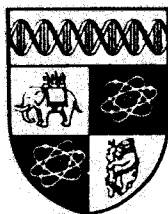


ACCOUNTING FOR TIME USE

Graham Pyatt

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This paper is circulated for discussion purposes only and its contents should be considered preliminary

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1 Introduction¹

This paper is an attempt to show how data on time use can be integrated with data on financial transactions or, more particularly, how the SNA can be extended by imputing value to time which is not explicitly marketed for financial remuneration. This subject has been treated previously by a variety of authors and, in particular, Hill (1977 and 1979) and Hawrylyshyn (1977) provide foundations on which the present analysis has been able to build.² However, while Hill argues against any attempt to value time spent on inalienably personal activities, the present approach is less restrictive in suggesting that all hours of the day should be considered: leisure has an opportunity cost, and this should be recognised if we want to avoid anomalous results.

In putting forward these and related ideas about how the national accounts might be extended, it is not intended to suggest that the innovations discussed should necessarily have the highest priority. The spirit is rather that the issues should be kept under review and that one way of doing so is to develop the necessary conceptual framework. Equally, within this spirit, the issues can be given some urgency by noting that adoption of the proposals to be discussed would make a very considerable difference to the profile of income levels and differentials which is otherwise observed across socio-economic groups. Not least, since the economic activities of women are disproportionately concentrated on unremunerated activities, the proposals in this paper would go a long way towards redressing the current practice of grossly discounting their contribution.

To match the proposals on the income side with corresponding imputations of expenditure the goods consumed by a household must be valued at user cost rather than market price. Doing so would bring the national accounts into line with developments in the analysis of consumer behaviour which may be traced back at least to Becker (1965). It follows that the difference between user cost and market price is to be interpreted here as the value of time, plus that of the services rendered by domestic durables, in transforming goods purchased at market prices in order to satisfy the needs and desires of consumers.

Introducing the concept of user costs provides one way of capturing within the social accounts a measure of consumption for these goods and services, such as health and education services, which are often provided free by government. A more general advantage is that user costs can be preferred to market prices because they are the measure of costs to which observed behaviour is a potentially rational response.

The paper is in three main sections following this introduction. The next section, section 2, provides a discussion of the strategically different categories into which time-use can be divided and the distinction between tradeable and non-tradeable production activity which is relevant in this context. This discussion is organised around a tabular format or matrix of time use which goes beyond what is normally referred to as a manpower matrix and otherwise yields a statement of the stock of human capital through row summation. The valuation of time is discussed in section 3 where a simple pedagogic model is used to formalise one version of the argument for valuing leisure as well as active time. Finally, in

section 4, there is a brief discussion of current practices in compiling national accounts and of the proposal in Hill (1979) for extensions. The present paper views this proposal as a half-way measure, and concludes with arguments for going the whole way ie for putting a value on time irrespective of how it is used.

2 A representation of time use

2.1 A tabular framework

Table 1 sets out a framework for recording details of how people spend their time. It represents an initial attempt to disaggregate the time available to different types of people according to a few strategic criteria defining different types of activities. Further disaggregation of activities is clearly possible and, indeed, will be desirable in any empirical implementation. However, such development is set aside for now in order to concentrate attention on distinctions which are thought to have conceptual importance.

Table 1 is intended to provide an 'around-the-clock' accounting of time use over a period of, say, a full year (since seasonal variations in activity are not important for present purposes). Time spent working is therefore only a part of what the table is intended to cover. And, by the same token, activities which are regarded as work are only a fraction of all the activities which Table 1 is designed to capture.

It follows from these remarks that what is usually referred to as a manpower matrix is contained within the format of Table 1. Specifically, if we delete all the rows of Table 1 which refer to

those types of people who are not a part of the labour force (children under 15, adults past retirement age) and, similarly, all columns are deleted which refer to activities that are not regarded as productive, then what we are left with is a table of the time spent by different types of workers engaged in different types of productive activity.³ The format is analogous therefore to that of a conventional manpower matrix.⁴

2.2 Typology of people

While the treatment of activities is the primary matter of interest in this paper it is useful to say something first about the choice of classifications for defining rows. In Table 1 it is proposed that rows should be defined by types of people and that the typology adopted might usefully recognise sex, age, education and location. Alternatives are, of course, perfectly possible. However, the suggested typology is useful not only in providing some specificity. It also represents one of the most important options to use in practice. It serves here to illustrate how the static representation of time use as in Table 1 can be linked to the dynamic modeling of population movements as envisaged in the System of Social and Demographic Statistics (the SSDS) set out in UNSO (1975).

To introduce the discussion of this point it can be suggested that classifying people as proposed in Table 1 has some advantages over the most important alternative approach, which is to classify people according to occupational groupings. In practice this alternative approach necessarily requires that individuals are classified according to their principle occupation since, as we shall

see, the spirit of Table 1 is that individuals spread their time across various activities. To identify the main occupation, therefore, it is necessary (in principle, at least) to look along the row of some table such as Table 1 in order to find the most important (active) use of time for each individual.

The need for some such process suggests that occupation is a label (or tag) which characterises an individual as a consequence of their tastes and behaviour, on the one hand, and otherwise as a result of the demand for different types of work to be done. It is therefore essentially an ex poste concept describing consequences of the operation of the labour market, as opposed to an ex ante classification of labour supply. To the extent that skills are transferable between jobs and that training, if necessary at all, takes a matter of weeks rather than years, an individual's occupation is a variable, not a fixed characteristic. It is perhaps not surprising therefore that occupational classification systems quickly degenerate into groupings such as 'worker in transport'.

