough estimates of investment in knowledge, human capital, household durables, and public durables are contained in F. T. Juster, *Household Capital Formation and Financing, 1897-1962*, 1966. John Kendrick is currently engaged in an NBER study designed to provide comprehensive estimates of investment in the United States along the lines discussed above.

The third source of concern has more to do with deficiencies in the measurement of real output, given the present scope and structure of the accounts, than with concept or coverage. In significant areas of economic activity, what the accounts record as output is measured entirely by inputs or costs. For products like automobiles, steel, clothing, etc., the accounts measure the value of output directly using expenditures and an index of output prices. But for most publicly provided services, for the production of services like health and education, and for the production of goods and services where changes in the quality of output are important but difficult to estimate, output measures do not exist: instead, the quantity of inputs is used to measure the quantity of output.⁶

To illustrate: Most services rendered by governments are conventionally valued by the salaries paid to public employees plus the cost of any complementary inputs purchased in the market. Thus, the "output" of police services is measured by salaries paid to members of the police department, the cost of police cars, etc., not by the social and economic value of crimes prevented or violators apprehended; the value of education, whether public or private, is measured as the cost of teachers' salaries, teaching equipment purchased in the market, the cost of school buildings, etc., not by the value imputable to the gain in pupil knowledge; and the value of health services is measured by the cost of doctors' fees and drugs, not by the reduction in mortality rates, the reduction in time lost on account of illness, etc.

Although this class of problems is endemic in the service industries, it is by no means absent in the traditional goods industries. During wartime, for example, we usually measure the value of munitions output by adding up the cost of the inputs required to produce them: the reason is our inability to design a meaningful and independent measure of output prices. And in any product category where technological change is important and where the product has a multidimensional utility to users, the same difficulty tends to arise although in a somewhat disguised form. For example, measures of clothing output will be unaffected by changes in either durability or maintenance costs associated with changes in the mix of material inputs, *unless* the change adds to production costs. To the national income accountant, in effect, "a suit is a suit is a suit"—unless it costs more (or less) to make.

Finally, it has become apparent even to nonprofessionals that GNP is not an adequate measure of social or economic welfare. This will come as no surprise to the national income statistician: the accounts were quite consciously *not* designed to measure welfare. But most people, including economists, have always supposed that GNP and welfare were, in fact, closely enough related so that changes in the one could be identified by looking at

⁶ The basic problem here is largely one of constructing an appropriate deflator for converting current-price output into real or constant-price output. For measuring current-price output, it makes no difference whether we use input costs or output values since the two must be identical. But for constant-price measures, it is clearly undesirable to infer changes in output from changes in input costs unless productivity change can be measured independently. In practice, moreover, even the current-price measures are apt to be distorted in the public sector, since not all the inputs are likely to be counted. In particular, because capital accounting in the public sector is notoriously poor and usually nonexistent, capital costs are likely to be understated.

changes in the other. It is increasingly clear that such an assumption is unwarranted.

Just to cite a few of the more dramatic specifics that cause GNP and welfare measures to diverge, virtually any type of disaster—personal or national—will cause the GNP to rise rather than fall. If a man's wife is killed in an automobile accident and he is thus forced to hire a housekeeper to care for his children, the GNP will rise because housekeepers' services are counted and housewives' services are not—and the stock of human capital is not reduced because it was not counted to begin with. A tornado that sweeps through Texas and destroys millions of dollars worth of capital assets will almost certainly cause the GNP to rise: workers must be hired to clean up the debris and rebuild the destroyed assets, and at least some of these resources would have preferred leisure (which is not measured) to market activity (which is). Moreover, the capital loss involved in destruction of property and lives does not explicitly enter the accounts at all, and is unlikely to have much if any influence even in subsequent years. Finally, social catastrophes like wars will often cause GNP to rise,⁷ partly because work is substituted for leisure and partly because we have no way of measuring the loss in efficiency that usually results from shifting economic resources from peacetime to wartime uses.

Other manifestations of the GNP-welfare distortion are the treatment of time allocation, of "free" goods and services, and of by-products that yield negative benefits. Moreover, an aggregate measure like GNP cannot register the fact that welfare does not depend solely on aggregate performance but is sensitive to the way in which at least some of the aggregates are distributed among the population.

