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MISUSE AND USE OF NATIONAL ACCOUNTS AS A WELFARE INDICATOR: SELECTED ANALYTICAL AND MEASUREMENT ISSUES

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Few economic relationships have been as scrutinized as that between SNA measures of national product, investment and consumption, and welfare. The present paper contrasts SNA economic production and welfare to total production and welfare within the Walrasian framework of usefulness and costliness. An evaluation of deductions and additions to the SNA made by Nordhaus-Tobin, Zolotas, Richard and Nancy Ruggles, Kendrick, Eisner and Jorgenson-Fraumeni, in their research on extended product and income accounts and improved indicators of welfare reveals numerous unresolved analytical and measurement issues; and reaffirms the usefulness of the SNA as a fundamental, initial, welfare indicator.

> "By social wealth I mean all things, material or immaterial ..., that are scarce, that is to say, on the one hand, useful to us and, on the other hand, only available to us in limited quantity."
>
> Léon Walras, 1984: 65

1. INTRODUCTION

There are a number of conceptual, analytical and measurement issues that need to be addressed in trying to link production, income and consumption, as defined by the System of National Accounts (SNA), and welfare, as perceived subjectively by members of a society. In order to understand the relationship between the SNA aggregate variables and total welfare, it is necessary to clarify these issues and define certain notions.

The first step in the attempt to link these notions involves an examination of the concept of production. Postponing until later a precise definition and examination of its meaning, total production (P) in a society is regarded as the sum of economic production (P_e) and free production (P_f), i.e. $P = P_e + P_f$. Furthermore, economic production (P_e) is the sum of SNA market production (P_n) and non-SNA non-market economic production (P_0), i.e. $P_e = P_n + P_0$. Economic production is a subset of total production. Furthermore, SNA-production is a subset of both total and economic production. The "other," missing from the SNA, non-market economic production has the fundamental feature and characteristic that it is real, utilizing scarce, non-market resources to produce an output capable of satisfying human needs.

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The second step in trying to untangle the major analytical and measurement issues that arise when SNA production, income and consumption are used as indicators of welfare is an examination of the notion of welfare. Delaying until later an explanation of its meaning, total welfare (W), which is used here as a synonym to well-being, utility and satisfaction, is considered as the sum of economic welfare (W_e), which is generated by the satisfaction of needs through economic production, and free welfare (W_f), which is the satisfaction of needs generated through free production, i.e. $W = W_e + W_f$. Furthermore, economic welfare (W_e) is the sum of welfare generated by the satisfaction of needs through SNA-type production (W_n) and non-SNA-type production (W_0), i.e. $W_e = W_n + W_0$.

As a third step, an attempt is made to match the production concepts with the welfare concepts. Total production is defined to be approximately equal to total welfare, i.e. $P \cong W$. Free production is approximately equal to free welfare, i.e. $P_f \cong W_f$. Economic production approximately equals economic welfare, i.e. $P_e \cong W_e$, and finally, SNA-type production gives rise to SNA-type welfare.

A summary of these relationships is presented in Table 1

TABLE 1

A. Total Production = A1 + A2	≅	B. Total Welfare = B1 + B2
A1. Economic Production = A1a + A1b	≅	B1. Economic Welfare = B1a + B1b
A1a. SNA-Production	≅	B1a. SNA-Welfare
A1b. Non-SNA Production	≅	B1b. Non-SNA Welfare
A2. Free Production	≅	B2. Free Welfare

Thus, estimates of SNA-type production, income and consumption can merely serve as an indicator of SNA-type economic welfare, i.e. that arising from the satisfaction of needs through a flow of output captured and measured by the SNA. SNA-based output, income and consumption estimates are not prepared in order to serve as an indicator of total or even economic welfare.

As economic development materializes both total welfare and the share of economic as well as SNA welfare in total welfare are likely to rise. Assuming total welfare to be equal to 100 percent, SNA economic welfare is likely to rise from even less than 10 percent or 20 percent, in early stages of economic development, to 40 percent, 50 percent, or 60 percent in later ones as an increasing amount of the so-called free "goods" is being replaced by "economic commodities." Furthermore, since both free production-welfare as well as non-SNA economic production-welfare vary both in absolute terms and as percentages of total welfare among nations at the same point in time and within each nation at different points in time, SNA production-welfare is not necessarily a faultless indicator of either the level or differences of total or economic welfare among or within economies. However, in the absence of an ideal or better measure of either total or just economic welfare, SNA production remains the best available indicator of levels, growth rates and differences of SNA welfare between and within nations. With "other things being equal," it may also serve as a useful, albeit indirect, indicator

of levels, growth rates and differences of economic as well as total welfare between and within nations. However, the SNA estimates were *never* intended to be anything more than an indicator of market-based and -oriented production, income and consumption and, possibly indirectly, of related welfare.

To recapitulate, the initial *SNA economic welfare* (SEW), or basic, market-based SNA-Satisfaction of Needs (SSN), is achieved as needs are satisfied through production and consumption of commodities included in the SNA. A second, more comprehensive, level of *total economic welfare* (TEW), or Total Economic Satisfaction of Needs (TESN), is attained as an increased number of needs is satisfied through the combined flow of market-based SNA as well as not-for-the-market, non-SNA production and consumption. The third, final and highest level of *total social welfare* (TSW), or Total Economic and Free Satisfaction of Needs (TEFSN), is achieved as an even larger number of needs is satisfied through the combined flow of economic and free production and consumption of commodities. This level is achieved by including the free welfare and satisfaction of needs as a consequence of production and consumption of such free commodities as air, water, sun, shelter, food and so forth.

Once the size of the pie, be it of SNA, economic or total production, is established ("measured"), a correspondence is obtained between production and welfare. From the value of production, we infer a corresponding ordinal value of welfare. A larger pie leads to larger welfare, other things, such as the distribution of income, being equal. In either case, it is the objective, observable satisfaction of needs that would be measured. No attempt or claim is made of measuring the subjective, unobservable degree or intensity of satisfaction.

The primary challenge is to implement an improved system of national accounts throughout the world. Furthermore, preparation of satellite accounts of non-SNA production could lead to improved estimates of output and indicators of welfare.

In sections 2 and 3 of this paper are discussed some of the analytical and measurement issues that pertain to the use and misuse of the SNA or the national income and product accounts (NIPAs) of the Bureau of Economic Analysis of the U.S. Department of Commerce as a welfare indicator. These either have been examined in recent years in the well-known, important contributions by Nordhaus–Tobin (1972), Eisner (1978, 1985, 1988, 1989), Kendrick (1979, 1987), Zolotas (1981), Ruggles and Ruggles (1982) and Jorgenson–Fraumeni (1988) and/or need to be in the future the subject of further major research efforts.

This paper does not address the index number or the aggregation problem. Instead, it deals with what can be called the "components" problem, i.e. the problem of determining which components belong and, therefore, should be included in the diverse production, income, consumption, investment and the corresponding welfare boundaries. Analytically, a two-step approach is utilized. First, explicitly formulated criteria are used to define and delimit the components of the distinct boundaries. Second, with various combinations of components forming distinct production, income and consumption boundaries, whenever appropriate, their correspondence-equivalence to welfare boundaries is ascertained.

2. The Usefulness Dimension of the Production, Consumption and Welfare Boundaries

Repeated reference has already been made to the concepts of production and welfare. At this point, an attempt is made to identify and focus on the criteria that have implicitly or explicitly been used to define and delineate the boundaries of production, income, consumption and welfare.

According to Léon Walras, production of economic commodities (his term is social wealth) includes "all things, material or immaterial ..., that are scarce, that is to say, on the one hand, useful to us and, on the other hand, only available to us in limited quantity" (underlining is in the original) (Walras, 1984: 65). In the aforementioned paragraph, Walras explicitly introduces, through the concept of scarcity, two fundamental criteria that have been used in defining the production boundary. These are the usefulness and the cost criteria.