In contrast to this, the classification of people according to sex, age, education level and location is essentially an ex ante characterisation which specifies, in its most important dimensions, the stock of human capital with which a society is endowed at a point in time. An advantage of Table 1 is that its row totals provide information on this stock, broken down in detail according to whatever row classification system is adopted.

Tracing the way in which the stock of human capital evolves over time is a basic feature of the SSDS. As explained there, and by Sir

Richard Stone in a series of writings under his own name,⁵ such evolution can be regarded as a stochastic process, with individuals moving with particular probabilities from one category to another over time. The typology of people proposed in Table 1 is designed to facilitate such mapping of the vector of human capital from its structure in one year to that of the next.

For age and sex, this mapping of population changes over time is quite straightforward. Sex is a characteristic fixed at birth, while age moves forward predictably (and inexorably) subject to the attrition caused by deaths. Education and location are somewhat less straightforward. However, they represent fundamental aspects of the population structure or stock of human capital and, therefore, of the way in which a society actually evolves.

Most likely a number of factors enter into an individual's decision to migrate, and not least of these will be the expectation of a better life. Table 1 can take us some way towards a characterisation of what that might mean if location is an element in determining the typology of people, because the table then permits a comparison of what otherwise similar individuals in different locations actually spend their time in doing.⁶

Education is a crucial variable from many points of view and not only as a characteristic of the stock of human capital: it can also be the key factor in obtaining entry into particular types of work. Moving up from one education level to another can be interpreted as a form of migration and Table 1 is potentially a useful source of information in describing the educational migration process.⁷ This is

because 'going to school' can be recorded in Table 1 as one of the activities on which time is spent. And the benefits of doing so are also captured in Table 1 to the extent that they are reflected by subsequent differences in the way that time is spent (and remunerated) by people with different levels of educational attainment.

These considerations support the proposition that the typology of individuals suggested in Table 1 is essentially ex ante in character. If time is divided into a series of discrete units, then the starting point is the stock of people (human capital) of each type at the beginning of each period: the row totals of Table 1. What they do during the period (of a year) is then described in the body of the table. And, partly as a direct consequence of this experience, and partly for exogenous reasons, by the end of the period people will have migrated or otherwise changed their status within the typology. The vector describing the stock of human capital is accordingly updated: and hence one arrives at the ex ante statement of the stock for the beginning of the next period. This characterisation of the process which Table 1 contributes to understanding is the fundamental stochastic process of the SSDS in all of its essentials.⁸

2.3 Alternative uses of time

Columns of Table 1 are defined by the alternative activities in which people engage. There are many possibilities and both the amount of detail and its particular character should depend in practice on which issues are of interest. Given the concern in this paper with conceptual issues, the main distinction to be made is between activities which are undertaken in order to produce goods and services

which could be traded on a market for cash (or kind) and those remaining activities which are not so motivated. As a second step, those activities which contribute to the production of tradeables are subdivided according to the criterion of whether or not the output they generate is in fact traded.

Within the body of Table 1 various types of activity are noted as examples within each of the three categories which emerge from the above distinctions. Within the first category, working for someone else involves providing a labour service which is evidently traded if the service is rewarded in cash or in kind. Similarly, self-employment falls into this same category if the objective is to produce a commodity or service which is sold on the market. Hence farming or retailing activities which lead to cash sales or barter transactions are included in this first category.

The distinction between commodities that are traded and those which could be traded but are not has little to do with the substantive nature of the goods and services that are being produced. Rather, the distinction is essentially between goods and services which are supplied to other people (or institutions) versus those which are retained by the producer for personal use. For example, subsistence farmers retain goods for domestic consumption which could have been sold on the market. Accordingly, subsistence farming activities make an important contribution to the set of activities which fall within the second category in Table 1. Uses of time which fall into this second category can be referred to collectively as DIY ("do-it-yourself") activities. Typical examples from developed countries are cleaning windows or decorating a room. In developing

countries the range of such activities is considerably wider, going beyond the subsistence cultivation activities previously cited to include gathering, fetching water and firewood, and much else besides.

In most countries, but again most especially in the developing countries, a large and significant fraction of women's time is spent on this category of activities. Making clothes, looking after children or the sick, preparing meals, etc. take up major proportions of the day. Yet each of these activities could conceivably be undertaken by others (for a fee). These activities therefore fall within the second category in Table 1. And they give rise to an important complication. Activities such as cooking, housekeeping and minding the children are commonly undertaken simultaneously. Such behaviour reflects the informal character of much non-marketed production activity. It permits the performance of such activities to be so inextricably interwoven that any attempt to disentangle them makes little sense. Rather, it is probably more appropriate to recognise that time deployed in informal activities often has joint products.

The extent to which individuals and households undertake for themselves activities which could be performed equally well by others is largely determined by their relative affluence. The poor typically have no option but to do things for themselves, such as cooking, making clothes or cleaning the house. The rich, on the other hand, can afford cooks, tailors and housekeepers who, in the nature of their jobs, perform personal services for others. It then follows that the extent of such activity is a measure of the inequality within a society: to the extent that one person can afford to employ another to

provide personal services, there is an evident difference in the value of their time and, a fortiori, the partners to such arrangements are unequal.

In contrast to the tradeable activities which individual households may or may not undertake, there is a category of activities which are clearly non-tradeable. Hill (1977) was perhaps the first to delineate an important category of time use as being non-tradeable or 'personal', basing his argument on the proposition that certain types of activity are inalienably personal in the sense that they can only be done by and for oneself.⁹ Sleep and relaxation are evident examples along with attending school, jogging or travelling to work. In contrast to these personal activities individuals may or may not undertake other activities themselves or have someone else undertake them on their behalf. Activities in this latter category have previously been categorised as 'tradeable'.