For time allocation, the problem is simply that only time spent at paid activity is counted as part of output. Hence, an increase in leisure or in time spent at unpaid (nonmarket) activities will not cause any direct increase in GNP, while time taken from leisure to sit in traffic jams or to wait for the appearance of the local commuter train will not make the GNP any less. Similarly, outputs that are "free goods," and therefore do not have to be produced in the market, are ignored in GNP despite the fact that these products are apt to have precise counterparts which *are* included in GNP in other economies precisely because they are *not* free and must be produced. For example, residents of the Virgin Islands need neither heating nor cooling equipment, since their fortunate location provides an unlimited supply of 70° weather for which Americans pay substantial sums every year; their requirements for clothing and shelter are reduced for the same reason. But this natural bounty is wholly ignored by the GNP statistician.

The problem of negative by-products has been discussed above: the basic difficulty is that no accounting is made for the decline in utility resulting from the unwanted side effects of economic activity—rivers that cannot be used for recreation, parks that are cluttered with disposable bottles, etc.⁸

⁷ A really destructive event like a major earthquake or a war that devastates large parts of the country will probably show up as a decline even in measured real output.

⁸ In the literature, the classic case of unwanted side effects was the rise in the costs of maintaining the exterior of a house because of soot emanating from neighboring factory smokestacks.

Finally, a perhaps inescapable shortcoming of the GNP accounts from a welfare viewpoint is the fact that they focus entirely on aggregates and pay no attention to the distribution of these aggregates. An economic system which generates conspicuously high incomes for some classes of its citizens and much lower incomes for other classes is unlikely to be as viable as one which provides a more even distribution of rewards. A system in which the distribution of the tax burden is widely regarded as unfair and inequitable is unlikely to have the same prospects for future performance as one in which the same burden is distributed with fewer perceived inequities. And a system in which the same total population is heavily concentrated in a small number of geographic areas is likely to generate a substantially higher level of negative social and economic by-products than one in which population is more widely dispersed.⁹ These aspects of welfare are in principle much more difficult to quantify than many of the others discussed above, although it is conceptually feasible to quantify the costs of removing many of the outward manifestations of distributional distortions.

Framework of the Present Accounts

In examining the problem of social and economic measurement, it is useful to recall the origins of our present system of national accounts. This system was shaped and developed during the 1930's and 1940's when the most obvious forces affecting the level and movement of economic activity were initially cyclical, subsequently national defense. During major cyclical swings in the level of economic activity, focusing on market output produced a measure whose welfare implications were probably very similar to those that would have resulted from focusing on a much broader range of activities. And during a major war, the emphasis was naturally on productive capacity for military output, for which a measure like GNP is reasonably well suited. Hence, given the catastrophic decline in market activity during the Great Depression and the subsequent recovery with the eruption of World War II, many of the conceptual problems that had been extensively discussed during the formative period of the income accounts gradually came to be regarded as of little practical or analytical significance, and the accounts came to be largely a reflection of "activity" regardless of the purposes to which the activity was devoted.

Thus the present national income and product accounts of the U.S. are basically designed to measure cyclical changes in total activity. In such a framework, the focus is on flow of inputs and outputs; stocks of assets are important only insofar as they cause cyclical movements in the related flows.¹⁰

⁹ This statement is not inconsistent with the observation that population shifts have historically been from sparsely populated rural areas towards densely populated urban areas, rather than the reverse: The balance of gains and losses can be positive even if the losses are substantial.

¹⁰ The investment part of the accounts consists only of business plant and equipment and residential housing, which, during the 1930's, were the major sources of cyclical variability in investment activity. The relative unimportance of the assets themselves in the structure of the accounts, as distinct from the investment flows which add to assets, is underscored by the almost exclusive reliance in current usage on *gross* national product

Similar reasons explain the preoccupation of the present accounts with that portion of time allocated to market activities: If cyclical variability is the major concern, the critical labor-time variables are the amount of market employment and unemployment, not the amount of time that people choose to allocate to nonmarket activities, leisure, etc. Hence, the allocation of labor time has always been treated as a simple flow of inputs yielding market income, with no attention paid to the fact that time allocated to the market is only one of many possible uses.