The Usefulness Criterion

According to the first criterion, a demand one, which henceforth will be referred to as the "usefulness criterion," for a commodity to be included in the production boundary, it must be useful. And, "things are useful ... whenever they are seen as capable of satisfying a want" (Walras, 1984: 65). Production materializes whenever commodities can lead to an economic transformation by satisfying a need, i.e. give rise directly, or indirectly through investment, to consumption. The satisfaction of a need materializes as a commodity is partially or totally used up or consumed.[1] A positive economic transformation occurs as, and because, a need is satisfied. A negative economic transformation occurs as, and because, the commodity that satisfies the need undergoes a change, i.e. it is used up through consumption. Thus, the first criterion used in defining the production boundary is that of usefulness of a commodity as measured by its ability to contribute to welfare through the synchronous satisfaction of needs and its own demise through consumption.

The Strong Usefulness Criterion

Walras, however, does not stop here. He distances himself from Adam Smith, David Ricardo and John Stuart Mill, by formulating the "strong usefulness" criterion, according to which the production boundary is defined to include all commodities capable of satisfying needs irrespectively of the nature of either the need or the commodity. The nature of the need should be of no concern.

> "... we need not concern ourselves with the morality or immorality of any desire which a useful thing answers or serves to satisfy. From other points of view the question of whether a drug is wanted by a doctor to

[1]The meaning of the term "commodity" follows the definition provided by Mamalakis (1989, Ch.15, 803–33). Along the lines of the Mamalakis theory of composite commodities and services (Mamalakis, 1989, Ch.15, 803–33), it stands for a product embodying value added by "service," i.e. providing an intangible (non-physical) economic transformation, as well as "goods," i.e. providing a tangible (physical) economic transformation, activities. Thus, all commodities are considered to be multidimensional and composite, i.e. inevitably embody value added by two or more service and/or goods activities.

cure a patient, or by a murderer to kill his family is a very serious matter, but from our point of view, it is totally irrelevant. So far as we are concerned, the drug is useful in both cases, and may even be more so in the latter case than in the former" (Walras, 1984: 65).

If we accept the "strong usefulness" or generalized economic transformation criterion, as articulated by Walras, the legal or illegal, moral or immoral, ethical or unethical, productive or unproductive nature of needs, expenditures, output and commodities should be of no concern in making national accounts product and income estimates. All final consumer or capital economic commodities should be part of production.

Since any attempt to bend the strong usefulness criterion in defining the production boundary is likely to open a Pandora's box of other problems, any downward adjustments in the "strong-SNA" production estimates on grounds that commodities and their production are immoral, illegal, regrettable, unproductive, instrumental, curative or unethical may be counterproductive. The goal of the new SNA should be to make product, income and consumption estimates on the basis of the strong usefulness criterion, without exceptions based on the criterion of the "nature" of need, commodities, activities and output. Whether the strong usefulness criterion should be relaxed whenever an attempt is made to transform the SNA output, income and consumption estimates into welfare indicators is a hotly debated research topic that will be addressed in the following sections.

The Weak Usefulness or Nature of Product Criterion

Nordhaus–Tobin, Zolotas and Eisner object to the use of the Walrasian strong usefulness criterion, according to which the nature of a need or commodity is irrelevant in measuring its economic usefulness. Instead, they propose what henceforth will be referred to as the "weak usefulness" criterion, according to which the nature of a need-commodity pivotally determines its usefulness, i.e. its welfare promoting capacity.

The weak usefulness criterion was adopted by William Nordhaus and James Tobin when in their 1972 essay "Is Growth Obsolete?" they constructed "a primitive and experimental 'measure of economic welfare' (MEW)" (N–T, 1972: 4) as a tool to reconcile discrepancies between GNP and economic welfare. It was also taken up in 1981 by Xenophon Zolotas when he constructed, in his monograph *Economic Growth and Declining Social Welfare*, "an index of the economic aspects of welfare (the (EAW-index) . . . depicting the full range of actual changes in a society's quantifiable well-being, regardless of whether or not these changes are the outcome of economic transactions" (Zolotas, 1981: 43). Robert Eisner also introduced, but to a much lesser extent than N-T and Zolotas, a version of the weak usefulness criterion in preparing his "total incomes system of accounts" (TISA) (Eisner, 1978, 1985, 1988, 1989).

Comprehensive deductions from SNA consumption are thus primarily made by Nordhaus–Tobin and Zolotas and, to a lesser extent, by Eisner. Jorgenson–Fraumeni (1988), Kendrick (1979, 1987) and the Ruggleses (1982) also make a

deduction for private household expenditures for consumer durables. The discussion that follows therefore concentrates on the work and the issues raised by Nordhaus–Tobin and Zolotas, who have adopted the "weak nature of the product" usefulness criterion more than anyone else working on the link between products accounts and welfare, with references to the work of Eisner, Jorgenson–Fraumeni, Kendrick and the Ruggleses whenever appropriate.

The Nordhaus–Tobin "Measure of Economic Welfare" (MEW) Deductions.

According to the weak usefulness criterion, the "nature" of a need-commodity is used in at least three different ways as a discriminating device to weed out SNA components that presumably do not contribute to welfare. First, total production is reduced by all or part of capital goods production since investment does not contribute directly to consumption. Thus, in principle, commodities which by their nature are considered as either replacement or new investment are excluded from the welfare-promoting consumption boundary. Second, all or part of collective consumption (government expenditures) is excluded from welfare promoting consumption as not being necessarily useful. Third, even private consumption is adjusted downwards by excluding items which allegedly do not contribute to welfare.

Thus, according to the weak usefulness criterion, the consumption boundary that serves as a welfare indicator excludes investment, most of collective consumption and even part of private consumption. We turn next to a discussion of these adjustments.

The Investment Deduction

The first step by N–T in moving from GNP to sustainable MEW is to deduct capital consumption and thus obtain net national product (NNP). In constructing their "measure of economic welfare" (MEW) as "a comprehensive measure of the annual real consumption of households" (N–T, 1972: 24), Nordhaus–Tobin adopt a dual treatment of investment. Their actual MEW (MEW-A) "excludes all final output actually devoted to capital replacement and accumulation" (N–T, 1972: 24). Actual welfare is determined exclusively by actual consumption. In contrast, sustainable MEW (MEW-S) which "is the amount of consumption in any year that is consistent with sustained steady growth in per capita consumption at the trend rate of technological progress" (N–T, 1972: 24), "excludes the capital expenditures needed to sustain the capital-output ratio. It allows for capital depreciation, for equipping new members of the labor force, and for increasing capital per worker at the trend rate of productivity change" (N–T, 1972: 24–5). They add, however, the value of services of public and private capital.

Even if it is accepted that only immediate, present consumption generates welfare, exclusion of either capital consumption or gross investment from GNP or GDP assumes that consumption and investment are largely competitive when in reality they are largely complementary. In other words, total or per capita production may be as good a measure of economic welfare as gross or per capita consumption. Investment may contribute only indirectly to consumption. However, the time distance between investment and welfare-promoting consumption

may be so short that its contribution may be considered for all practical purposes immediate and direct. Subjective welfare of a society may be determined more by the level and growth of GNP, which determine how much households can consume *and* save, than just present consumption. Furthermore, household welfare is determined by total income rather than just present consumption. Assigning zero or little utility to saving, as Nordhaus–Tobin seem to have done, involves a major contradiction. Saving increases lifetime consumption which indeed is the best measure of welfare. It should be noted that N–T exclude all or part of investment from the consumption boundary used as a welfare indicator, but not from the production boundary.

The Collective Consumption Deduction. Deduction of Collective Consumption Considered Collective Investment

Their second step is far more drastic and questionable. In trying to reach sustainable MEW N–T deduct from NNP much of government consumption (production of collective commodities). They make three adjustments in government purchases: First, "government purchases of goods and services" (N–T, 1972: 26) that are counted as final output are reduced by the "replacement and accumulation of capital contributing to future consumption possibilities" (N–T, 1972: 26). Nordhaus–Tobin "have counted as gross investment only items that raise productivity (education, medicine, public health) or yield services directly consumed by households (housing, transportation). Investment so defined represents 65 percent of government purchases in 1929 and 43 percent in 1965" (N–T: 27–8). The negative impact on final output of this adjustment is reduced whenever "imputations for the consumption of the services of government capital are necessary" (N–T, 1972: 28). Thus, 65 percent of the intangible output of government in 1929 and 43 percent in 1965 is reclassified from intangible collective consumption to intangible collective investment. Subsequently, an offsetting imputation for the consumption of the services of government capital is made. This reflects a major surgery in the traditional SNA. Within the SNA, capital goods are normally defined as commodities produced and sold by enterprises on the market that provide factor-type services over two or more yearly accounting periods and are used as an input to produce collective, semi-public or private commodities. Government expenditures classified as investment by N–T are none of these: they are not produced and sold on the market (their value, at best, is cost based); they do not provide factor-type services over two or more accounting periods, and they are not used by other "buyers" to produce collective, semi-public or private commodities.