The line between what is personal and the DIY activities is not necessarily an easy one to draw. This is because the pace at which DIY activities are performed is often a matter of discretion. At some point, therefore, the chore of painting the bedroom (or drawing water from the well) can become a form of relaxation or socialising ie a personal activity. Hawrylyshyn (1977) has suggested that these two elements can be separated by splitting the time taken to paint the bedroom or fetch the water into two parts. The 'work' part is time it would take to have someone else do the job on a contract basis. The rest of the time taken can then be categorised as 'personal'. Alternatively, we can simply regard this as another example of joint production.

3. Imputations and the social accounts

3.1 An accounting schema

Tables compiled along the lines suggested above to describe the population and what they do would most likely become a centre piece of economic statistics. Their value would then be significantly enhanced if they were complemented by a second set of tables, using the same format of rows and columns, but this time recording the value of time spent by each type of individual in each of the alternative activities. For that part of Table 1 which is, in effect, a manpower matrix, the corresponding elements in this second table would be wage payments; and the ratio of corresponding elements of the two tables would therefore be the wage rate paid to particular types of labour (or people) for undertaking particular activities.¹⁰

To the extent that Table 1 covers a much broader range of activities than those which are rewarded by cash payments or in kind, implementation of the above proposal would call for an extensive range of imputations, ie it would be necessary to imput a value to time spent by each type of individual in each activity for which no actual wage payment is made. The remainder of this paper is largely taken up with the related questions of whether this should be done and, if so, how. But before coming to them it is useful to note that if such imputations were made then they could be integrated into a complete scheme of national accounting. Moreover, this is true irrespective of whether imputations are made to cover all instances of non-market and personal activity or only some of them. Both these points can be developed with the help of Table 2.

Table 2 shows a straightforward social accounting matrix (SAM) in which the capital accounts for institutions have been consolidated with accounts for the rest of the world. Within Table 2 'activities' correspond to the columns of Table 1, (complemented by any further activities which do not engage people's time, such as the provision of housing services). Similarly, all the different types of people recognised in Table 1 can be thought of as 'factors' in Table 2. However the latter must also include accounts for different types of capital as well as labour. It then follows that the submatrix of the SAM which appears in Table 2 at the intersection of the row for factors and the column for activities has the structure which is shown schematically in Table 3. And the north west quadrant of Table 3 is the financial version of Table 1 previously discussed.

In a full SAM scheme such as Table 2, if no imputations are made at all, then the complete matrix, which we can denote by T , would simply record cash transactions. And T would then be a balanced square matrix with corresponding row and column totals equal to each other. This fundamental property of the matrix would evidently be spoiled if we were now to impute a value to some particular time use that does not receive a cash reward. It is therefore necessary to make compensating adjustments elsewhere in the system, so that the consequences of an imputation are not simply to change one cell of the SAM (and so lose its balance) but also to make related changes elsewhere in the matrix so that any imputation of an income is always matched by imputation of outgoings which are necessary to preserve the balance of the matrix. Hence any imputation of value to a particular use of time not only affects the sub-matrix of factor payments to

activities. It will also affect the incomes of households and their recorded expenditures as well.

An initial imputation and its related changes can be represented in a new matrix, say I_j , where I_j is the same size as T , and I_j is also a SAM in the sense that its corresponding row and column totals are equal. Hence $T_j = T + I_j$ will be a SAM, where T_j is the new SAM which results from adding the balanced matrix of imputations, I_j , to the SAM matrix T of monetary transactions. It then follows that any set of imputations, J , can be made cumulatively, and that

$$T_J = T + \sum_{j \in J} I_j \quad (1)$$

will always be a SAM. Accordingly, there is no reason why imputations have to be made for all DIY or personal activities. Indeed, as we shall see, common practice is to make only a few.

3.2 Theoretical foundations

If imputations are to be made, it is important to have some rationale on which to base the calculations. This can be provided by a production function approach to household behaviour as noted by Hawrylyshyn (1977). In a relatively simple version of this approach the individual or household can be viewed as addressing the following formal problem:

$$\begin{aligned} &\text{maximise} && U(c, \ell) \\ &\text{subject to (i)} && c + \omega h = f(e + h, \kappa); \text{ and} \end{aligned} \quad (2)$$

$$\text{(ii)} \quad \theta = e + \ell \quad (3)$$

The notation is as follows. First, θ is used to denote the time endowment of a particular person, ie the total time available as accounted for in Table 1. The time constraint set out as (3) above implies that the individual is free to allocate this time endowment either to personal activities (amount l) or to employment in one form or another (amount e). Next, it is assumed that personal activities give pleasure so that utility, U , increases with l . However, utility also increases with the consumption of goods, c , and this is limited by the budget constraint (2). The function f on the right-hand side of (2) is a production function. It assumes that the individual has capital κ (farm equipment and/or consumer durables) and that the services of these assets are combined with a total labour input of $e + h$, where e is supplied by the individual themselves and h is a measure of labour services that are hired. This hired labour is paid a wage, w , so that the budget constraint (2) is to be interpreted as saying that consumption, c , is limited by total output, f , less payments to hired labour.

The output f can be thought of as comprising any tradeable goods and services produced by the individual, including z-goods as proposed by Becker (1965). Moreover, it should be noted that if the individual has limited scope for self employment and the production of z-goods (κ is small) then some of their time will be spent with advantage in working for someone else (also at wage w). Such behaviour is consistent with the above formulation if it is allowed that h can be negative.