Given this background, it was natural for the emphasis to be on a system of accounts designed to trace variations in output, employment, and productivity in the market sector, where performance during the 1930's had been so unsatisfactory. Moreover, it was entirely reasonable during this period to equate changes in output thus measured with changes in economic and social welfare, since changes in the one dominated changes in the other. But during the past few decades, the combination of sharply reduced cyclical movements in market output and the changing importance of nonmarket activities have made market output an increasingly poor measure of economic and social well being.¹¹

An Alternative Framework

In general terms, economic and social output can be thought of as a flow of satisfactions or utilities generated by combining the services of various types of capital assets. A wide variety of such assets exist in the system, and these assets produce a number of different kinds of utilities. The assets themselves can be classified into five broad categories: (1) tangible capital assets (equipment and structures); (2) intangible capital assets (knowledge); (3) human capital assets (skills and talents); (4) physical environmental assets; (5) sociopolitical environmental assets.

Tangible capital assets comprise business assets, consumer assets divided into housing and durables, and government assets.¹² Intangible assets result

rather than *net* national product: the difference between GNP and NNP is, of course, simply the amount of capital stock estimated to be used up in the process of producing current output. Yet one rarely hears any mention of NNP (or its cousin, national income). One important reason is that most economists use the accounts to measure cyclical changes, and the capital consumption component of gross investment has little or no cyclical content.

¹¹ It is important to keep in mind that analysis of cyclical variability in output is still, and will presumably continue to be, a major use of any system of national accounts. Hence the emphasis should be on extension and refinement of the existing accounts to make them more useful for the analysis of trends in social and economic welfare, while at the same time insuring that a market subsector is retained to facilitate cyclical analysis.

In point of fact, a greatly expanded set of accounts with a "market activity" subsector might well be *more* useful for cyclical analysis than the present system. It is hard to believe that the quantitatively important collection of imputations now included in the accounts (e.g., housing services) adds anything to their usefulness for analysis of cyclical behavior.

¹² As noted above, only business tangible assets and housing are treated as capital assets in the present system of accounts. At some stages of economic development, defining capital assets in this way might have been appropriate and useful. But in a world where business firms spend upwards of \$20 billion a year on research and development

from the application of human capital and other resources to research and development problems. This process results in the production of socially useful knowledge, a type of asset that is analytically distinct from the skills and talents of the people who produced that knowledge. Human skills and talents represent both innate ability and training, the latter ranging all the way from parental time spent with children through formal schooling and on to work experience designed to aid future productivity. Physical environmental assets can be thought of as comprising natural resources as traditionally viewed: mineral and agricultural wealth; other natural assets like temperature, precipitation, water, and air; and partly man-made assets like forest preserves and parks. The assets comprising the physical environment and the sociopolitical environment overlap to some degree. While welfare-producing assets like the amount and distribution of water resources and the quality of the atmosphere clearly belong in the physical environment category, environmental assets like population density are partly physical and partly social. The major assets in the sociopolitical category are difficult to define precisely, but are meant to cover such concepts as equity, security, freedom, social and economic mobility, privacy, and so forth.

Specifying a structure of economic and social accounts in which outputs (benefits) are derived from these assets seems both useful and possible, at least in principle. Empirical implementation is another matter; while clearly feasible in some cases, it is not possible at present for others and may not be realizable at all for some. Nonetheless, the exercise seems worthwhile, since the purpose of a system of accounts is to provide a conceptual framework for all meaningful and measurable aspects of social and economic performance.

Net economic and social output can be defined as the sum of direct consumption benefits yielded by this collection of assets, plus or minus net changes in the assets themselves. For most goods and services that pass through the marketplace, the suggested set of accounts would differ little if at all from the present accounts: net output would still consist of the flow of consumption goods and services plus net changes in the stock of capital assets used to produce the output.¹³ However, there would be major differ-

(which clearly adds to the stock of useful knowledge and hence to future output); where the single most important capital asset in the economy is not business capital equipment but the stock of human skills and talents; where consumer and government capital assets in the form of roads, dams, automobiles, furniture, appliances, etc., are much larger than business-owned capital assets (the only difference being that consumers and governments use capital assets to produce services that are not bought and sold in the market); and where our natural resource and environmental assets are, in the view of many, being depleted and despoiled at a rapidly expanding rate; it seems just as incongruous now to exclude these facets of economic and social activity from being reflected in the national accounts as it must have seemed forty years ago to exclude residential housing.