There exist here two separate methodological issues. The first pertains to the nature of the collective output of public administration and defense. The second pertains to the nature of the "intermediate inputs" purchased by public administration and defense in producing their respective collective products.

Let us first address the second issue. There exists little, if any, disagreement that "collective services," such as public administration and defense, are produced by using labor, land and capital services as well as intermediate inputs. Consequently, it is also agreed upon that some government input expenditures or costs,

which up to now have been classified first, on the input side, as intermediate consumption and then, on the output side, as final consumption, are indeed investment, i.e. purchases of producer durables and, therefore, should be classified as such. As long as capital goods, which are acquired by producers of collective services such as public administration and defense, or by producers of semipublic services such as health and education, have the same characteristics and are subjected to the same "production use" as those acquired by state or private business enterprises, there is no reason why they should not be treated uniformly as investment.

It is the first issue, which pertains to the nature of the collective output produced by public administration and defense, with the help of capital goods services, that raises significant methodological and measurement questions. According to N–T it is only the minuscule subsidy of the post office and recreation outlays that can be considered as welfare-promoting collective consumption. The largest segment of "collective services" is investment or "capital goods." This argument is, to say the least, highly ambiguous. These "capital collective services or goods" are neither marketable nor, in any clear-cut manner, a capital input providing factor services in the production of other collective, semipublic or private commodities. The N–T reclassification of part of collective output from collective consumption to collective investment is far too ambiguous to be acceptable at this moment.

Deduction of Collective Regrettables

Second, final government expenditures (purchases or collective consumption) are reduced by "'regrettable' outlays that use resources for national purposes other than consumption or capital formation supportive of future consumption," (N–T, 1972: 26). "'Regrettables' represent final expenditures—made for reasons of national security, prestige, or diplomacy—which in our judgment do not directly increase the economic welfare of households" (N–T, 1972: 28). The most important regrettable final expenditure according to Nordhaus–Tobin is national defense. Eisner (1988: 1650) also deducts expenditures for national defense and police, but on the grounds that they are intermediate rather than regrettable in nature.

Thus, the weak usefulness criterion is used as an instrument to exclude from the production, expenditure, consumption, activity, commodity and need boundaries those segments of government consumption which are considered as regrettable (N–T), undesirable, unproductive, illegal, corrective (Zolotas) or useless, i.e. do not contribute to economic welfare.

Nordhaus–Tobin exclude defense expenditures, i.e. the collective service of defense, first, because "no reasonable country (or household) buys 'national defense' for its own sake" (N–T, 1972: 7) and, second, because "defense expenditures are input rather than output data" (N–T, 1972: 8). "The only judgment we make is that these expenditures yield no direct satisfactions" (N–T, 1972: 8). By dividing countries into reasonable–unreasonable and output into regrettable–nonregrettable, Nordhaus–Tobin violate the Walrasian strong usefulness criterion. However, contrary to N–T, and as the recent upheavals in Iraq, former Yugoslavia, Lebanon, Africa, and the former Soviet Union seem to indicate,

public administration and defense expenditures yield direct and immediate satisfaction in the form of peace and security. Indeed, the collective services of public administration and defense may be the most productive and least regrettable flow of consumer output in an economy. Without the complementary production of the collective services of law and order, private consumption may not be feasible let alone be the sole foundation of welfare. We will return to the relationship between collective and private consumption later on in this section.

Third, final output is reduced by those government purchases which Nordhaus–Tobin consider as "intermediate goods and services instrumental to final production" (N–T, 1972: 27). The clearest item in this category arises "when the government is providing direct services or materials to business enterprises. It also includes more diffuse instrumental outlays: the costs of maintaining a sanitary and safe natural and social environment" (N–T: 28).

Deductions from Private Consumption

In addition to discarding a major part of collective consumption as regrettable, Nordhaus–Tobin use the weak usefulness criterion to eliminate regrettable, instrumental or disamenity components from SNA private consumption. They adjust private consumption downwards by the amount of "(a) personal business expenses and one-fifth of personal transportation expenses" which are "regarded as intermediate or instrumental" (N–T, 1972: 28) "(b) Educational and medical outlays" which "are regarded as gross investments" and by "(c) All outlays for consumer durables, not just purchases of residences," which "are treated as investments." However, consumption and total output (expenditures) are adjusted upwards as "imputations are made for those services of consumer capital that are directly consumed" (N–T, 1972: 28–9). "The costs of commuting to work" (N–T, 1972: 7) "are only instrumental" (N–T, 1972: 7), "they are regrettably necessary inputs to activities that may yield utility" (N–T, 1972: 7). "Some government 'purchases' are also of this nature—for example, police services, sanitation services, road maintenance, national defense" (N–T, 1972: 7). Each of these three N–T deductions will be discussed in subsequent sections of this paper.

It is worth noting that the regrettables of Nordhaus–Tobin are neither consumption nor investment, they are in an analytical vacuum. In using the weak usefulness criterion, Nordhaus–Tobin join a similarly minded distinguished group of scholars which includes François Quesnay, according to whom all nonagricultural expenditures are "sterile" [Quesnay, 1972: viii] and Adam Smith, according to whom all services are unproductive: "The sovereign, for example, with all the officers both of justice and war who serve under him, the whole army and navy, are unproductive labourers. ... In the same class must be ranked ... churchmen, lawyers, physicians, men of letters of all kind; players, buffoons, musicians, opera-singers, opera-dancers, ..." [Smith, 1976: 352].

Deduction of Disamenities of Urbanization

In addition, according to Nordhaus–Tobin:

"Many of the negative 'externalities' of economic growth are connected with urbanization and congestion. The secular advances recorded in

> NNP figures have accompanied a vast migration from rural agriculture to urban industry ... But some portion of the higher earnings of urban residents may simply be compensation for the disamenities of urban life and work. If so we should not count as a gain of welfare the full increments of NNP that result from moving a man from farm or small town to city. The persistent association of higher wages with higher population densities offers one method of estimating the costs of urban life as they are valued by people making residential and occupational decisions.
>
> ... we have tried to estimate by cross-sectional regressions the income differentials necessary to hold people in localities with greater population densities. The resulting estimates of the disamenity costs of urbanization ... (are) quite substantial, running about 5 percent of GNP" (Nordhaus–Tobin, 1972: 13).

Nordhaus–Tobin's disamenities of urbanization, which amount to a 5 percent reduction from GNP, raise serious analytical and measurement issues. The so-called negative "externalities" of urbanization and congestion may just reflect a reduction in such free goods as air, low population density, proximity to work and so forth. The higher urban wages may to a large extent reflect a shift from free rural production to scarce, economic urban production. Only to the extent that the "new, urban economic production" falls short of the "original, free rural production" enjoyed by the migrants would there be a disamenity. However, there exists an even more serious objection. There may exist significant amenities of urbanization and equally significant rural disamenities that are not captured by the GNP figures. If that is the case, the negative disamenity of urbanization of Nordhaus–Tobin may not exist; instead there may exist an amenity of urbanization not measured by GNP figures. Should that be true, in order to obtain an adequate measure of social welfare it may be necessary to introduce a positive amenity adjustment to urban GNP and a negative disamenity adjustment to rural GNP. Since the issues related to amenities or disamenities of urbanization or rural life need substantial additional research before they can be settled, it is premature, in seeking a measure of welfare, to introduce adjustments to the GNP of the nature recommended by Nordhaus–Tobin.

The Nordhaus–Tobin "measure of economic welfare" (MEW) is really not an accurate measure of *economic* welfare since it explicitly excludes major, vital economic, i.e. useful and costly, components of production as well as consumption which they describe as regrettable.