If π denotes the surplus or profit earned by the individual from non-marketed output, then $\pi = f - w(e + h)$ and simple manipulation yields the result

$$c + w\ell = \pi + w\theta \quad (4)$$

It follows that for the individual to maximise profits, π , with respect to h now requires that

$$f'(e + h) = w \quad \text{or} \quad e + h = f'^{-1}(w) \quad (5)$$

which implies that π is uniquely determined by w . It also follows that the formal problem facing the household can now be restated as

$$\text{Maximise} \quad U(c, \ell) \quad (6)$$

$$\text{subject to} \quad c + w\ell = \pi(w, \kappa) + w\theta \quad (7)$$

where π , w and θ are all given. This is a standard utility maximisation problem in which utility depends on c and ℓ . Their relative price is w , and total income (in units of c) is given by $\pi + w\theta$. This total income is the time endowment, θ , valued at the wage w , plus any unearned income or surplus received as a return on the assets κ .

The result expressed in equations (6) and (7) provides a simple theory on which to base imputations. If total income is to be given by the right-hand side of (7) then all time (including personal time) must be valued at the wage w which could be earned in the market, and any surplus received by the individual in producing goods and

services which are marketed or might have been marketed should also be included as a return on individual assets. If this is done then, from equation (7), there will be an accounting balance between income and outlays in the form of consumption expenditures and personal time, the latter being valued at its opportunity cost. Moreover, these income and outlay balances will correspond exactly to the constraints on an individual seeking to maximise utility which are suggested by basic theory.¹¹

3.3 Problems and limitations

The theoretical framework described above is inevitably an abstraction. The actual environment for individual decision making is not necessarily so simple and the description of behaviour is not necessarily correct. However, the theory can provide a useful starting point from which to consider some of the problems that would inevitably arise in any attempt at application.

The theory assumes that time spent in working for someone else should be valued at the wage actually paid. Similarly, if an individual spends time producing something which is marketed, the theory squares up with the idea that the output should be valued at its market price. Value added can be obtained from this simply by deducting raw material costs. The wage component is then any actual wages paid plus an imputed wage for self-employment. This imputation can presumably be based on the wage rate that could be earned on the open market by the individual in question or a person with similar characteristics. Finally, any surplus of value added over wages is a return to assets employed. All of this is relatively straightforward.

It is when we come to value the output of tradeables which are not in fact traded that more difficult problems can arise. If these outputs are to be valued at the market price of equivalent goods and services, then two types of difficulty may be encountered. The first is that the product market may be imperfect. If there is no exact substitute available on the market for DIY output, then there is no self-evident method for imputing its value. Thus it may often be more appropriate to value DIY activities at the opportunity cost of supplying them, rather than by the market price of an imperfect substitute. To implement this alternative it must be possible to estimate both the opportunity cost (or shadow wage rate) for the time of each individual, as well as the shadow price of services provided by those household durable goods which are involved in the DIY production activity.

It is not proposed to enter a lengthy discussion here of how the services of consumer durables might better be measured in the national accounts. It may suffice to make two points briefly. First, if such services were to be measured, then the present context provides a theoretical justification for doing so. And, second, if such services cannot be measured, then it is perfectly possible to retain the current practice of treating purchases of consumer durables as a part of current consumption expenditure. Output from DIY activities would then be (under) valued at the opportunity cost of the labour time necessarily involved in their production. Hence the services of consumer durables would make no measured contribution to domestic output.¹²

Two further complications could be accommodated by elaboration of the simple theory set out above. The first is to recognise that the skills of people differ, and that individuals should therefore specialise in those activities in which they have a comparative advantage. This argues for each person spending more time in producing goods and services which are marketed and less on DIY. However, such a tendency is offset to the extent that the tax system provides strong incentives going in the opposite direction.

The remaining complication to be discussed here arises from the fact that theory as set out above takes it for granted that individuals are free to allocate their time in continuously variable amounts across different activities. But in fact this is not so. The labour market is imperfect in two important respects. Firstly, transaction costs and indivisibilities will arise in any attempt to hire someone else to undertake tasks which one otherwise has to do oneself. Consider, for example, the phenomenon of queuing. Were it not for the imperfection of the labour market it is probably a fair assumption that no-one would stand in a queue if the opportunity cost of their time was greater than that of an alternate who could be hired to do the job. It follows that in this case, as in many others, the cost of hiring an alternate is an upper bound when the market for having someone else do 'it' for you is imperfect. Were it not so, and the inequality went the other way for some individual, then that individual is simply wasting their time by standing in line.

The second important respect in which the labour market is imperfect is illustrated by the fact that all those who are sick, in prison or attending school have limited discretion in their time

allocation. However, perhaps the most important loss in discretion arises as a result of employment in the formal sector.

The distinction between formal and informal activity has come into common usage in development economics since it was first introduced in ILO (1972). And it is now used in a variety of ways. In some contexts the distinction is used synonymously with that between modern and traditional sectors, where the meaning is clearly based on differences in technology. But here the usage will be based entirely on phenomena in the labour market, which may or may not derive from the characteristics of production technology. Specifically, the degree of formality can measure the extent to which the hiring of labour is formalised under a contract which specifies, inter alia, hours of work and, perhaps implicitly, the intensity of effort expected. In the informal sector these things are at the discretion of the worker to a greater extent and payment is typically based on a piece-rate. In contrast, in the formal sector, the marginal products of different sub-divisions of labour, or of equipment, are highly interdependent. For this or other reasons an inadequate contribution by one worker may have a disproportionate effect on the productivity of others. Hence the need arises for some systematic understanding of what each person's contribution is expected to be, and this is typically expressed in a contract.¹³

The consequence of formality which is of some importance here is that the individual does not control their hours of work. Accordingly, given the average hourly rate for a formal sector job, individuals engaged in that job might prefer to work for longer hours or for less. The boundary between time spent on formal, as opposed to

informal activity, is therefore not likely to be set in the ideal place from any one person's point of view. Rather, it will most likely be a compromise, and the wage paid will therefore be an imperfect estimate of the opportunity cost of time for each employee.