¹³To produce market output, business firms combine the services of capital assets with material and labor inputs to produce goods and services which yield, directly or indirectly, a flow of utilities to consumers. In measuring results or performance, GNP represents the total value of all goods and services produced, depreciation represents the amount of capital equipment used up in producing these goods and services, and net national product is the total value of output less depreciation. The measurement of net output recognizes the fact that capital assets may be used up in producing a current

ences. First, a much wider range of outputs would be recognized as contributing to economic and social welfare, including some that are free for some countries or regions while only obtainable through the use of scarce resources for others. Second, changes in stocks for a much wider range of assets would be explicitly taken into account, with a resulting tendency to increase or reduce measured net output depending on whether assets were being augmented or reduced as a consequence of activity in the system. For example, deterioration of the physical environment because of various types of pollution—air, water, noise, waste—means that the flow of benefits from this asset has been reduced. Thus, where the process of economic growth deteriorates the physical environment, an augmented set of accounts would register the usual increases in net output resulting from growth in the market sector, but they would also record an offset consisting of the degree to which physical environmental assets had been depreciated, with a consequent reduction in the flow of future benefits.¹⁴

A Preliminary Look at Concepts

Empirical implementation of this suggested structure for economic and social accounts cannot be seriously explored here, but a few of the more far-reaching conceptual changes are worth examining in more detail. Before proceeding, it would be well to recognize the basic value structure ordinarily embedded in economic accounts. The implicit assumption underlying almost all measures of aggregate monetary output is that goods and services are worth their value “at the margin” as determined by the least anxious buyer—not, for example, what they are worth to the average buyer nor what buyers would pay if required. It is also assumed that marginal value is equal to marginal cost as measured by resource inputs. Thus, automobiles are valued at prices like \$3,000 per unit and cans of tomato juice at prices like 30¢ per unit, reflecting an assumption that “at the margin” one automobile could be turned into 10,000 cans of tomato juice in terms of resources required to produce them and in terms of utility to consumers.

Time Allocation in the National Accounts

The valuation of costs and returns implicit in the accounts suggests that the total return to an extra hour of leisure time must, at the margin, be equal to the return from an extra hour of work, provided that consumers have a

flow of goods and services, with a consequent reduction in the capacity to produce future goods and services. If some of the goods produced are themselves capital assets, and if their value exceeds the wearing out of existing assets so that future production of goods and services is enhanced, net output will consist of consumption goods and services plus additions to the stock of assets.

¹⁴ Alternatively, the community might choose to halt or reduce further deterioration, or to reduce accumulated deterioration, by diverting scarce resources to that end. In that case, the flow of benefits from the physical environment would either not be reduced as much as otherwise because environmental assets are more fully maintained or, if the level of accumulated deterioration were actually reduced, environmental assets and the consequent flow of future benefits would be increased because net environmental investment would have taken place.

continuous range of choice about the division of time between work and leisure. Time spent at earning income in the market yields an indirect flow of utilities in the form of purchased goods and services, while time spent at all other activities yields a direct flow of either present or future utilities that should be valued at the market wage rate. The same valuation would presumably apply to time spent in activities designed to maintain human capital (sleeping, eating, etc.), to activities that involve net investment in human capital (studying to increase one's future productivity, or spending time in training one's children so as to increase theirs), or to activities that involve direct consumption benefits (going to a baseball game or to the opera).¹⁵

In principle, we would want to count as output all of the services yielded by the application of human skills to welfare-producing activities. The total returns would constitute gross output, while net output would be the total less the amount of activity required to maintain the stock of human capital. Gross output could include either positive or negative net investment, depending on the extent to which activities added to the stock of skills through additional training or reduced skills because they failed to offset obsolescence and depreciation. At present, the accounts essentially specify that only the application of human skills to activities that result in money earnings are to be counted as output, and no adjustment is made for either positive or negative net investment in the stock of human capital. Hence, students, housewives, hospital volunteers, unpaid members of civic or social agencies, vacationers, and Wednesday afternoon golfers are all presumed to be engaged in nonproductive activity.

The possibilities for anomalies are boundless: we can get some insight into the appropriate treatment by noting some of the characteristics of the existing treatment which are clearly unsatisfactory. For example, according to the present system, output is increased if a woman stops putting in ten hours a week at a remedial reading clinic for ghetto youngsters and begins to work ten hours a week as a dental technician; output will be increased if a clinical health program manned by volunteers becomes funded through a government grant and the volunteers thus receive pay; output is increased if a man who ordinarily takes off one afternoon a week to relax is coerced into earning income during that afternoon; output is reduced if, to cite the traditional case, a man marries his housekeeper; and so on.