The Zolotas "Economic Aspects of Welfare" (EAW) Deductions

In preparing his measure of "economic aspects of welfare" (EAW), Xenophon Zolotas (1981) also abandons the Walrasian strong in favor of his own version of the weak usefulness criterion. Like N-T, Zolotas bases his EAW on private consumption instead of GNP. He excludes investment as well as collective consumption because "specifically, expenditures on national defense, police services, fire department activities, etc., are corrective" (Zolotas, 1981: 44). Furthermore, Zolotas deducts from private consumption the private expenditures on

consumer durables, private expenditures on advertising, the cost of resource depletion, the private cost of environmental pollution, the private cost on commuting and private expenditures on health and education. Each of Zolotas' six deductions, which reflect legitimate concerns about the appropriateness of using SNA macro variables as indicators of welfare, needs to be carefully evaluated.

Deduction of Private Household Expenditures on Consumer Durables

The first deduction from private consumption is that of private household expenditures on consumer durables. In turn, consumption of services provided by these durables is added back. Since, in addition to Zolotas, also Nordhaus–Tobin (1972), Eisner (1978, 1985, 1988, 1989), Ruggles and Ruggles (1982), Kendrick (1979, 1987) and Jorgenson–Fraumeni (1988) make similar deductions and adjustments, the following comments are directed to their work as well.

If the SNA market transactions criterion is adopted, only those private household expenditures on consumer durables that are utilized by households for market production are considered investment and are deducted from private consumption. In other words, only those "consumer" durables, which effectively are household for-market-use *producer* durables, are shifted out of the household consumption boundary and into the household production boundary by being considered investment. All other private household expenditures on consumer durables are treated as consumption. Ideally, SNA household production using such durables should be accompanied, within a production function framework, by estimates of compensation of employees, consumption of "fixed" capital, intermediate consumption and operating surplus.

If the SNA transactions principle is abandoned and a household non-market production function framework is adopted, those household expenditures on consumer durables that are used for own account nonmarket production would be considered investment, would be added to the household capital stock, would be amortized and the imputed capital factor services would be part of a ficticious, nonmarket, household operating surplus. In addition, however, some household expenditures that are complementary to those on durables, which were previously considered as final consumption, would now have to be reclassified as intermediate. As a rule of thumb, all household purchases of nondurable commodities, which are either used up in household production or are subjected to further economic transformation before they can be consumed, would have to be reclassified from final consumption into the category of intermediate inputs. Finally, an imputation for final own account, nonmarket household consumption would have to be matched by corresponding actual intermediate consumption and imputations for compensation of employees, consumption of capital and operating surplus by households.

In agreement with Nordhaus–Tobin and most other authors who view household expenditures on consumer durables as investment, Zolotas argues that "the services from these goods do, however, contribute to personal welfare and are therefore added as annual flows to the EAW-index, just as in the case of services from public capital" (Zolotas, 1981: 97). However, the factor-type services of both household and government capital are only one of the inputs producing the

welfare-determining household or government output value. Exclusive or partial use of such capital services as a measure of output and as an indicator of welfare could lead to significant underestimates of both. Even though it may represent a first step in the right direction, the positive adjustment for capital services is inadequate and indeed, maybe, misleading.

Before nonmarket household production can form a solid building block in measuring economic welfare, and, possibly, be integrated into the SNA, it would be necessary to resolve the formidable methodological and measurement problems encountered in making estimates or imputations of household output and inputs. Even though they represent a valiant effort, estimates of nonmarket household production which are constructed by combining an input-type "services of consumer capital imputation" with an output-type "imputation for nonmarket activities" (Nordhaus–Tobin, 1972: Table 1, p.10 or Table A.16, p.52) are too speculative to form a reliable addition to SNA figures. They need to be improved significantly before being able to serve as a solid link between SNA and total economic or social welfare. However, preparation of satellite accounts for nonmarket household production can provide an important link between SNA production and welfare.

Deduction of Suggestive Advertising

Zolotas makes a second deduction from private consumption for suggestive advertising which is equal to "50 percent of all expenditure on advertising" (Zolotas, 1981: 49). Suggestive advertising is deducted because it reduces rather than enhances welfare: "it ... causes confusion and disorientation regarding theoretical variety and properties of goods ..."; its "aim is to create an insatiable desire for new goods, thereby causing dissatisfaction with those already possessed" (Zolotas, 1981: 49). Even if part of advertising is "suggestive" in nature, this does not necessarily imply that it lacks the ability to satisfy needs and promote welfare. In a modern society even entertainment and information could be interpreted as being suggestive and therefore detrimental to welfare. The "suggestive" nature of a product criterion, which violates the Walrasian strong usefulness one, is too ambiguous and arbitrary to be used in linking SNA macrovariables to welfare.

Deduction of Cost of Resource Depletion

The third deduction from private consumption made by Zolotas is of estimated "real costs of accelerated exploitation of natural resources, resulting in their faster depletion" (Zolotas, 1981: 49). The cost of resource depletion is estimated as the difference between actual and imputed expenditures on eight basic raw materials (lead, copper, aluminum, zinc, gold, petroleum, iron and molybdenum) (Zolotas, 1981: 60).

Resource depletion is an important public policy issue. However, there does not seem to exist a clear negative relationship between resource depletion and welfare. The hypothesis here introduced by Zolotas is that welfare falls when needs are satisfied by commodities (resources, raw materials) that are by nature depletable rather than renewable. The presumed deduction in welfare is measured

by a fictitious "depletion cost surcharge" which Zolotas deducts from consumption. The "cost of resource depletion" deduction is questionable. There do not seem to exist compelling theoretical or empirical arguments in support of the view that *present* welfare is lower when needs are satisfied by depletable rather than renewable commodities. Furthermore, even future consumption and welfare may not fall as a consequence of present resource depletion. Historically, technological progress of the raw materials saving type has been so spectacular, as e.g. in the case of natural nitrate, that future welfare may be affected as much by a gain as by a loss in the value of raw materials.

Deduction of Private Cost of Environmental Pollution

The fourth deduction made by Zolotas is in regards to the private cost of environmental pollution. Zolotas divides the social costs of environmental pollution into "control costs," "which comprise actual outlays aimed at preventing or correcting the destructive effects of pollution," and "damage costs" which "denote residual amounts of social cost owing to that part of environmental pollution not affected by control costs" (Zolotas, 1981: 61). However, since his EAW-index is based on real private consumption, he deducts control costs of air pollution "born directly by private consumption in the form of increased demand for, say, domestic smoke eliminators, special filters for car exhaust fumes, etc." (Zolotas, 1981: 65–6) (these are one half of all control cost), all control costs for water pollution and solid waste disposal, and the air pollution damage cost (Zolotas, 1981: 68–72). Nordhaus–Tobin, as we have already seen, make a related environmental reduction.

There exist serious conceptual and methodological problems with the control and damage cost deductions from EAW made by Zolotas. All control costs simply reflect and measure economic production of goods which previously were free. Such costs trace the substitution and replacement of free air, water and other environmental "goods" by economic ones. They do not imply or prove that either their total supply or the satisfaction of the corresponding needs have necessarily decreased. Thus, if a control cost deduction were at all to be made, it would have to be from the production and consumption of free environmental goods with a corresponding positive correction in production and consumption of SNA-type environmental ones. Whether total social welfare will increase, stay the same or decline depends on the extent to which the increased economic output exceeds, equals or falls short of the reduced free production. Replacement of free air, water, land, tranquility or other environmental commodities by equivalent economic ones may maintain social welfare. There exists no analytical justification for deducting the costs of environmental pollution from economic output, although depletion and pollution may indeed reduce free welfare and thereby total social welfare.

Zolotas' "damage costs" of air pollution could become a legitimate deduction from real private consumption only if the presumed decline in the stock and flow of free goods is responsible for a measurable decline in economic output and of the needs that are satisfied by it. Addition to resources could be counted as investment or capital accumulation if it can be demonstrated that this "addition" is (a) produced, (b) market produced and (c) is used but not used up in

production. If that were the case, then "depletion of natural resources" could be treated as capital consumption. The issue of addition and deduction of resources provides fertile ground for further research and satellite accounts. Unfortunately, as of this moment, in the author's opinion, too many issues in respect to addition and deduction of resources remain unresolved and it is therefore impossible to make *a priori* unconditional recommendations about their treatment as investment, consumption or intermediate input. In practice, the market value of natural resources used will most likely be a necessary component of consumer, capital as well as intermediate composite commodities.

