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SYSTEM OF NATIONAL ACCOUNTS (SNA)

SUPPLEMENTING THE NATIONAL ACCOUNTS FOR PURPOSES OF WELFARE MEASUREMENT

CONTENTS

INTRODUCTION

1. In recent years increasing attention has been given to the deficiencies of the usual national accounting concepts of the gross domestic product, the national income and elements of these aggregates as measures of economic welfare and to ways in which these deficiencies might be rectified. It has been suggested that these national accounts series do not measure adequately or at all certain activities which make important contributions to levels of living. An example, in this view, of a class of important omissions are the domestic, educational and similar services which households perform on their own account. An illustration of activities thought to be inadequately assessed are the non-marketed services of government, which are valued at cost, excluding any return for the use of capital. On the other hand, it is said that the inclusion of the output of regrettable necessities overstates the gross domestic product and consumption from the point of view of welfare. Certain of the questions raised concerning the adequacy of the national accounting aggregates as measures of welfare create doubts about their usefulness in assessing the gaps in levels of living between the developing and developed countries and the growth in economic welfare as development proceeds. This is due, for example, to circumstances such as the following: The share of the excluded household activities in the output and consumption of services is larger and the share of regrettable necessaries is smaller, the lower the level of economic development. Furthermore, the estimates of substantial household output of primary and certain processed goods on own account in the case of the developing countries, which is included in production, nationalincome and consumption in the national accounts, are often questionable. Because of some of these considerations the Committee for Development Planning of the United Nations in (52, paragraph 17) concluded that the national accounting aggregate for the gross domestic or national product should be supplemented by more suitable measures of economic welfare. The Committee hoped that this question would be pursued by the appropriate bodies of the United Nations, especially the Statistical Commission.

2. This paper is intended to serve as a basis for the consideration by the eighteenth session of the Statistical Commission of the class of questions outlined above.[1/] It reviews the topics on which new information or rearrangement of existing information is called for in order to furnish suitable measures of welfare and the related circumstances and suggests whether and through what means it may be feasible to furnish that information. The paper is designed to deal with the following specific questions: can the required information be supplied; if so, is this best done by a modification of the national accounts or by some other means? what are the difficulties and priorities of implementing these proposals?

3. The suggestions that have been made for amending or extending the national accounts are numerous and to some extent interrelated. Accordingly, it is desirable to set them out systematically in relation to the basic concepts used in national accounting. This will be done below under the headings: production; intermediate and final product; current and capital expenditure; the distribution of income, consumption and wealth; and socio-demographic and environmental studies. The last heading does not refer to anything to be found in the national accounts but it is useful because there are a number of proposals which cannot be introduced into the national accounts but which are important and the subject of study in other fields.

1/ The paper was, for the most part, prepared by Professor Richard Stone as consultant to the United Nations.

4. As we shall see, the proposals range from topics which it is already quite usual to find dealt with in national accounts, through topics which have been discussed by national accountants and could, with varying degrees of difficulty, be incorporated in the accounts, to topics which could not conceivably be dealt with in this way in the foreseeable future. The difficulty of implementing this last group of suggestions seems largely to arise from one of three sources. Let us first see what these are and then discuss the individual suggestions in detail. At the end, the suggestions made in this paper will be summarized and a list of works cited will be given.

I. SUGGESTED ACTION BY THE STATISTICAL COMMISSION

5. Based on the discussion of this paper, the eighteenth session of the Statistical Commission may wish to indicate the ways in which more adequate measures of welfare might be developed and the sort of future work which should be undertaken on these questions within the frameworks of the national accounts, of a system of social and demographic statistics, of statistics of the environment or of supplementary bodies of data, if required.

II. THREE BASIC ISSUES

6. In one context or another three issues recur again and again in the critical discussions in recent years of the national accounts as they are usually set up. The main differences that have appeared in the recent literature, for instance in (60) and in (34), arise from wide divergences of opinion on what it is possible to measure and value and on what constitutes final output. Let us, therefore, look at these issues before going into further detail.

A. The measurement of output

7. The first issue concerns the terms in which we try to measure output. Usually we think of a good or a service which can be expressed in an appropriate physical unit. Quite apart from difficulties arising from lack of data, there are frequently conceptual difficulties, well-known to the makers of index-numbers; many of these are discussed in chapter IV of (55). Some of these difficulties can be met but others prove intractable and, in extreme cases, the attempt to measure output directly is abandoned and use is made of input measures of output. This means that a series for the quantity of output is approximated by an index-number of physical indicators of inputs weighted by their cost in a base year.