¹⁵ Two points should be noted. First, it is not at all clear that the market wage rate is the appropriate measure of productivity in all (any?) nonmarket activities. If people allocate time rationally, however, there is much to be said for adopting that convention as a first approximation.

Second, it is interesting to speculate about the policy implications of the investment in human capital that takes the form of parental training of children. The total amount of this type of investment might well be appreciable compared with the investment in human capital that takes the form of regular schooling. If market wage rates measure the value of parental time inputs, there would necessarily be marked differentials in the amount of such investment by parents in different socioeconomic groups, given equal time inputs. Hence, there would be large differences in the estimated quantities of "capital" with which youngsters begin formal schooling, since they would have been exposed to a large amount of parental "investment" valued at markedly different imputed wage rates. The differential would be even wider if the amount of parental time invested in children were positively correlated with wage rates, as may well be the case. In short, compensatory education might have a very large differential to overcome, perhaps of the order of several years worth of investment in formal schooling.

Another aspect of the current treatment concerns the handling of depreciation and depletion of human skills. An implicit allowance for these factors enters the present accounts because all nonmarket allocations of time are ignored, including blocks of time used for the maintenance of human capital—time spent in sleeping and eating, as suggested above. While these types of activities could be considered as gross output, they are clearly not net output. But consider what would happen if a pill were invented that revitalized and restored the human body and mind in the same way that sleep does but without a time cost of seven or eight hours per day. Under the present system of accounts, this gain of 50 per cent in available time would not increase output except to the extent that the time was used to earn money income in the market. Otherwise, the present accounts would say that nothing has changed.

Finally, what of involuntary idleness? In some respects, the present convention of valuing only time spent at market employment is perfectly adequate: if someone is employed only part-time who would prefer to work full-time, or if someone is wholly unemployed, conventionally measured output is lower than it would otherwise be. Since time allocation is clearly suboptimal when unemployment exists, a welfare-oriented measure should indicate a decline in output. The appropriate treatment, in principle, would put a low or zero value on time spent in being involuntarily underemployed, given the market wage rate: being involuntarily idle is obviously different in a welfare context from choosing not to work on Saturday or on Wednesday afternoon (for pay) and to do something else instead.¹⁶

However, even the present conventions do not take full account of the effect on human capital of long periods of involuntary idleness. Surely one of the major costs of the depression of the 1930's was the erosion of human skills and talent due to prolonged and involuntary inability to use those talents in income-earning jobs. If human capital were recognized by the income accounts, prolonged and involuntary idleness that resulted in an acceleration of depreciation would reduce output to an even greater extent than the loss of currently produced goods and services, because of its effect on the stock of human capital and, in turn, on future output.

Physical and Sociopolitical Environmental Assets

One of the oldest questions troubling income theorists concerns the proper treatment of activities, mainly but not entirely governmental, designed primarily to prevent a reduction in social or economic welfare, e.g., the use of resources for national defense purposes. During the Second World War the United States devoted close to half of its total resources to military purposes: Should this have been considered net output in a welfare sense or a cost of maintaining the social environment? One suggested solution was that government-provided goods and services should be counted as net output to the extent that they were paid for by taxes, on the theory that willingness to pay

¹⁶ Implementation of the "full output" notion thus requires much better information than we now have on the extent of involuntary idleness, defined to mean the difference between the amount of time people would prefer to work in the market, given the wage rate, and the amount they actually work.

taxes indicated a willingness to pay the price (foregone private goods and services) of these services. Hence, in the military output case, the community must place at least as much value on maintenance of the social environment as on the private consumption that could otherwise have been obtained. While this criterion correctly indicates that the community is better off using resources for national defense than not doing so, it does not register the simple fact that a deterioration of the sociopolitical environment will impose costs and thereby reduce welfare. This is to say, using resources for national defense may impose a lower welfare penalty than not doing so, but some welfare penalty cannot be avoided.