Deduction of the Cost of Commuting

The fifth deduction that Zolotas makes from real private consumption in constructing his EAW-index is the cost of commuting. This cost, which Zolotas (1981: 73) considers a subset of urbanization cost, "is estimated on the basis of, firstly, the direct cost of travel to and from the place of work by the various means of transportation available and, secondly, the loss of time involved in travelling to and from work" (Zolotas, 1981: 33). In addition to Zolotas, Nordhaus–Tobin and Eisner make similar deductions for commuting and other expenses related to work, considering them as intermediate in nature.

Both producers and consumers have needs satisfied by the transportation activity. According to the basic SNA "use" criterion, the output of the transportation activity which is *used* by producers and *used up* in production is an intermediate input, whether purchased or produced internally. Accordingly, only those household transportation expenditures, including own-account production, arising as a consequence of for-the-market barter or cash production can be considered intermediate and deducted from final consumption. All other household transportation expenditures, including those of commuting to and from the place of work, reflect final private consumption. Unless commuting workers are considered members of a fictitious enterprise producing and selling intermediate commodity-type rather than factor-type services to the "employing" producer, commuting costs satisfy a final need and are final consumption expenditures. Introduction of a fictitious enterprise as a means of reclassifying final transportation into intermediate expenditures would open the flood gates for similar reclassifications of equally questionable nature. Furthermore, although the "cost from the loss of time" (Zolotas, 1981: 77) could be deducted from a hypothetical supply of such a "free good" as proximity to a rural work place, there hardly exists an economic justification for deducting it from actual economic production or consumption since no such decline takes place.

Deduction of Corrective Health and Maintenance Educational Expenses

Finally, Zolotas omits from the EAW-index "corrective health expenditure, namely expenditure intended to remedy harm caused to human health by the conditions of life in today's real economies, ..." (Zolotas, 1981: 80). "Some of these adverse factors are environmental pollution, the mental stress inherent in today's way of life, the uneven distribution of health services among the various

population groups, and so on" (Zolotas, 1981: 80). Because they merely compensate for the aforementioned negative factors, Zolotas deducts "from private consumption 50 percent of the annual increment in per capita health outlays (at constant prices)" (Zolotas, 1981: 80) as corrective in nature.

It is true that "the industrialised way of life" (Zolotas, 1981: 80) may be responsible for increased health expenditures that are largely "corrective" in *nature*. Deducting, however, because of their nature, "corrective" expenditures from consumption, not only violates the strong Walrasian usefulness criterion, but also may give rise to an inappropriate measure of welfare. Not only may the so-called corrective expenditures be even more welfare promoting than noncorrective ones, but also major parts of other modern life expenses, including trade, transport, finance, government and even information and entertainment, could be perceived as corrective in nature, thereby leading to unprecedented as well as inappropriate reductions in welfare promoting consumption.

The weak usefulness criterion which Zolotas uses to exclude part of "health consumption" from private consumption can be referred to as the "corrective nature of the product" criterion. In dealing with educational expenses Zolotas goes further and introduces what can be referred to as "maintenance nature of the product" weak usefulness criterion. Accordingly, "... private expenditure on primary and secondary education plus half of private spending on higher education" (Zolotas, 1981: 83) are deducted from private consumption because they are considered as a form of investment outlays essential "for maintaining the 'quality' of the stock of human capital" (Zolotas, 1981: 83). If the "maintenance nature of a product" criterion is adopted, as done by Zolotas, reductions in the production and consumption boundaries could become arbitrary and excessive. In addition to health and education, even food, shelter and clothing could be reclassified as necessary to maintain the quality of human capital and, quite inappropriately, be deducted from private consumption in constructing an index of economic aspects of welfare (EAW). In contrast, according to the marginalist school, "maintenance" needs, expenditures, activities and consumption may raise the level of welfare even more than non-maintenance, nonbasic expenditures.

The EAW index constructed by Zolotas can hardly be considered a measure of "economic" aspects of welfare since it excludes from the consumption boundary numerous components that are eminently economic in nature, i.e. are useful and costly. Furthermore, as we will see in the last part of the paper, it adds other components, such as leisure, which have not as yet been convincingly demonstrated to be both useful and costly.

3. The Cost Dimension of the Production, Consumption and Welfare Boundaries

In the second part of the paper, an attempt was made to review and evaluate the different versions of the "usefulness dimension" of the Walrasian scarcity criterion that have been formulated by various authors trying to define the consumption, investment and production boundaries. We also examined the *deductions* from GNP and consumption made by authors attempting to construct welfare indices. We now turn, in the third part of the paper, to a review and

examination of the different versions of the "cost dimension" of the Walrasian scarcity criterion that have been formulated by authors trying to define the various boundaries. In this part, we examine the *additions* to GNP and SNA or BEA consumption made by authors extending the SNA accounts or the NIPAs of the BEA and/or attempting to construct welfare indices.

The Cost Criterion

Not all commodities that can satisfy needs are part of the economic production boundary. For commodities to be included in economic production, according to Walras, a second, a supply-scarcity criterion, that of cost, needs to be satisfied: "I say things are available to us only in a limited quantity whenever they do not exist in such quantities that each of us can find at hand enough completely to satisfy his desires" (Walras, 1984: 65).

According to this two-pronged cost, economic transformation criterion, economic production arises, first, when one or more physical, tangible or nonphysical, intangible dimensions of composite commodities are transformed, i.e. useful things are created, and, second, when costly, scarce factor services or other inputs are used (up). According to the positive cost-scarcity economic transformation criterion, production occurs when the supply of useful things is augmented. According to the negative cost-scarcity economic transformation criterion, as production occurs costly factor services and intermediate inputs are used (up) and their supply decreases. For purposes of the present paper, we classify the various interpretations of the cost criterion into the strong market cost, the moderate cost and the weak cost categories.

The Strong Market Cost Criterion

According to the strong market-cost criterion, only those private, semi-public and collective commodities, which are produced by market-based, factor-type services and intermediate inputs, should be included in the consumption, investment and production boundaries. Only those useful commodities that are "market-costly," i.e. require expenditures involving markets, are included in the production boundary. The commodity markets can be private, in which case costs are covered primarily from sales revenues; semi-public, in which case costs are covered from sales as well as other, e.g. tax, revenues; or collective, in which case costs are covered primarily from taxes, grants, credits and so forth. According to the strong market-cost criterion, nonmarket household production of useful things is excluded from the SNA consumption, production and the corresponding welfare boundaries. Also excluded are "leisure" and "free goods" since their "production" does not involve market outlays on factor services. However, according to the strong market cost criterion, there exists no reason whatsoever why services of durables along with those of all other factors of production should not be included in the government and household-for-market production boundaries. The resulting imputations can hardly be considered "nonmarket" ones.

Non-SNA, not-for-the-market economic production, income, consumption and investment can and does significantly contribute to economic welfare. The "nonmarket" components of consumption, investment and production need,

therefore, to be fully taken into account whenever the aim is to measure economic production as well as welfare. However, the "nonmarket" components of the boundaries of economic production, income, consumption and investment are intrinsically quite different from the market components. The market components differ from the nonmarket ones of these boundaries in terms of taxability, exchangeability (exchange value) and relevance for monetary and fiscal policy. As a consequence, treating them as homogeneous, additive, interchangeable entities and incorporating the not-for-the-market ones into the SNA presently remains rather inappropriate.

The strong market cost criterion, which is largely accepted by the SNA, is rejected by Eisner (1978, 1985, 1988, 1989), Jorgenson and Fraumeni (1988), Kendrick (1976, 1979, 1987), Nordhaus and Tobin (1972), Ruggles and Ruggles (1982) and Zolotas (1981) on the grounds that it leads to inadequate (under)-estimates of economic production, consumption and welfare.

The Moderate Cost Criterion

According to the moderate cost criterion, all private, semi-public and collective commodities should be included in the production boundary as long as their production involves costs. It should not matter if these are market or nonmarket costs. The form of payment or nonpayment should not matter as long as factor-type services and intermediate products are utilized in production. Whenever market costs or payments are not available, product and income imputations are made by relying on the opportunity cost or the "analogy with the market value of similar activity" (Ruggles and Ruggles, 1982: 17) criterion.