It is evident from the above arguments that the valuation of DIY activity is not always a simple matter when the output does not have a perfect commercial substitute. However, as we have seen, an approximation can be made provided that a shadow price of time (or wage rate) can be estimated for each type of individual. These same shadow wage rates can then also be used to value personal time, as required by the theory.

4. The case for change

4.1 Current practice in national accounting

The arguments above suggest that a theoretical basis might be found for valuing the pattern of time use for each individual in society, and that the resulting estimates could then be integrated into the overall framework of social accounts. However, for the most part, such an exercise would represent a venture into new territory. National accountants generally try to avoid imputations and are not especially concerned with the disaggregation of value added as payments to different factors. It is not surprising therefore that the GDP as measured by international standards includes value added in the monetised economy and little else besides. Blades (1975) provides a detailed description of the practices in many countries while Hill (1979) gives us some generalisations to characterise the situation. These suggest that the production boundary, ie the limit of

imputations beyond the monetised economy, is typically drawn so as to include DIY production of goods and to exclude that of services. However, within this boundary, items may be excluded if they are 'unimportant' or difficult to measure. For the developing countries, therefore, subsistence production in agriculture is usually estimated. Gathering activities are rarely included. And the contribution of housework, for example, is invariably ignored. This situation implies various problems of which the most obvious is the lack of international comparability. Slightly more subtle is the fact that, if only a part of non-monetary activity is recorded then, as monetisation spreads, this will create a spurious impression of economic growth while the average level of income will evidently be understated.

As a further illustration of how 'importance' may be ambiguous we can refer once again to the phenomenon of queuing. While purchasing, of itself, necessarily takes up time (a transaction cost) in those markets which are not cleared by setting the price of goods appropriately, the excess demand is often met by obliging would-be consumers to queue, thereby raising the opportunity cost to the customer of the goods eventually consumed. This phenomenon is quite often observed when the prices of particular consumer goods are state controlled. To be comparable with uncontrolled market situations, the appropriate basis for comparison is that of opportunity or user cost, which includes the cost of time spent queuing. To base a comparison on the price of goods alone would be to overstate the relative living standard of individuals in an economy with controlled prices. And the overstatement would be precisely that of omitting the necessary costs of queuing.

Deciding what to impute by the criterion of what is important raises distributional issues also. If the objective is to measure aggregate GDP then small numbers are not important. But if the social accounts are seen as a framework for recording income distribution across household groupings, then the measure of what is important must change. A ten per cent change in income for the poorest ten percent of the population will be a significantly smaller fraction of GDP than 1% - more like 0.1%. By the GDP criterion it is not important, therefore. But by the criterion that it is people that matter, a 10% change in income is important.

4.2 Hill's half-way house

In Hill (1979) it is suggested that the correct point at which to draw the production boundary is at the margin between personal and DIY uses of time. In other words, the range of what is productive should be extended to include all those production activities which others could do on our behalf, while personal activity should continue to be regarded as 'unproductive'.

Setting aside for now the potential difficulties which have been noted previously in making a distinction between personal and DIY time-use, it can be acknowledged that if Hill's proposal was actually to be followed then it would make a considerable difference to the range of activities which are conventionally treated as productive by national accountants. And this would be no bad thing. In particular it would bring into the purview of the national accounts the vast range of activities undertaken by women outside the formal sector.

These are the homemaking, child-raising, feeding and gathering activities which have previously been referred to. And, as noted before but worth repeating here, their customary exclusion from the realm of productive activity implies that a large part of the productive contribution made by women goes unrecorded in the national accounts. For the developing countries especially this is a great pity: amelioration of the lot of women is, in the final analysis, much of what development is all about.

In making the argument for his particular choice of production boundary, Hill (1979) puts great emphasis on the fact that, in principle, goods produced on a DIY basis can be valued, albeit imperfectly. So too can services which can be supplied by others as an alternative to DIY. But there is, by definition, no alternative source for supplying personal services, ie there is no corresponding market. Hill concludes that the valuation of such services is not appropriate for measuring economic activity. Hence any such valuations should be excluded from GDP.

4.3 Why not go all the way?

There seems to be two difficulties in the way of accepting the argument in Hill (1979) and hence rejecting the notion that, in principle, personal time might be valued within a framework of social accounts.

The first difficulty is that the absence of a market for a product is no obstacle to valuation, as illustrated in section 3.2 above. Just because going to school or jogging is something that each

individual must do for themselves does not mean that time spent on these activities cannot be valued: such activities have an opportunity cost which can, in principle, be measured. Hence time spent on them can be included in a factor cost measure of gross value added, and should be.

One of the major trends in economic theory since the present system of national accounts was drawn up (see UNSO 1968) has been the replacement of an earlier neo-classical formulation of consumer behaviour, whereby each individual maximises a utility function $U(x_1, \dots, x_n)$ subject to a budget constraint $y = \sum_i p_i x_i$. In its place the profession has increasingly turned to the more general approach promoted in Becker (1965) which is illustrated by the formulation in section 3.2 above. This more general approach has facilitated considerable progress in understanding the economics of education, unemployment and travel, and in many other areas besides. In each of these developments the opportunity cost of time is a key feature. If measurement is to keep abreast of theory, therefore, then serious consideration must be given to the merits of going the whole way and imputing value to all time within a social accounting framework, irrespective of whether time is used for personal activities or for DIY.