8. It is sometimes said that not only should input measures of output be abandoned but that even output measures, as conventionally thought of, do not go far enough. To take the case of medical services, numbers of doctors' appointments, days of patient care, quantities of different drugs administered, numbers of different operations performed are themselves, it is said, inputs into an ultimate output (benefit) called health. But apart from the seeming impossibility of finding a measurable empirical correlate of a concept like health, it is not clear that the concept is the right one because health depends on circumstances as well as on the performance of medical services. A man who is ill needs treatment and it is pointless to tell him that he would probably not be ill if he lived in a warmer climate and did not work so hard.

B. The valuation of output

9. The second issue arises from the fact that in non-market activities, that is the services produced by government and private non-profit bodies, there is no means of observing the value of output independently of the cost of inputs. These activities register neither gains nor losses and so, whatever is done, the accounts for them provide no economic signals.

10. It is sometimes said that this difficulty can be overcome by imputing a return to primary inputs other than labour (whose input cost is already measured as employees' compensation). But the question then arises: what rate of return? There is little reason to suppose that all assets employed in non-market activities should be credited with a normal rate of return and still less to suppose that they should all be credited with the same rate of return. Imputations of this kind would only serve to make the accounts of non-market activities look like the accounts of market activities without providing any indication of which branches it would be desirable to expand and which to contract, that is which are high earners and which low, when judged by some welfare criterion.

11. The imputations that have been described cannot provide such a criterion; indeed they cannot even provide an output measure of output. All that is changed by the imputations is that the input measure of output is somewhat amended. Thus, if they were made, we should not know how the outputs of government services were changing in the only sense that is in any way relevant as a measure of welfare.

12. A discussion of alternative measures of output will be found in (59, ch. VI, section B) No numerical examples are given there and it might be supposed that the differences were small between input measures of output and output measures of output. Whatever might be the case if it were possible to solve all the conceptual and statistical problems of constructing a refined output measure of output, it is certainly not the case with the measures that can be constructed at the present time.

13. The difficulties just discussed go a long way to explaining why national accountants are reluctant to abandon their existing treatment of non-market activities; why they see insuperable difficulties in an ultimate measure of output (benefits), raise serious objections to a blanket imputation of a rate of return to capital employed in non-market activities and therefore see no adequate means of measuring changes in the productivity of the primary inputs into these activities.

14. The difficulties of measuring and valuing non-market activities have been a subject of discussion for a long time and there does not appear to be any short-cut solution which is not more misleading than informative. That a solution is highly desirable cannot be in doubt, and the most promising line of attack would seem to lie through the use of programming methods which, at least in principle, would make it possible to apply the models of such writers as Lange (27) and Lerner (29) relating to the allocation problems of a socialist economy. It has long been realized, as in Koopmans (25) that models of this kind are also relevant "to the allocation problems of the many sectors of capitalist or mixed economies where competitive markets do not penetrate". In general, it is necessary to formulate the aims of a non-market activity, to indicate how the aims are related and to describe the technology of the activity. Although progress has been made with the application of programming methods to more limited problems, it cannot be expected that usable results in dealing with problems on the present scale would be obtained in the short run. But a thorough examination of the problems and possibilities of applying such methods in the present context would hold out some hope for the future. In the meantime the limitations of what can now be done should be recognized.

C. Regrettable necessities

15. The third issue arises with proposals to omit certain products from measures of total output on the ground that they are not wanted for their own sake, that they are defensive expenditures, that they are regrettable necessities. Since the national accounts set out to record the transactions that take place in an economy (plus some imputations) it is clear that these omissions could hardly be made in the accounts themselves. But they could be made in a separate tabulation, starting with output as conventionally measured and then deducting the output of what are regarded as regrettable necessities. The matter was discussed many years ago in Reddaway (40, pages 451-452) where it was shown that the ability of the British public to obtain peace-time goods (the things they really wanted) in the four years after the second world war owed more to the run-down of war production than to the rise in total product as usually measured. This seems a sensible use of national accounts data and, even if the conclusion is not very surprising, it is interesting, since war expenditures cannot forever be run down at the rate possible in the years following a major war, so that before long the growth in the things people really want will have to keep pace with output.