Richard Ruggles and Nancy Ruggles can be considered as the main proponents of the moderate cost criterion. In constructing their "integrated economic accounts" (IEA) they appear extremely reluctant to make any imputations at all because "the valuation of nonmarket activity is speculative, and generally must be based on analogy with the market value of similar activity taking place elsewhere in the economy. ... it is difficult to decide just where to draw the production boundary ... (and) ... if imputed valuations for nonmarket activities are combined with actual transactions in the accounts, the accounts may be less useful for fiscal and monetary policy" (1982: 17). The Ruggleses only modestly expand the production boundary by showing separately nonmarket imputations for nonprofit building rent, owner-occupied housing, margins on owner-built homes, household durables, farm income in kind and government durables. The Ruggleses' "moderate cost production boundary" is only modestly larger than the *sui generis* BEA "strong market cost production boundary" since the latter already includes imputations for the rental value of owner-occupied housing and of buildings owned by non-profit institutions and for the value of food and fuel produced and consumed on farms.

Unless all of these imputations are analytically evaluated and carefully implemented within aggregate, sectoral and activity production function frameworks, the resulting production, investment and consumption boundaries still may remain too speculative to serve as solid measures of economic welfare. The use of "consumer" durables for nonmarket household production probably stands out as the

most speculative imputation due to analytical as well as measurement problems. By adopting the moderate cost criterion, the Ruggleses adopt a middle-of-the-road approach. They stand out by rejecting both the strong market cost criterion, which is used to define the "narrow market cost" production boundary, and the weak cost criterion, which has opened the doors of the corresponding "weak" cost production boundary to such an exotic item, in terms of national accounting, as "leisure."

The Weak Cost Criterion

The production, investment, consumption and welfare boundary frontiers have been greatly expanded by Nordhaus–Tobin (1972), Eisner (1978, 1985, 1988, 1989), Kendrick (1976, 1979, 1987), Zolotas (1981) and Jorgenson–Fraumeni (1988) who, to increasing degrees, reject both the strict and moderate cost criteria, and advance as well as implement their own idiosyncratic versions of the "weak cost criterion." In the hands of Nordhaus–Tobin, Eisner, Kendrick, Zolotas and Jorgenson–Fraumeni the notion of cost has become so elastic as to almost lose any connection to the traditional notion of economic market cost. Adoption of the weak cost criterion has permitted inclusion in the production, investment, consumption and welfare boundaries of items, such as leisure, which lack most or all characteristics of "things" classified as produced commodities that are both useful and "costly" in an economic sense. It should be immediately noted here that Eisner excludes leisure from the consumption and welfare boundaries.

Additions to Product, Income, and/or Consumption as a Consequence of the Weak Cost Criterion

1. *The Nordhaus–Tobin MEW Additions.* Nordhaus–Tobin add imputations for government and household capital services, nonmarket work and leisure. They do not add imputations for the services of education and health capital because these are considered as intermediate in nature.

2. *The Zolotas EAW Additions.* Zolotas adds imputations for the value of services from consumer durables, public health and education outlays considered to contribute to welfare, the imputed value of household services and a major one for the value of leisure time.

3. *The Kendrick "Adjusted Gross Product" Additions.* By introducing his own elastic version of the weak cost criterion, John Kendrick makes additional non-market imputations for economic activity by the personal sector (unpaid housework, volunteer labor, school work, frictional unemployment, rental values), the business sector (financial products), the government sector (rental values) and imputed value of leisure time (Kendrick, 1989: Table 1, 6A). In addition to BEA business investment in structures, equipment, and additional inventories, Kendrick includes all government and other household acquisition of structures, equipment, durable commodities, and inventories, gross tangible human investment, gross intangible investment as well as business investment in education and training, health, mobility, and research and development.

4. *The Jorgenson–Fraumeni "Full Gross Private Domestic Product" Additions.* In calculating their "full gross private domestic product", Jorgenson and

Fraumeni add to the BEA private GNP the value of subsidies, imputations for household physical capital services, time in household production and leisure and investment in human capital.

5. *The Eisner "Total Income System of Accounts" Additions.* In addition to services of household and government capital, Eisner adds to the consumption boundary the value of nonmarket household labor, services of volunteers, value of other uncompensated factor services and commercial media expenses and other intermediate business expenses. Eisner expands the investment boundary by adding, not only acquisition of tangible, nonhuman capital by government and households, but also expenditures for research and development, education and health, opportunity costs of time of students and revaluations of existing assets and liabilities. Most of the additions made to the production boundary by authors using the weak cost criterion are discussed in the following sections. A unique version of the weak cost criterion is used by Eisner, according to whom "TISA values output as the value of all of the factor services and resources from which it flows, regardless of the form of payment, or nonpayment" (Eisner, 1988: 1650). At the one extreme, Eisner endorses a "nonpayment version" of a truly elastic, weak cost criterion. On the other hand Eisner also uses both the "actual market cost" and the "opportunity cost" versions of the cost-scarcity criterion. As we will notice immediately, this can create serious problems. Eisner's TISA "includes government subsidies and the deficits of government enterprises in the market value of output along with the services of volunteer labor and the difference between the opportunity costs of military conscripts and jurors and what they are paid" (Eisner, 1988: 1650).

The Government Subsidies and Deficits of Government Enterprises Addition

It appears appropriate to include "government subsidies and the deficits of government enterprises in the market value of output" since these determine the costs, i.e. the actual payments to and thus the income of the factor services utilized in the production of collective, semi-public or private commodities by the state. Use of the actual-market-input-cost criterion justifies their inclusion in the production and income boundaries. However, this does not mean that actual factor payments in the aforementioned instances reflect true factor opportunity costs. Indeed, in cases where "market" value of output includes government subsidies and the deficits of government enterprises, output value measured by actual market costs may greatly exceed its true "opportunity cost" value. In this case, therefore, at least implicitly, Eisner does not use the opportunity cost version of the cost-scarcity criterion.

The Volunteer Labor and Related Additions

In contrast, by adding the services of volunteer labor, and the difference between the opportunity costs of military conscripts and jurors and what they are paid, to the market value of output, Eisner introduces and accepts the opportunity cost version of the cost-scarcity criterion. Assigning values to output and input services based on opportunity costs may, however, lead the national accounts practitioner into unintended traps. Should, e.g. some or all labor factor services

in rich countries with high open unemployment or in poor ones with high disguised unemployment be valued at their true scarcity price or opportunity cost even if it is minimal or zero? Should positive opportunity cost imputations be made in rich countries where the true opportunity cost of military conscripts is above their military "pay-consumption" while negative imputations be introduced in many other ones, e.g. former socialist Eastern European or developing ones, where the opportunity cost is significantly below the military "pay-consumption?" Should the return to capital be adjusted upwards, through positive imputations, in developing countries where it is allegedly kept artificially below its free market or international opportunity cost, or adjusted downwards, through negative imputations, in those economies where it is artificially kept above its "true" opportunity cost. Or, should the labor services of already unionized employees, e.g. senior pilots, truck drivers or janitors, be valued at the lower cost of second-tier, recently hired employees of the same skills or vice versa?

Furthermore, since neither the military conscripts, nor volunteer workers, nor unpaid or underpaid jurors either receive or can spend the "imputed differential values" of their services, it is hard to understand how their consumption or welfare are increased to a more accurate level through such "opportunity cost" imputations even though the society's may have improved. The conceptual, analytical and measurement problems associated with imputations based on the opportunity cost are so great that their introduction in efforts to either extend the SNA product and income accounts or link their estimates to welfare on a global basis may be so cumbersome as to be counterproductive. Selected additions to the consumption boundary will be discussed next, followed by a review of the additions to the investment boundary.

Additions to the Consumption Boundary

Consumption provides the most critical foundation in measuring welfare. Unfortunately, as was seen in Part II, there exists disagreement both about what "consumption" is and about the "consumption" concept which is the most appropriate one in measuring welfare. In Part II we examined the various definitions and interpretations of welfare-promoting consumption from the "usefulness" perspective of the Walrasian scarcity criterion. In the present section, we will examine the notion of consumption from the "cost" perspective of the Walrasian scarcity criterion. In particular, we will try to evaluate the wide variety of concepts and estimates of the consumption component of the production boundary that have been proposed, adopted and carried out by authors utilizing successively more elastic notions of the cost criterion.