A particular criticism of this position can usefully be dealt with at this juncture. It can be elucidated with the help of Figure 1. The figure represents the theoretical formulation of individual behaviour described by equations (6) and (7). However, the figure as drawn introduces the feature of minimum levels of consumption and leisure. These can be thought of as committed levels of c and t

in a Stone-Geary utility function or more generally as parameters of the restricted form

$$U(c, \ell) = U(c - \gamma, \ell - \lambda) \quad (8)$$

for all $c > \gamma, \ell > \lambda$

The implication is that if the individual was to have less time to relax and sleep than λ , or less consumption than γ , then they would not survive.¹⁴

Given the restricted specification of U in (8) it follows from the mathematical character of the formulation that there would be no change in the behaviour of the individual if the income constraint (7) was written instead as

$$c + \omega(\ell - \lambda) = \pi(\omega, \kappa) + \omega(\theta - \lambda) \quad (9)$$

It would then be consistent with this new formulation to impute value to leisure time only to the extent that it exceeded λ . There would therefore be no need to impute a value to necessary sleep and relaxation.

An objection to this line of argument is the asymmetric treatment of ℓ and c which it suggests; if survival levels of rest do not have to be accounted for, then why not treat nourishment in the same way, ie account only for consumption in excess of γ ? More generally, to suggest that resource uses which are essential to survival should be excluded from both theory and measurement is really an argument for a net concept of production, ie for measuring only those things which

actually increase welfare. It would certainly be possible to set up a social accounting framework in which the production of basic needs or survival requirements was separated out from the provision of supernumary wants.¹⁵ Interesting aggregates based on the latter and excluding the former could then be constructed. The general principles involved would be no different from those required to account for depreciation or for the exhaustion of minerals. However, if we want to start our calculations with a gross measure of output, then it is necessary to value all uses of personal time, and not only those that are supernumary relative to survival.

The third and final difficulty with the position promoted in Hill (1979) is that, as Hill himself recognises, the question of what should be included in GDP is in many ways misleading. For certain purposes it will be useful to sustain the aggregate measures which have been developed from the recommendations in UNSO (1968) and its antecedents. However, as Hill also suggests, he and others might also find it useful to have available a second set of aggregates which correspond to his preferred location of the production boundary. A key point is that the one does not preclude the other provided that the more extensive definition, with appropriate disaggregations, is the one which is adopted for empirical implementation. Users are then free to work with any sub-aggregate they choose.¹⁶ And to follow this point to its logical conclusion, there is no implication that imputing value to all uses of time necessarily entails abandoning GDP as conventionally understood in those contexts in which it has proved useful. Rather, the point is simply that the familiar measures could be readily derived from a more extensive SAM framework which adopted the broad approach to imputations that has been discussed in this

paper. The real issue, then, is whether it would be a useful and interesting thing to attempt. There are several reasons for thinking that an affirmative answer should be given to this question and that evident advantages would attend success. Several of these have already been referred to in the text and can now be summarised to conclude the argument.

First, to draw the production boundary in any way which excludes some activities is ultimately to invite ambiguities. The implications of marrying ones housekeeper are often cited as a critique of current practice, but the issues are much more serious than this example would suggest. Spurious trends in output due to increased monetisation have already been mentioned, as has the gross misrepresentations of women's contributions to value added. To these we can now add that much activity in the hidden and illegal economies are of the DIY type, and aggregate output measures are seriously biased if this is excluded.

A second line of argument is that the proposals in this paper, if implemented, would bring social accounting practice into line with current theoretical formulations of economic behaviour and otherwise forge strong links between economic and social statistics. While previous work using social accounting matrices has brought into the framework of the SNA questions of income distribution across socio-economic groups, other aspects of the linkage between the SNA and the SSDS have largely been set aside. This is corrected in the present paper to the extent that the proposals described in Table 1 would make it possible to capture within the accounting framework both the stocks of different types of people (ie human capital) and their use of time.

This, then, would be a major step forward in integrating what are otherwise distinguished as economic and social statistics.

A further implication of the proposals would be to change (ie enhance) the picture of income distribution which otherwise emerges from the social accounts. The reason is as follows. Previous work has shown that it is relatively straightforward to disaggregate the accounts so as to show separate detail for different socio-economic groups.¹⁷ Table 1 now envisages a similar disaggregation of labour by type, which is to be complemented by income accounts for labour and the other factors of production in Tables 2 and 3. These two disaggregations - of institutions and factors - are brought together within a SAM by a mapping from factor incomes to institutions within which all of labour income is to be credited to the different socio-economic categories of households. With suitable choice of categories, it is reasonable to assume that this mapping is on the basis that the different types of household receive income in proportion to their endowments of labour of different types, ie both households and types of people should be so defined that an individual has equal access to a given labour market irrespective of their socio-economic origin. Putting this somewhat differently, categories are to be defined in such a way that there may be discrimination between them but not within. And if this can be achieved, then mapping from factors to households is straightforward. Also, it follows directly that imputing different amounts of income to different types of people will have major consequences for the perceived distribution of income across socio-economic groups.

A case in point arises in Malaysia where conventional income figures, with imputations covering only subsistence production, suggest that the majority of the poor are Malay, rather than Chinese. However, on examination, it is apparent that relative few Malay women are employed on the open market, preferring rather to work only within the family or for a close relative.¹⁸ The Chinese, in contrast, do not have this particular preference, so that there is an important difference for the two groups in their hours of work outside the home. It follows that the income differential between these groups is reduced, if not reversed, if value is imputed to the time which is spent inside the home.

This said, it must also be recognised that the appropriate value to impute for time spent inside the home is not the same for Malays and Chinese. In the latter case, given that the Chinese women are free to work for others in the open labour market, an appropriate measure of the opportunity cost of their time is the marginal wage-rate at which additional work is available. For Malay women, who do not have this open market option, the appropriate rate is presumably less for that reason: for them a more suitable estimate might be the wage for (unskilled) labour which these households are willing to pay others for providing labour services, as an alternative to performing particular tasks themselves.