16. Among his regrettable necessities Reddaway included, in addition to war expenditures, some other items such as expenditures on tax collection and the police. Some writers would like to go much further and as Reddaway said: "if one once allows one's ingenuity free rein almost all uses of income can be put into that category". This is indeed true as the following two examples show. It is suggested that commuting expenses should be treated as regrettable necessities; but this implies that commuters are forced to commute rather than live in the city centre with its attendant disadvantages including, in many cases, high cost. Probably most commuters would regard it as highly regrettable if they were not allowed to commute but were forced to live in the city centre that actually exists. A second example is provided by air-conditioning expenses which it is said, are only incurred as a defence against an inclement climate. Evidently, if such expenditures were omitted, total output would be the same whether or not people were protected against an inclement climate, which can hardly be a sensible conclusion.

17. Regrettable necessities seem to have a feature in common which indicates that they should not be left out of the national accounts or out of product totals intended for general use: they are always judged by reference to a difference in external circumstances. As international hatred and tension mount a given military expenditure buys less sense of security; metropolitan regions involve expenses that do not arise in less densely populated areas; inhabitants of a country with an excessively hot, cold or variable climate are forced into outlays which would not be needed if the climate were more temperate. But useful accounts cannot be kept on the assumption of a non-existent uniformity. If it is a bad year for the crops, the harvest is smaller and the price is higher. The farmer and his men may have worked harder than ever but they have produced less and, through no fault of their own, their productivity has fallen. It would serve no useful purpose, in fact it would be positively misleading, to keep the accounts as if weather conditions were constant.

18. Thus, in addition to the problems of measurement and valuation already referred to, those who would measure welfare must learn to account for the influence of external circumstances as well as the responses of economic agents. This assuredly cannot be done by deciding to leave responses to changing external circumstances out of the accounts.

III. PROBLEMS RELATING TO PRODUCTION

19. The national accounts are based on the concepts of production, consumption and accumulation and these terms are defined with some reference to what it would be useful to know and to the institutional arrangements in society which strongly influence, if they do not actually determine, what it is possible to know. Thus, we might begin with the idea that production means the bringing into being of goods and services, but it would soon become apparent that a line would have to be drawn somewhere. For instance, when a man shaves himself he undoubtedly performs a service but not one which is accounted for in the national accounts. It is not accounted for because, even if it were thought interesting to know the extent to which people shave themselves, it would be difficult and costly to collect statistics on the matter, particularly when it is considered that to do so in this case would suggest the need to collect statistics about everything else that people do for themselves. Economic accounting becomes virtually impossible if it is insisted that economic activity is coterminous with life itself.

20. The consequence of this line of thought is that production is given a restricted meaning; in fact, in the national accounts it is restricted, with certain exceptions, to commodities, namely goods and services intended for sale at a price which will at least cover their costs of production given the prevailing levels of indirect taxes and subsidies, and to the government and private non-profit services mainly furnished to the community free of charge. This means that production takes place in the business (or enterprise), government and private non-profit sectors and, as it is said, households lie outside the production boundary. The goods and services bought by households is measured and constitute a major part of final product; but no attempt is made to record any further processing they may undergo once they have passed the boundary.

A. Suggestions for extending the boundary

21. Some writers think that the national accounts should aim at providing a general measure of human welfare rather than restrict themselves to a general measure of unduplicated output of goods and services and, as a consequence suggest, among other things, an extension of the production boundary so as to include household activities. They point out that a limited number of imputations for non-market transactions are usually made in the national accounts and that these could be extended.

1. Household services

22. For instance, in their search for a measure of economic welfare, Nordhaus and Tobin (36) revive, among other things, the suggestion of imputing a value to the services of housewives thus, by intention, including the main slice of household activity within the production boundary. The main ingredients in their calculation are the number of married women, the average weekly hours spent in housework and the average hourly earnings of women. The product of these three items plus some further refinements, such as an allowance for the time spent by men on home duties, yields an estimate of the value of unpaid domestic services. This estimate is then divided by the service component of the price index of consumption expenditures to form an estimate at constant prices. The contribution of capital to these services is considered separately; expenditure on consumer durables is treated as investment and the value of the services of these durables is calculated as the depreciation of the stock plus an estimate of net return taken from Juster (24).