In principle, it is thus hard to see the objection to a criterion which says that the costs of maintaining a "given" social and political environment constitutes gross but not net output. A country which needs, or thinks it needs, to spend a quarter of its resources to maintain a military establishment for defense against actual or potential enemies is less well off than one which needs to spend only one-tenth or one-twentieth of its resources in this way, other things being equal. And a shift in the political stability of the world community which results in the need, real or imagined, for all nations to expand military expenditures from 10 to 20 per cent of total output has clearly diminished the social and economic well-being of the entire community.¹⁷

It is not of course only military outlays that fit this category. A community or world that needs to spend more resources on policemen, firemen, burglar alarms, safety locks, night watchmen, etc. is clearly worse off than a community or world in which these outlays can be kept to a minimum. No one buys police or fire protection, or hires night watchmen, because these services

¹⁷ There is an interesting difference between the case in which real or imagined needs for defense cause a country to use x per cent of its resources for military purposes, and the case in which deterioration of the physical environment causes the country to use the same x per cent of resources to control pollution. In the latter case, there is a strong presumption that deterioration of the environment is a direct consequence of the normal functioning and growth of the economy: if so, the accounts clearly overstate the flow of benefits from economic growth unless they include an allowance for the negative by-products of growth.

In the former case, however, it is far from clear that deterioration of the sociopolitical environment, as manifested by the need to maintain a large defense establishment, is a direct consequence of the functioning and growth of the economic and social system. One could conceive of circumstances in which that might be the case; e.g., an aggressor nation that builds up its military strength in order to conquer other countries and thence derive future economic benefits. But in general the causality is unclear.

If the size of a defense establishment is basically unrelated to the functioning of the system but is simply an exogenous event, should one "penalize" the system by registering defense outlays as costs of maintaining the sociopolitical environment? If the objective is to measure social and economic welfare, it seems that the answer should be yes: resources used for defense cannot be used elsewhere, and I cannot see that it matters for purposes of measurement whether defense needs are a cause of one's own actions, are real but exogenous to one's actions, or are wholly imaginary. It does, however, make a great deal of difference for purposes of policy decisions whether or not the system has caused its own defense needs. If this is the case, there is a large hidden cost to a change in social policy that increases the optimum size of the defense establishment, just as there is a large hidden cost to a growth policy that produces deterioration in the physical environment as an inevitable concomitant of growth.

If defense needs are unrelated to economic and social policy, however, the appropriate analogy is to phenomena like earthquakes, floods, and other natural disasters: welfare is willy-nilly reduced, and there is nothing that can be done about it. But the reduction is real and needs to be registered in the accounts.

are desired per se: if there were no crime or fires, and no risk of either, there would be no expenditure on crime or fire prevention and everyone would be better off.¹⁸

It is interesting to contrast these preventive or environmental maintenance activities with those that involve the production of "positive" benefits. The two can be distinguished by asking whether society will always receive additional benefits from devoting additional resources to the activity. In the case of preventive activities, the answer is no: once resources are sufficient to reduce the level and risk of damage to zero (i.e., once we have hired enough policemen) no benefit accrues from hiring more. But this would not be true of resources devoted to producing houses or operas or baseball games: there is no natural limit to the amount of resources that will yield additional benefits in the aggregate for these activities, although there is of course a zero marginal utility point for any specific product and individual.

This analysis has quantitatively important implications for the measurement of net output. Not only do we in the United States spend a large fraction of total output on national defense and related activities, but it appears we have also been spending a growing proportion of output on public and private preventive activities of various sorts—policemen, firemen, private guards, weapons, safety locks, etc.

The analytically appropriate treatment is to view the social and political environment as an asset which yields direct consumption benefits in and of itself and also permits other productive activities to be carried on without interference. Like any asset, the social and political environment can deteriorate or depreciate, and it may do so for reasons having no causal association with activities designed to increase material well-being. Expenditures required to "maintain the asset intact" would thus constitute gross but not net output of the system. In the case discussed above, wars, crimes, and fires are some specific manifestations (costs) of environmental deterioration, while resources spent to suppress these manifestations must be presumed to have enabled environmental assets to be better maintained than in their absence. Thus, "depreciation" of the asset "sociopolitical environment" can be estimated as the *sum* of two components: first, costs imposed by the amount of deterioration that has been permitted to occur (as reflected by the damage resulting from crimes, fires, wars, etc.); second, costs incurred to maintain the asset at its present level (the resources represented by the services of policemen, firemen, members of the Armed Forces, etc.). In the absence of maintenance expenditures, or in the event of their reduction, it must be presumed that the asset would deteriorate further and that the costs represented by the specific manifestations of deterioration would thus increase. Optimum social policy, of course, consists of equating at the margin the cost functions associated with these two activities.