Finally, it can be suggested that a considerable advantage of adopting Hill's proposals, suitably extended to include personal time, is that the corresponding imputations on the expenditure side would encourage the valuation of consumption according to the user cost principle, and hence an extension of social accounts to embrace a

range of issues which are otherwise ignored or misrepresented. The journey to work provides a case in point. Without imputing a value to time, standard accounts show only the amounts spent on fares or car expenses. These may well be related monotonically to the time taken up in travel. But they evidently underestimate the total user cost, and hence the costs of urban congestion which have to be borne at the household level.

The question of underestimation takes a more extreme form when goods and services are provided free, as is the case for a wide range of government services, notably health services and education. Because these items are free, households spend nothing on them. Hence there is no trace in standard national accounts of who benefits from public provision in these areas. This problem is overcome when we move to the user cost principle since it is now necessary for the household to allocate time (as well as any expense of books and drugs) to receive the services. Of course, user costs involve a significant element of subsidy when hospital beds are free, for example. But that is not the point. The point is rather that adoption of the market price principle of valuation would give no indication of who was benefitting from free goods. The user cost principle overcomes this difficulty.

A counter to this argument is that other ways of keeping a record of who benefits from public expenditure can be developed. In particular Meerman (1979) has proposed that the benefit to different socio-economic groups from public expenditure can be imputed on the basis of their cost of provision ie a producer cost principle. The Meerman alternative is clearly viable and in fact makes a significant

difference to the observed details of income distribution. In maintaining a preference for the user cost approach, two points can be noted. One is that user costs are just that. Therefore, they are the costs which households actually respond to.¹⁹ The second line of argument in support of user costs is that imputations based on producer prices are really a way of trying to see who benefits from particular subsidies ie they constitute a partial tax/subsidy incidence study. As such they provide useful and interesting results. But it is not an improvement to the social accounts of the nation to modify data by making imputations about the incidence of particular subsidies. General or partial incidence calculations are one of the useful applications of the accounts once they are set. But these imputations are not something to impose. In particular, there is no special merit in the picture of income distribution which is obtained by imputing the value of some, but not all, of the subsidies (and, by the same token, the indirect taxes) which government injects into the price system.

The proposals in this paper are sympathetic to what seems likely as the natural evolution of social accounts as an integrating framework for the concepts and coverage of a wide range of statistics. It seems increasingly evident that the future will belong to micro data bases in machine-readable form, as opposed to the derived statistics offered by secondary sources. There will always be a need for particular aggregates, such as the GDP, to be maintained for as long as such aggregates prove useful. But, otherwise, both from the narrow perspective of organising data and definitions, as well as from the broader perspective of trying to record and understand the structure of society, the particular definition of GDP is secondary. The

primary issue is to understand how everything fits together. This paper has attempted to contribute in this spirit by showing how data on time-use can be fitted together with that on financial transactions.

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Figure 1

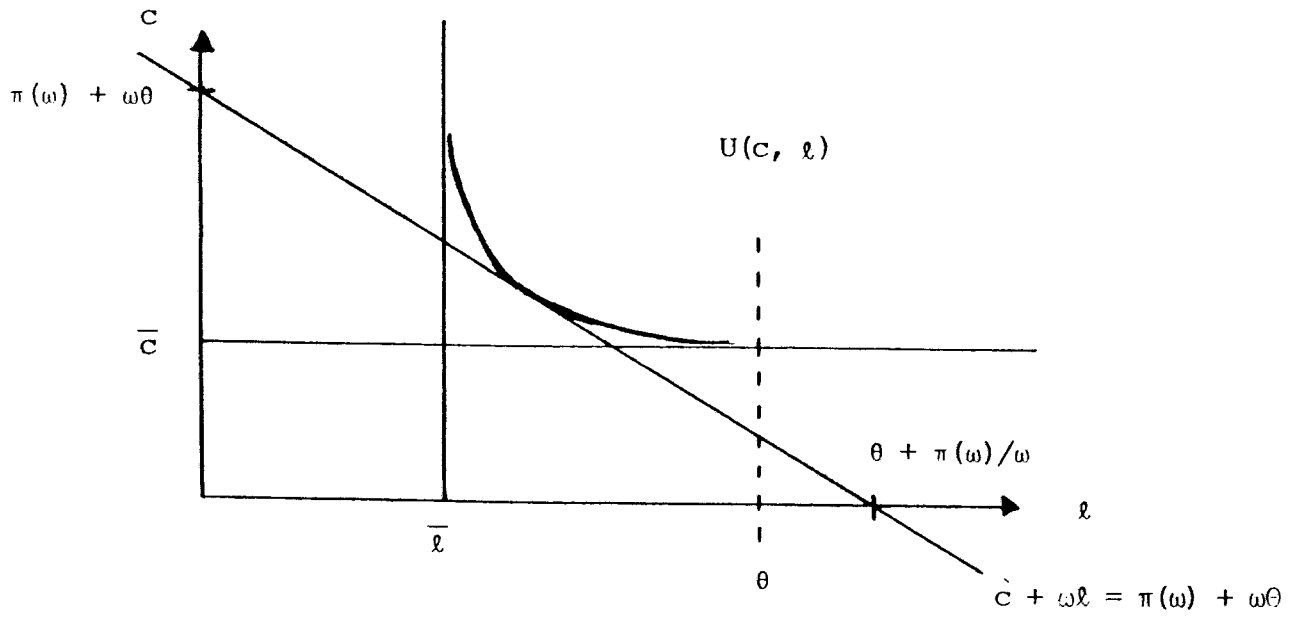


Table 1

Accounting for time use

Types of people versus types of activities

Types of people	Types of activities			Total available time
	Production of domestically tradeable goods & services		Production of non-tradeables (Personal)	
	Traded	Not traded (DIY)		
Classification by age, sex, education, location	Work for wages	Fetching & carrying	Leisure & sleep	Population by type
	Self-employment in production of goods and services for the market	Queuing	Going to school	
		Housekeeping	Travel time	
		Care of children & the sick		
		Production for own consumption		