23. The aim of these calculations is to ensure that the value of unpaid domestic services is not overlooked. The difficulties are the same as those discussed in sub-sections II A and B above: the analogy with market rates of return seems tenuous, but here it is more important since a rate of return is imputed to labour as well as to capital; the measure of the movement of output at constant prices is still an input measure which, from a welfare point of view, begs the question; and the calculations provide no guidance for the better management of the household economy. In view of all this, it is difficult to see why statistical offices should be encouraged to undertake a great deal of new work in this direction.

24. But while, in this case too, it seems undesirable to suggest that, unpaid household services could be incorporated in the national accounts in a meaningful way, this view does not imply that nothing should be done. Clearly productive activity does take place in households and a study of the use of time in the household economy should yield valuable information on this question. A promising analytical approach to the use of these data is provided by Becker (3) who extends the usual theory of consumers' behaviour by recognizing that the goods and services that are capable of giving satisfaction to consumers require time to be spent in the household either in processing purchased goods and services or in actually enjoying this final product. In order to represent this, products and time are combined by means of household production functions.

25. As a result, the consumer is faced with two constraints rather than one: the money he can spend on the products is limited by his income; and the time he can spend either on earning income or on consumption is limited by the twenty-four hours of the day. The situation envisaged is similar to that which arises under points rationing in which the consumer has to operate under a regime of two currencies, money and points. In Becker's model the two constraints can be combined and this is equivalent to the special case of the rationing model in which points can be converted into money and sold.

26. In setting up his unified constraint, Becker makes use of a concept which he terms full income that is the income that would be obtained if all time and other resources available to a household were devoted to maximizing income without any regard to consumption. This would not of course mean working a twenty-four hour day since some sleep, food and even leisure are needed if income is to be maximized. In practice, most people have some regard for consumption and are willing to give up income in order to obtain something they like better: this may be time in which to play the piano or entertain their friends or it may be occupying themselves in a more pleasant but worse paid job. Time can be converted into goods that increase satisfaction and the cost of this additional satisfaction is measured by the income foregone, the estimation of which is fraught with difficulties and pitfalls.

27. Becker is concerned with the factors affecting the price of time for a single person but, in his study of the evaluation of housewives' time, Gronau shows in Moss (34, pages 63-90) that the model can be extended, with only minor modifications to cover multi-person households. Further, Ghez (18) discusses the problem of adapting the model to cover a sequence of time periods. With more experience of the application of these methods, we may see eventually how to supplement the national accounts to cover household activities. In the meantime we should recognize that we do not have this experience but that it is useful to gather data on the use of time for purposes of assessing household activities of a productive character. Such data are called for in a proposed System of Social and Demographic Statistics (SSDS) in (59).

2. The services made possible by free time

28. The examples of household services considered so far, relate to activities which can easily be recognized as productive even if there are good reasons for not including them in the national accounts. However, Nordhaus and Tobin (36), Juster in Moss (34 , pages 25-109) and other writers in the same vein, would like to go much further and include leisure in their measure of economic welfare. This suggestion can be made to fit in with Becker's ideas by reflecting that the services of a sailing boat combined with the time in which to sail it yield the final product of an afternoon's sail.

29. It is undoubtedly possible to look at matters in this way. One of the innumerable accounts on the production of households would be concerned with do-it-yourself sailing services. On the cost side we should find the depreciation and maintenance costs of the boat, insurance, harbour dues, perhaps provisions (unless these were all allocated to a meal services account) and the shadow value of the time devoted to sailing by all those who engaged in it. On the revenue side we should find the shadow revenue from sailing services. How the quantity of output corresponding to this revenue should be measured is a nice question. In different degrees for different people, time, speed, distance, safety, comfort and many other factors would be relevant.

30. It is evident that many conceptual problems would have to be solved, a great deal of information would have to be collected and sophisticated methods of analysis would have to be further developed and tested before such accounts could be established What would be gained from all this? Conceivably, we might be able to demonstrate that a unit of time spent in sailing boats was, on average, more highly valued or less highly valued than a unit of time in general. This suggests that people would be better off, on average, if they changed their use of time. Given individual aims, including the possibility of having no very well-defined aims, it seems unlikely that major misallocations of time would be detected. The major misallocations, if they exist, are likely to arise from a different source, ignorance of ultimate consequences, which the kind of analysis indicated above would not help to resolve. For instance, in some societies married women have on the whole an aversion to taking up paid employment because they have been brought up to believe that they are better engaged in looking after their homes and their families. This is not a very fashionable view but it may well be correct. Of course, if it does not matter how children are brought up then the stay-at-home mother can be regarded as engaging in a self-indulgent use of what is essentially her leisure time. But if the personal care and guidance of the mother is important in developing robust and balanced personalities in the children, it can be said that it is the working mother who may be self-indulgent since she is trading present affluence for herself and her family against a higher probability of disturbance for her children and for the society in which they live.