Before proceeding to examine similar problems relating to the physical environment—air and water pollution, waste accumulation, etc.—it is worth

¹⁸ The relevant class of activities actually extends far beyond the national or personal security outlays discussed here. For example, resources used for medical care are largely in the same category: few people go to hospitals because they enjoy the rest and the good food!

noting that the distinction between gross and net output is a much more treacherous problem in social and economic accounts than is generally realized. To be precise, much of what economists have always considered to be output might be described more appropriately as intermediate product (a cost of producing output) rather than net output. As a simple illustration, take the treatment of laundry services—washing machines, clothes dryers, commercial laundromats, cleaning establishments, and so forth. Conventional income accounts treat outlays for these products and services as current consumption. But they really comprise a collection of inputs designed to maintain a stock of clothing at a given level of cleanliness and neatness. The real “net output” associated with these expenditures is not the expenditure itself but the flow of utility that comes from wearing clothes that are clean and pressed rather than soiled and rumpled. Evidently, if clean clothes could be obtained without the need to incur these costs, real output would not be reduced at all. Thus, the accounts should in principle treat the stock of clean clothes as an asset, the amount of dirt and other foreign matter introduced into clean clothes by the normal process of wearing them (or by living in a heavily polluted urban environment) as depreciation, and expenditures for laundries, dry cleaning, and washing machines as costs associated with maintaining the asset.

Physical Environment

By now the appropriate analytical treatment of the much-discussed subject of environmental pollution should be evident. A community starts off with some stock of environmental assets—air and water of a certain degree of purity, roads that are free of abandoned cars, playgrounds and streets free of discarded newspapers, broken bottles, and so forth. As a (perhaps inevitable) part of the process of industrialization and economic growth, these environmental assets tend to deteriorate or depreciate, thus reducing the flow of benefits from environmental assets. Expenditures designed to slow down or reduce deterioration are clearly costs associated with the maintenance of the asset rather than an output of the system. As with the sociopolitical environment discussed earlier, the full cost of deterioration is the sum of the reduced yield on the asset plus any costs incurred to prevent even greater deterioration.¹⁹

It is not easy to see how, in practice, one would measure the social and economic costs of environmental deterioration. One possibility is to estimate the cost of restoring the environment to some specified (previously attained?) level of purity, viewing these costs as a measure of the welfare loss from the actual level of deterioration. This procedure would almost certainly tend to overstate the true cost: The welfare loss from deterioration is likely to be an increasing function of the amount of deterioration, while the costs of prevent-

¹⁹ Alternatively, one could view industrialization and economic growth as producing a series of dis-products and dis-services—various kinds of impurities and undesired products introduced into the physical environment and left there. In the absence of expenditures designed to reduce environmental deterioration, real net output is decreased by the negative value of these dis-products and dis-services.

ing deterioration are likely to rise sharply as the zero deterioration level is approached. That is, at very low levels of pollution, an increase in the amount of pollutant probably involves little or no welfare loss at the margin, but the loss is likely to rise rapidly as the pollution level increases to the point where discomfort, illness, or death begin to appear. And the marginal costs of removing the first 10 per cent of existing pollutants is likely to be small compared with the costs of getting rid of the last 10 per cent once 90 per cent has been removed. Hence, it might not be socially worthwhile to bring the environment back to some "100 per cent pure" state, given the probable high costs and modest benefits realized from removing the last small amount of impurity and the competing demands for resources.

Social and Physical Environment: Some Comparisons

As indicated above, the conceptually appropriate treatment for the contribution of sociopolitical and physical environmental assets is much the same. But there are some interesting differences in the problems associated with these two types of environments, and some of these differences can be usefully discussed even in the absence of quantitative information.

One of the differences can be illustrated by asking the question: What is the likely time-path of changes in real output, given that either of these environments has initially been permitted to deteriorate? That is, if the sociopolitical environment has deteriorated by x per cent (measured somehow), what will it take to restore that environment to its original state, and is the relationship different for the sociopolitical than for the physical environment?