Table 2

A basic social accounting matrix with capital and external accounts consolidated

	Current A/cs of institutions	Production			Other A/cs	Totals
		Factors	Activities	Commodities		
Current accounts of institutions	Current transfers	Factor income	0	0	(a)	Total Income
Factors	0	0	Value added	0	(b)	GNP
Prod- uction	Activities	0	0	Domestic supplies	0	Total Revenue
Commodities	Consumption	0	Intermed- iate Demand	0	(c)	Total Demand
Other accounts	Savings	0	0	Imports	*	..
Totals	Total Income	GNP	Total Revenue	Total Supplies	..	

(a) Net non-factor income received from abroad

(b) Net factor income received from abroad

(c) Investment plus exports

Table 3

Factor income sub-matrix of the SAM

		Activities involving people		Provision of capital services	Totals
		Tradeables	Non-tradeables		
Labour	Types of people	Actual and imputed wages	Imputed wages	0	Total labour income
Capital	Household	Surplus of domestic + self- employment enterprises (including the return on consumer durable goods)		Rental income (including the imputed rent on owner- occupied dwellings)	Total Profits
	Corporate	Corporate profits	0	Rental income	
Totals		Value added in tradeables	Value added in non- tradeables	Value added by pure capital services	

FOOTNOTES

- 1 An earlier version of this paper was presented at the 20th Conference of the International Association for Research in Income and Wealth in Rome, August 1987. I am grateful to my official discussant, Anne Harrison, and others attending the conference for their comments at that time.
- 2 Some of my earlier thinking is reflected in Grootaert (1982).
- 3 The characterisation of particular activities as productive or unproductive is an issue to be taken up on section 3 below.
- 4 The units in which the cell entries are recorded is unconventional, however. Rather than record the time devoted to each activity, the usual convention is to base the cell entries of a manpower matrix on head-counts of the number of persons of each type in each activity. The difference is, of course, a measure of the average hours of work (by type of labour and activity). It follows that, to the extent that this number is the same for all cells of the matrix, the difference in units reduces to being simply a scalar change of the cell entries.
- 5 See, for example, Stone (1982).
- 6 This comparison is enriched when, at a later stage in our discussion, we come to consider the economic returns from engaging in alternative activities. But the first step is not unimportant since the opportunity to engage in, or enjoy, particular activities is often location specific.
- 7 It can be noted that it is often necessary to migrate physically in order to obtain further education, simply because it is rare for all levels of education to be available in any particular locality.
- 8 By extension, the approach is supportive of the concept of active life profiles as developed by the late Dudley Seers, since Stone has shown that there is a simple link between these profiles and the stochastic process which features in the SSDS. See the paper by Seers, published as Chapter 25 of Syrquin, Taylor and Westphal (1984) and the appendix to this chapter by Stone.
- 9 Essentially the same distinction is made by Hawrylyshyn (1977).
- 10 An illustration of this approach applied to Malaysia, with 48 types of labour and 30 different activities, is provided by Pyatt and Round (1985).
- 11 A change in the wage rate does not, of course, affect all households equally. It can be shown that an implication of condition (3) is that an increase in the wage, w , will raise the level of income for those who supply labour services to others, and it will have the opposite effect for those who are employers. This can be seen from the fact that total differentiation of the constraint (7) yields $w d\ell + h d\omega + d c = 0$.

- 12 Their treatment would then correspond to that of capital employed by government in providing services to households eg schools and hospitals.
- 13 Since labour contracts can take a variety of forms, the above argument does not necessarily lead to any clear distinction between formal and informal activity. In practice, therefore, a criterion which can be useful, at least in the developing country context, is to describe an activity as formal or informal depending on whether or not it is covered by social security legislation.
- 14 For survival to be possible therefore requires that $\pi + \omega(\theta - \lambda) > \gamma$.
- 15 Pyatt and Thorbecke (1976) discuss this possibility.
- 16 It can be noted that having alternative measures M_1, M_2, M_3 etc of aggregate money supply is actually useful for monetary policy. There is every reason for extending the analogy to measures of income and production.
- 17 See for example various papers included in Pyatt and Round (1985).
- 18 Kusnic and Da Vanzo (1980) provide an interesting discussion of these issues.
- 19 If total income was actual income, plus an imputation for time, and if prices were actual prices, plus due allowance for user cost premia, then actual expenditures, at user costs, would be precisely equal to our proposed estimates. In contrast, if income was actual income, plus the producer cost of benefits provided by the government, and if such benefits actually cost the consumer what it costs government to supply them, then it is most unlikely that the income aggregate would be spent as estimated. In other words, the first line of argument is that the user cost approach improves the social accounts in the direction of closer concordance with realities.

SUMMARY

The paper discusses how statistics on time use can be integrated into a social accounting matrix representation of economic activity. Time use data are presented as an extended manpower matrix and related to Stone's basic dynamic framework for social statistics. The valuation of time and methods of imputation are then discussed in relation to the choice of production boundary. It is argued that any imputations of labour income must be balanced by valuing goods consumed at their user cost and that there is a case for imputing value to all uses of time.