31. In any case, before it is possible to contemplate introducing general time accounting to supplement the national accounts a great deal of further work is needed. Some empirical data are available in such studies as Szalai (49) and some analytical methods have already been referred to. Again, the collection of data on the use of time would be a practical step for dealing with this question.

3. Goods and evils

32. The emphasis in recent years on the dangers of environmental pollution have brought home the fact that the use of many productive processes and types of apparatus leads to an output of evils, in the form of pollutants, as well as of positive goods and services. If the pollutants are treated, they are recorded in the national accounts but otherwise they are simply ignored.

33. The production of substantial quantities of untreated pollutants which cannot be absorbed by the natural environment leads to a situation in which the quality of life is reduced not by an exogenous natural phenomenon, such as the silting up of a river or the arrival of a little ice age but by a choice of techniques, a factor endogenous to the economic system. Clearly, the consequences of such factors should be recorded in a national accounting framework and the question is: have we a means of doing this?

34. In Leontief (28) it is shown that, given the necessary data, the well-known input-output framework can be extended to cover the production and reduction of pollutants by introducing a set of accounts for anti-pollution activities. Under this arrangement the inter-industry flow table is divided into four quadrants. The first of these contains the inputs of regular goods and services into the production of regular goods and services; the second contains the inputs of regular goods and services into the production of anti-pollution services; the third contains the inputs of anti-pollution services into the production of regular goods and services; and the fourth contains the inputs of anti-pollution services into the production of anti-pollution services. This last quadrant is needed because pollutants may be produced by anti-pollution activities.

35. In addition to these activities for dealing with the current production of pollutants it would be necessary to introduce activities for dealing with the effects of past pollution, for instance for reviving plant and animal life in lakes and rivers. It would also be necessary to take account of the fact that pollution can often be better dealt with by preventing its appearance, as when an emission filter is fitted to a chimney, than by letting it appear and then setting up a separate activity to reduce it.

36. Thus pollution is tied in with the national accounts. The outlays on treatment are already included in the accounts; the major difference is that an endeavour is made to enumerate the sources and output of pollutants and to detail the outlays on treatment.

37. If the accounts could be extended in this way it would be possible to work out the consequences of operating anti-pollution activities at different levels. The question then arises: at what levels should they be operated? If the levels are high, pollutants will be eliminated but the cost in terms of regular goods and services foregone may be very large; and if the levels are low, the cost will be small but the current output of pollutants may be dangerously large. This problem is discussed in Stone (46) where it is suggested that while, in theory, anti-pollution services could be included in the consumer's utility function, in practice, the degree of reduction requires a political decision taken by reference to the foreseeable consequences of different levels of pollution and to the expected cost of different levels of anti-pollution activities. In Meade (33) it is pointed out that the above argument should be rephrased to give recognition to the fact that what is important is the state of the land, air and water as a consequence of anti-pollution policy rather than the quantities of pollutants that are eliminated.

38. Thus, while there are many problems of taxonomy and data collection to be solved, it appears to be possible to cover a number of aspects of pollution in a national accounting framework; in view of the importance of the subject, it is desirable to do so. It is most convenient to deal with this and other aspects of pollution together, in a coherent body of statistics of the environment which is ccupled with the national accounts.

39. There remains the question of whether anti-pollution services should be treated as intermediate or final product. This subject belongs to the next subsection.

B. The distinction between intermediate and final product

40. Several somewhat different questions come under this heading.

1. The treatment of anti-pollutant services

41. At present the treatment is not uniform for producers and consumers. If a producer incurs expense to deal with the pollution for which he is responsible this is charged as a production cost, the necessary inputs form part of his intermediate inputs and the cost, but not the volume, of his product is increased. If, on the other hand, a government service sets up an anti-pollution service, such as an installation for water purification or the treatment of sewage, the expense of operating this service will be reflected in the volume of the final product. This would also be the case when enterprises furnish such anti-pollution services directly to households. It is generally felt that there is something inconsistent about all this and writers who emphasize the measurement of welfare prefer to think of anti-pollution services as part of intermediate product.