It is more difficult to analyze the sociopolitical than the physical environment, since we know much less about the factors that influence or change it. It might be argued that deterioration of the sociopolitical environment, once permitted to begin, has a greater tendency to be cumulative and is more difficult to reverse. To illustrate, in recent years there appears to have been a marked increase both in the incidence of illegal activity and in air and water pollution.²⁰ Both are a manifestation of environmental deterioration—the first in the sociopolitical environment, the second in the physical environment. But the deterioration reflected by rising crime rates seems more likely to be self-reinforcing: Behavior that reflects an increasing irresponsibility toward persons or property is likely to encourage similar behavior on the part of others, simply because near-universal disapproval may be one of the major inhibiting forces to begin with. Thus one would argue that a rising rate of illegal activity will, in and of itself, produce a change in the social and political environment which will lead to a further rise, other things being equal. And to the extent that the basic sanction against illegal activity is widespread disapproval in the community, a reduction in the pervasiveness of disapproval will itself tend to increase the amount of disapproved activities. Moreover, if this change in environment is ignored by society, it is hard to see any reason

²⁰ The empirical facts are not entirely clear in either case, especially for the incidence of illegal activity. We are certainly more aware now of both types of deterioration, but that is a different proposition from knowing that the situation has objectively deteriorated.

for stabilization or reversal. Even if its basic causes were to be removed or alleviated, it might reasonably be expected that the sociopolitical environment would continue to deteriorate.

In the physical environment, in contrast, the same cumulative process may not be at work. An increased level of air pollution is a consequence of the fact that, in the absence of an appropriate penalty structure, various sorts of productive activities are conducted so as to expel waste materials into the atmosphere. Because productive activities tend to be concentrated geographically, the result is an atmosphere that is contaminated to a perceptible degree at selected (mainly urban) locations. But these concentrations of contaminants are continually in the process of being dispersed and diffused by natural forces. If contaminants were to be evenly spread over the entire atmosphere, the resulting contamination level would probably be so low that the welfare loss could safely be ignored. Assuming this to be the case at present (and foreseeable?) contamination levels, a worsening of the physical environment thus means that new contaminants are being injected into selected local areas at a greater rate than existing contaminants in these areas are being dispersed, a situation that might be remedied fairly easily and at moderate cost.

Suppose, for example, that a penalty structure were introduced which succeeded only in reducing the injection rate of new contaminants to the point where it was lower than the dispersal rate of existing ones. That change would be sufficient to reduce the contamination level, and the reduction would continue as long as more contaminants were being dispersed than were newly injected. If this analysis is correct, air pollution constitutes a self-liquidating rather than a self-perpetuating or cumulative type of deterioration.

Much the same argument applies to water pollution, where natural regenerative processes at work in most bodies of water have a persistent tendency to reduce pollution. The pollution level is increased only if more new pollutants are injected than are being removed through these natural processes. Thus, to reduce the pollution level, it may be sufficient to reduce the injection rate of new pollutants.²¹

It may thus be the case that the social and economic cost of a given amount of environmental deterioration is greater for the sociopolitical environment than for the physical environment. Not only might deterioration in the physical environment be arrested by simply cutting back on the amount of impurities being currently injected, but the methods of controlling deterioration are likely to be much better understood because they are essentially technical and scientific rather than behavioral. That is to say, society clearly has enough knowledge to reduce at least certain types of environmental deterioration to lower levels than at present: what is lacking is simply a political decision to

²¹ This analysis, of necessity, greatly oversimplifies the problems of deterioration in the physical environment. For example, the dispersal rate of existing pollutants may be so slow that the injection rate of new pollutants might have to be reduced virtually to zero. Also, certain types of long-lived pollutants appear to move from one part of the physical environment to another and to produce cumulative effects that have not yet been fully registered: DDT seems to be a case in point. Finally, the "natural regenerative processes," which are clearly at work in many instances, can probably be rendered inoperative if pollution levels get to be sufficiently high. In that case, deterioration will either not be self-liquidating at all, or the process of regeneration will take so long that it will amount to the same thing for practical purposes.

incur the costs needed to realize that objective. But for the sociopolitical environment, not only do we probably need to do more than simply reduce new sources of social and political discontent below what they have been, but we may need to go a good deal further in order to overcome the cumulative effects of past social and political discontents. Moreover, we know much less about the relevant technology—the probable consequences of programs designed to change the sociopolitical environment—and thus we know less about how to use resources in order to achieve the desired objective.²² Hence, the great public outcry over environmental pollution, and the interest and energy with which that problem is being attacked, may represent a misplaced emphasis. It might be much more important to concern ourselves with deterioration in the sociopolitical environment than in the physical environment.

²² This proposition is discussed in F. Thomas Juster, "Microdata, Economic Research, and the Production of Economic Knowledge," in *Papers and Proceedings of the American Economic Association*, May 1970.