Consumption According to the Strong Market Cost Criterion

Households consume private, semi-public and collective commodities. Total household welfare is, therefore, determined by the total consumption of economic as well as free private, semi-public *and* collective commodities. Economic household welfare, in turn, is determined by consumption of economic private, semi-public and collective commodities. And, finally, SNA household welfare is

determined by household consumption of private, semi-public and collective commodities that pass the strict, market cost criterion.

According to the strict market cost criterion, the consumption boundary includes all private, semi-public and collective commodities that satisfy final household needs and require market payments to factor services and intermediate inputs for their production. In other words, the SNA consumption boundary, which is delineated by the strict market cost criterion, excludes both free and nonmarket economic consumption. However, it includes *all* market-cost-based consumption irrespectively of character or nature of final household needs and of the private, semi-public and collective commodities satisfying them. Whenever consumption is chosen as the point of departure in measuring welfare, it is hereby recommended from an analytical and methodological perspective, that total, i.e. private, semi-public and collective, household consumption be used as a foundation rather than just private one. It would then be unnecessary to transfer or add "welfare promoting" government consumption expenditures to private consumption, such as government capital services.

Consumption According to the Moderate Cost Criterion. Addition of Nonmarket Household Consumption

According to the moderate cost criterion, production of private, semi-public and collective consumer commodities is included in the consumption boundary both when these are produced by government, enterprises, nonprofit institutions and households for the market utilizing market-costly inputs and when they are produced by households for own consumption using market or nonmarket but costly resources. A narrow version of the moderate cost criterion is adopted by Richard Ruggles and Nancy Ruggles who make imputations on the consumption side for ": (1) nonprofit building rent, (2) owner-occupied housing, (3) margins on owner-built homes, ... (and) ... (6) farm income in kind, ..." (1982: 17). A *sui generis* moderate cost criterion is also adopted by Eisner who prepares comprehensive estimates of market and nonmarket household consumption and also includes the previously discussed services of volunteers and value of other uncompensated factor services.

Market as well as nonmarket household production of consumer commodities as well as volunteer and other uncompensated factor services are a major determinant of welfare. Any part of such household or related production not included in the SNA should therefore be added whenever an attempt is made to measure welfare. It is still premature, however, to include nonmarket household and related consumption into the SNA consumption boundary because of immense, unresolved analytical and measurement problems. The resulting imputations would still be too speculative to make meaningful international or intertemporal comparisons. Research on satellite accounts, however, would be useful.

Consumption According to the Weak Cost Criterion. Addition of the Value of Leisure

By adopting an extremely elastic cost criterion, Nordhaus–Tobin, Zolotas, Kendrick and Jorgenson–Fraumeni are able to include imputations for leisure in their consumption and production boundaries. According to their very weak

version of the cost criterion, even leisure has an opportunity cost and, therefore, should be part of the consumption boundary. The Ruggleses do not adopt the weak cost criterion because resulting imputations for leisure are viewed as too speculative. Likewise, Eisner is unwilling to stretch his weak cost criterion to include leisure in the consumption boundary.

The analytical and measurement problems that arise when, as a consequence of applying the very weak cost criterion, leisure is included in the consumption boundary are of unprecedented magnitude. No author has made a convincing case that the "value of leisure time" is or stands for a consumer commodity that is sufficiently distinct from SNA consumer commodities to warrant its addition to SNA consumption in an effort to measure welfare. "Leisure" has not been proven to be either a useful or a costly nonmarket commodity satisfying nonmarket needs. No author has demonstrated how leisure is produced and consumed.

If leisure were to be included in product and income accounts, it would be necessary to demonstrate, within a production function framework, both the marketability of "leisure output" and the corresponding utilization of nonmarket but nevertheless marketable, i.e. costly, inputs. It would also be necessary, according to the Ruggleses "analogy with a market value" cost criterion, to demonstrate that "leisure" is a marketable commodity that can and has been produced by enterprises and households alike; that its consumption or investment give rise to direct or indirect satisfaction of needs, i.e. it is useful; and that as an output, whether of enterprises or households, it is a market, or nonmarket economic, rather than a free, noneconomic commodity which, in order to be produced, requires utilization of "market-costly" resources. None of the above has been convincingly demonstrated. The value of leisure may already be reflected in and measured by the SNA economic output consumed during leisure time, i.e. when leisure needs are being satisfied, such as travel, entertainment, exercising and so forth. Addition of the value of leisure time to SNA consumption may give rise to double counting by defining welfare as the sum of sales (supply) plus purchases (demand) of the same commodities during "leisure time."

There exist neglected areas of research in respect to the consumption boundary which are far more important in terms of measuring welfare, quality of life and public policy than the extremely controversial issue of leisure. These include, first, the historically neglected bundle of analytical and measurement problems in respect to the nature and value of public consumption, i.e. production and consumption of collective commodities. Second, they include the politically fashionable basket of research issues on the relationship between free and economic production of environmental commodities, on the one hand, and welfare, on the other. Research on these neglected topics of collective and free-versus-economic environmental commodities and preparation of satellite accounts, which could be carried out within the Walrasian usefulness and cost criteria framework, could yield handsome returns.

The Investment Boundary

The investment component of the production boundary has also been subject to a wide variety of estimates depending on which cost criterion has been used.

Investment According to the Strong Market Cost Criterion

Whenever the narrow, very strict, market cost BEA criterion is used, the production boundary includes only gross private domestic investment, "which comprises business and nonprofit institution expenditures for structures and equipment and business accumulation of inventories" (Eisner, 1988: 1650). However, the BEA concept of investment and the underlying strict market cost criterion are unduly narrow, if not misleading. According to the true, strong market-cost criterion, the investment boundary should include all expenditures for structures and equipment and accumulation of inventories associated with market production of collective, semi-public or private commodities. According to what will henceforth be referred to as the universal, strong market cost criterion, the investment boundary should include expenditures on structures, machinery and equipment and accumulation of inventories not only by private business but also by state owned enterprises, nonprofit institutions and government as well as households, as long as these household durables are used for cash or barter (this can be very large in developing countries) market production. It is recommended that the universal, strong, market cost criterion be adopted by the new SNA in defining the investment boundary. Household production of both goods- and service-components of composite capital commodities that are used for household market production should be included in the investment boundary since they satisfy the above criterion.[2]

Investment According to the Moderate Cost Criterion

If the moderate cost criterion is adopted, the investment boundary is expanded to include acquisition as well as in-house production by households of durables which are used for nonmarket production. The moderate cost criterion is implicitly adopted by Richard Ruggles and Nancy D. Ruggles when they make imputations for "... (4) household durables consumed, ..." in addition to those for "... (6) government durables consumed" (1982: 17). The Ruggleses also adopt, as pointed out later on, the weak cost criterion. Household production and/or use of durables for nonmarket purposes are important because they contribute, albeit indirectly, to economic welfare. Unfortunately, however, the unresolved conceptual, methodological and measurement problems associated with making the necessary imputations for nonmarket capital stock, consumption of durables, output, compensation of employees, operating surplus and intermediate inputs are most formidable. Resulting imputations may be too arbitrary and speculative to make meaningful international comparisons of economic welfare.

Investment According to the Weak Cost Criterion

Estimates of the investment component of production are further increased by those authors who recommend and adopt the weak cost-scarcity criterion. The major addition is investment in human capital, which is measured either through costs of rearing and education (Kendrick) or just education (Eisner) or as the

[2]Both household and other production of services, which is very important in rural areas of developing countries, is frequently ignored by the SNA (Mamalakis, 1985).

sum of the present values "of lifetime incomes for all individuals born in that year and all immigrants plus the imputed labor compensation for formal schooling for all individuals enrolled in school" (Jorgenson–Fraumeni, 1988: 9). More specifically, according to Eisner, "TISA offers, as a supplement to conventional capital accumulation, net revaluations of tangible assets, that is, increases in the market values or replacement costs of tangible assets over and above changes in the general level of prices. TISA also includes in capital accumulation very large amounts of investment in intangible capital in the form of research and development, education and training and health" (Eisner, 1988: 1650).