42. Let us examine the consequences of these alternative treatments. They can be seen from the simple numerical example given in Stone (46), which relates to a full-employment economy with a single factor of production (labour) whose earnings per unit of time are constant. In the base period this economy ignores pollution and in the current period it eliminates it, treating the services needed for this purpose either as intermediate or as final product. In both periods and however anti-pollution services are treated, the value of total final consumption (= the value of total net output -= the national income) is constant. Also, however anti-pollution services are treated, the quantity index of the consumption of regular goods is lower in the current period than in the base period and the corresponding price index is higher. If anti-pollution services are treated as intermediate product, the quantity index of total consumption (= total net output) falls to the same extent as the quantity index of the consumption of regular goods and the price index rises correspondingly. If, on the other hand, anti-pollution services are treated as final, the quantity index of total final consumption (= total net output) does not fall and the corresponding price index does not rise. Small variations may appear as a consequence of changes in relative prices when pollution is treated as an intermediate product and also as a result of using Laspeyres' or Paasche's formula, but these are likely to be of secondary importance.

43. Once the consequences of the alternative treatments are clearly understood, it could be argued that it does not greatly matter which one is adopted since neither will give an acceptable answer in all circumstances. If we start from an Arcadian world (with all the unrealities that that implies) then any untreated pollution beyond what the natural environment can dispose of worsens the situation and may be said to reduce final product. On the other hand, if we start from the filth and stench of most eighteenth century cities, public health expenditures would seem to contribute to final product. Only if a society is in equilibrium, always treating the amount of pollutants needed to keep it at its preferred level of pollution, will treatment costs reflect a stable situation in which the degree of pollution is neither increasing nor diminishing.

44. Let us now consider the institutional aspects of this question. Anti-pollution services are provided to producers and consumers either by producers on a commercial basis or by general government out of the proceeds of taxation. Moreover, they may take the form of direct services such as waste collection and sewage disposal, or of the modification or redesign of capital equipment, as when emission filters are fitted to or embodied in cars or chimneys. The consequences and treatment options to which these possibilities give rise would seem to be as follows.

45. First, if either kind of service is supplied commercially to a producer it will appear either as an intermediate product or as a rise in the cost of capital equipment which, if net concepts are used, will also appear effectively as intermediate product.

46. Second, if a service is supplied commercially to a consumer it will appear as final product. Whether or not this will affect the quantity index of final consumption is another matter. If an emission filter is embodied in a new car, this will appear as a rise in price unless the quality of cars fitted with filters is considered to be higher than that of cars not so fitted. The reasons usually given for considering the quality to be higher are the embodiment of a greater volume of work from the point of view of the producer and the greater satisfaction of meeting social obligations from the point of view of the consumer. If the filter is bought for fitting to an existing car, it will appear among spares and parts and will usually be included in the quantity index of final consumption. Another approach to dealing with these problems is to consider the purchases of new cars and spare parts as inputs into motoring services. This would imply including motor cars purchased by households in fixed capital formation and setting up a limited household production account for private motoring services. It would not be necessary to go to the length of imputing an income to car ownership or to the time spent in driving; motoring services might be measured by some such indicator as car-miles and these services might be valued at the sum of the input costs. If this were done, the inclusion of filters in new cars and the purchase of filters as spare parts would result in an increase in the cost, but not the volume, of motoring services.

47. Third, if let us say sanitary services are provided by general government they will appear as final product; and if the physical inputs into these services rise the index of final consumption will rise. If we could discover how these services were allocated to users, we might consider treating their use by producers as intermediate product. But this would lead to complications since businesses do not buy these services but only contribute to their finance and so it would become necessary to reduce tax flows to compensate for the imputed payments. It is not clear how this could be done and, moreover, much of the cost of these services is met by consumers so that in part they would turn up again as final output, this time private rather than public.

48. Despite the seeming inconsistency of treating some anti-pollution services as intermediate and others as final, this treatment is in fact the same as that of other products in the national accounts and follows from the uniform principle that the polluter pays. If this principle were fully realized in the accounts, it would ensure that services designed to combat pollution arising from the choice of techniques would be treated as intermediate product, whereas services designed to deal with some of the consequences of everyday human functioning would be treated as final product. In achieving this result it would probably be helpful to set up limited forms of production account for the operation of consumer durables such as cars and heating systems and it would be necessary to see how far it was possible to separate out the costs incurred by public authorities in combating industrial pollution.

49. This last remark is not intended to reopen the old controversy over so-called government services to business. Inevitably a business has valuable property on its premises, including cash in the till, and one of the duties of the police is to try to protect such property; but a business is not bound to use polluting techniques and, if it does, to fail to provide for their treatment.

2. Free services provided by businesses

50. In the course of discussing possible future developments of the System of Natinnal Accounts (SNA), reference is made in (55, paras. 1.93 and 1.94) to the functional classification of inputs. At present no such classification is made and it was pointed out that certain input costs, such as expenditure on recreational or medical facilities and on research and development, do not contribute exclusively, if at all, to current production. In dealing with the first case it was further pointed out that three obvious possibilities present themselves: (a) the inputs could simply be identified as a separate category; (b) they could be included among supplements to wages and salaries, in which case they would come to form part of private consumption expenditures; or (c) they could be formed into a new category of industrial final consumption.

51. At present these expenditures are not treated as part of compensation of employees on the ground that, although they are of general benefit to employees, they are also of benefit to the business that makes them: readily available medical services may save loss and expense; it may be difficult to recruit staff if no canteen facilities are available; the availability of recreational facilities may increase morale and loyalty. The only exception is the provision of certain goods, such as food, coal and working clothes, free to employees; these are treated as in (b) above since the value of the free goods is included in the compensation of employees who are deemed to buy the goods as a part of consumption expenditures. However, the expenditures of employers, on recreational services, medical services and the like for their employees are included in the concept of total consumption of the population in the complementary system of statistics of the distribution of income, consumption and accumulation discussed below. It is therefore necessary to identify these outlays as a separate category. There are of course other factors - heating, lighting and ventilation are obvious examples - which affect conditions of work; and many more, some less clear and objective, could be thought of. While it would be valuable to be able to distinguish satisfactory patterns of working conditions from unsatisfactory ones, this is a difficult task. None the less, indicators of job satisfaction and industrial morale which cover all aspects of working conditions might be included in the SSDS, assigning relatively low priority to their development.

52. The usual example of free services provided by business to the general public is the finance of television programmes from advertising budgets. The argument for treating these as intermediate inputs is the same as in the preceding case, namely that these expenditures are undertaken for business purposes. However, it would be possible to identify and measure these expenses and this would be useful in building up a supplementary estimate to the national accounts of the total consumption of the population, as in (58), which includes all expenditures undertaken by or on behalf of individual consumers. This approach is equivalent to option (a) above.

53. An alternative approach is suggested by option (c) above, that is establishing a new category of industrial final consumption in the national accounts. It would then be necessary to introduce new entries in the production and income and outlay

accounts. Expenditures on television advertising (and presumably newspaper and magazine advertising too) would appear as a separate entry in the production account and from this it would be transferred, along with the operating surplus, to the enterprise income and outlay account. Assuming no direct taxes or business saving, the operating surplus is paid out to households and the advertising expenditures finance business final expenditures in the form of television programmes. Household income equals the cost of the goods that people actually buy and total household income equals this plus the cost of television programmes. This concept of income balances the total consumption of the population but it exceeds the sum of factor incomes; indeed it is not a factor income concept at all. If we use these ideas in conjunction with an input-output system we must be careful only to include the goods actually bought by households (the only true final buyer in the example) in the vector of final demands.

54. Option (b) above, which is the usual proposal where goods are supplied free to employees involves a reconstruction of any observed input-output table since businesses are no longer deemed to buy working clothes or whatever it may be but, instead, to pay out increased incomes to employees who are deemed to buy the clothing. This solution has the merit that factor incomes (redefined as a result of the imputation) constitute the total income concept. But this solution is hardly available in the present case since television programmes are available to everyone with a television set and by no stretch of the imagination can all these beneficiaries be said to contribute to the production of the business whose advertising budget financed the television programme.

55. Although expenditures on research and development were mentioned at the beginning of this section, they will be deferred to subsection 3 below in which the distinction between current and capital expenditure will be discussed.