Addition of Net Revaluations of Tangible Assets

The issue of "net revaluations of tangible assets" is, no doubt, an important one. However, as the recent collapse in market values of tangible assets in the United States and Japan has demonstrated, the alleged increases in the market values may be, as a norm, transitory and cyclical, rather than secular or permanent, as Eisner seems to suggest. A cautious approach may, therefore, have to be adopted in treating "net revaluations" of tangible assets as permanent, when in reality they are transitory. Revaluations of existing assets and liabilities are also included in the investment boundary by Jorgenson–Fraumeni and the Ruggleses. It should be added, however, that the issue of transitory versus permanent increases in market values and the related problem of relative, nominal and real prices is not unique to holding gains or losses but is also relevant to the analysis of the relationship between conventional measures of production-income and welfare.[3]

Addition of Investment in Intangible Capital

The investment boundary has been expanded to include investment in human capital by all authors except Zolotas. The "items" representing investment in human capital, which are added to the boundary, vary between authors. Expenditures for research and development are included by Kendrick, the Ruggleses and Eisner. Expenditures on education are included by all except Zolotas. Opportunity costs of time of students are included by Jorgenson–Fraumeni, Kendrick and Eisner. Expenditures for health are included by Nordhaus–Tobin, Kendrick, the Ruggleses and Eisner. Costs associated with labor mobility and search are included by Kendrick. Rearing costs are included by Jorgenson–Fraumeni and Kendrick.

The conceptual, analytical and measurement problems are truly formidable in the gray areas of intangible capital, such as research and development, education, training and health. Unlike tangible capital, which is produced and sold in the market and is used as a factor input in marketable production, education, training and health are not marketable, transferable, market priced commodities generating market-priced factor-type services, that are used in the production of a marketable, transferable output. Neither human beings as a whole nor their portion

[3]I am grateful to both Robert Eisner and Richard Ruggles for emphasizing the importance of this point to me.

referred to as "human capital" are or can be treated as reproducible and marketable commodities within a production function framework. Since all household expenditures, including food, clothing and shelter, determine the quantity and quality of human capital and its services, according to the weak scarcity-cost criterion, they also can or should be considered either as intermediate, whenever they are used up, or as capital ones, whenever they contribute a flow of services to the production of "labor services."

A clarification of some basic aspects of the consumption-investment debate would here be of help. The services of tangible capital can be used for the production of either consumer commodities, including "food" in corporate dining rooms or a faculty club building, or "entertainment" in the luxury suite of the chief executive officer of a large corporation, or of capital commodities. Expenditures which are increasing this tangible capital stock are in both instances investment expenditures. These investment expenditures, however, should not be confused with the actual or imputed expenditures on the final composite output produced with factor services and intermediate inputs which can be either consumption, as in the case of "food" or entertainment, or investment, as in the case of machinery. Similarly, the services of labor can be used for either consumer or capital commodity production.

In contrast, expenditures on "educational output" are either intermediate or final consumption ones. The "educational output" that has been produced and "purchased" can be considered investment only if it (1) is used in market production and (2) is used but not used up in production. As of this moment, in the author's opinion, it has not been convincingly demonstrated that educational, health or welfare expenditures satisfy the above criteria and can, therefore, be considered as investment. No author has as yet developed and implemented non-arbitrary criteria that can be used to divide such expenditures, e.g. educational, into consumption, in which case the agent acts as a consumer, and investment, in which case the agent acts as a producer, components. Nor has it been demonstrated that in correspondence to investment expenditures on tangible capital, final "educational investment expenditures" augmenting intangible capital stock factor services are used but not used up in either consumer or capital commodity production by the production agent undertaking them.

Research and Development, Computer Software and Mineral Exploration Expenditures

In order to be included in the SNA core capital boundary as investment, "expenditures" (1) would have to be on commodities generating a flow of services used in market production, i.e. serve as a means of collective, semi-public or private commodity production, (2) be themselves market-produced means of production, i.e. require market-costly factor services for their own production, and (3) be used but not used up in production by possessing economic, use and time durability, i.e. be indirectly useful to consumers through multiple uses in production over two or more accounting periods (Mamalakis: 1992c). Expenditures on health, nutrition, welfare or education cannot be included in the core capital boundary because it has not been convincingly demonstrated that (1) they are

used in production rather than used up in consumption, i.e. satisfy criterion 1, and (2) that they are used but not used up in production, i.e. satisfy criterion 3 that they are producer durables rather than intermediate inputs.

Research and development expenditures in the natural sciences, engineering, social sciences and humanities as classified in OECD's Frascati manual also cannot by included in the core capital boundary because it has not been convincingly demonstrated that they are both used in production, i.e. satisfy criterion 1, and are not used up in production, i.e. satisfy criterion 3. Neither the flow of services nor their actual market value, i.e. the value of their indirect usefulness to consumers, can be easily ascertained. Neither for education, health, nutrition and welfare nor for R and D expenditures has it been convincingly shown that they are a source of produced, marketable, exchangeable factor-type services that can be estimated on the basis of market transactions and be deflated.

Computer software expenditures may qualify for inclusion in the core capital boundary as long as or because, in the author's opinion, it can be demonstrated that (1) they satisfy the means of production, (2) the produced means of production and (3) the durability criterion. Mineral exploration expenditures cannot be included in the core capital boundary because it has not been convincingly demonstrated that they satisfy the third, economic, use and time durability criterion.

Addition of the Opportunity Cost of Students Investment

Any attempt to include "imputations for the opportunity costs of students 14 years of age and over" and part of "the value of nonmarket household labor" (Eisner, 1988: 1650) as part of investment in human capital stretches the limits of production beyond what can be considered as reasonable. Considering such opportunity costs and the value of nonmarket household labor as producible, marketable commodities appears highly questionable. Once again, the arbitrary nature of any resulting imputations and the lack of sufficient analytical substance of these notions would make international comparisons of economic output as well as welfare almost impossible as well as less than meaningful. However, the aforementioned considerations should not deter us from attempting to obtain a better analytical understanding and even estimates of the "non-market-household-component" of the production and welfare boundaries. Such a component has output and input dimensions which up to now have not been sufficiently understood, examined and integrated. Furthermore, as it has been pointed out elsewhere (Mamalakis, 1992a, b), many welfare and developmental issues can be examined better through sectoral, mesoeconomic analysis, and corresponding satellite accounts, than through macroeconomic analysis and the corresponding system of national accounts which may conceal enormous inequalities in the distribution of benefits from educational, health, governmental and other services among various segments of the population.

4. Conclusion

Welfare of a society is determined by a partially understood complex set of economic, political, social, and environmental factors. A modest attempt was

made in the present paper to examine selected aspects of the relationship between national output, investment and consumption, as defined by the SNA, and welfare. The relationship between economic factors and welfare was examined within the Walrasian framework of scarcity. Within this framework, production, which is defined as creation of things that are both useful and costly, was linked to welfare by examining selected analytical and measurement issues raised in the works of Nordhaus–Tobin, Zolotas, the Ruggleses, Kendrick, Eisner and Jorgenson–Fraumeni.

The major conclusions of the paper are that, at best, such SNA macro-variables as consumption and production were always intended to be and, therefore, still are fundamental but only initial (even incomplete) direct measures of SNA and indirect measures of economic welfare; and that much more research needs to be carried out before reliable versions of the missing blocks that bridge SNA-variables with economic and total welfare can be built. Solid satellite accounts could provide some of these missing blocks.

In addition, welfare is affected by the distribution of various types of consumption, income and wealth, and sharply falling relative prices due to productivity increases; and there is utility or disutility associated with labor force participation. Due to space limitations, discussion of these and other issues was deferred to another occasion.

There exists a correspondence between SNA production and SNA welfare; between economic production and economic welfare; and between total production and total welfare. "Economic production" is a better measure of "economic welfare" than SNA production because it incorporates the non-SNA output component in its boundary. However, SNA production still is the best indicator of SNA-welfare. And, *mutatis mutandis*, until comparable estimates of the non-SNA components of production become available, it may still be the best, though by no means an infallible, albeit indirect indicator of international levels of economic and total production and welfare as well as of international differences thereof.

International organizations and national statistical offices may in coming years be subjected to increasing political pressures to create *(inter)national welfare accounts* to complement the SNA and NIPAs. Should the resources necessary for such an undertaking be forthcoming, such offices would need to address the issues examined in the present paper.

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