3. An emphasis on net concepts

56. As is said in Nordhaus and Tobin (36, page 5) "the depreciation of capital stocks is a cost of production, and output required to offset the depreciation is intermediate as surely as materials consumed in the productive process". There can be no argument about this and, in fact, many countries have published net estimates of total output for a long time. Jaszi in (60, page 214) favours "the recommendation that measures of economic depreciation be incorporated in the national accounts". The emphasis here is on the word "economic" since the United States accounts have long contained estimates of capital consumption based, for instance, on depreciation charges allowed for tax purposes.

57. In view of the fairly general agreement on this issue, it may be asked why the gross product is so much used as the measure of total output. The answers would seem to be: (a) it is easier to calculate; (b) in any one country the ratio of gross product to net product does not appear to vary greatly through time; (c) the methods used for calculating capital consumption vary from country to country perhaps more than most other components of gross product; and (d) there are undoubted difficulties, relating to service life, the pattern of depreciation over the life time of assets and the effects of uncertainty and valuation. But it is thought that, at least in the case of reproducible tangible assets, there is enough experience to suggest that these difficulties can be overcome.

58. There is little doubt that measures of economic depreciation ought to be compiled and published together with net estimates of output and investment. This would improve the usefulness of the national accounts and experience shows that it is feasible.

59. In Nordhaus and Tobin (36) a suggestion is made which goes far beyond the above proposals. They point out what is true and has long been recognized, for instance, in Stone (41), namely that in a growing community provision must be made not only for the using up of the existing capital stock but also for endowing the increment of the population with the existing average capital per head before we can speak of saving available for increasing capital per head. In fact the authors would like to go further and ensure the continuation of past growth rates before we can speak of net investment.

60. The object of these suggestions is to arrive at a measure of output or output growth which is maintainable. This is an interesting and important exercise for anyone concerned with economic policy but it is not clear why these or any other policy assumptions should be built into what purports to be a description of the current functioning of the economy. Furthermore, there are likely to be other conditions that would have to be met before the economy could be said to be in a maintainable state. It would seem therefore that these suggestions are more relevant to the analysis of economic prospects than to a quantitative description of the economy.

C. The distinction between current and capital expenditure

61. Total (duplicated) product is divided into intermediate product and final product; and final product is divided into consumption and accumulation (or investment). Expenditures devoted to intermediate product and consumption are current and expenditures devoted to accumulation are capital.

62. Capital expenditure is usually restricted to expenditure on reproducible tangible assets, such as buildings and works, plant, machinery, vehicles and ships, with an allowance for the value of any physical increase in stocks of goods and work in progress. Until about a generation ago, these expenditures were restricted to business expenditure including the business of owning houses; social capital in the hands of public authorities and consumer durables in the hands of individuals were excluded. The reason is that capital is associated with a rate of return rather than with the durability of the asset in which it is embodied and so a durable good which does not and is not intended to earn a measured rate of return is not capital and expenditure on it is not capital expenditure.

63. The criterion of an explicit rate of return automatically excludes most tangible assets held by general government and households. A different criterion is length of life and this is coming to be adopted fairly generally. If a public authority builds a school or a household buys a car, it does not as a rule use up what it has acquired within the annual period of account but can expect to have a lasting good which will be usable for many years. As far as use is concerned these goods are like any other reproducible tangible assets. Expenditure on them is capital expenditure and this can be divided between the depreciation (or consumption) of the stock and the net addition to the stock (which corresponds to net investment). The question of whether or not to impute a rate of return to the capital embodied in these stocks can then be dealt with as a separate issue. There is no compulsion to do this and, as was argued in subsection III A above, the information needed to make any kind of rational approximation is only rarely available.

64. Proposals for extending the concept of capital expenditure do not stop at reproducible tangible assets. Non-reproducible tangible assets, such as minerals and fossil fuels, are candidates for inclusion. It can be argued that research and development costs, which clearly do not contribute to production at the time they are

incurred, should be treated as capital expenditure. Finally, there is the suggestion that a concept of human capital should be formulated and introduced into the accounts. This is a very far-reaching idea since it would seem to imply that everything spent on maintaining and improving the stock of human beings should be treated as either intermediate or capital expenditure so that consumption would disappear from final product which would simply measure the increase in the quantity and quality of all forms of capital.

65. Let us now examine these various proposals in greater detail.

1. Capital expenditure by general government

66. Expenditure by general government on reproducible tangible assets is treated as capital expenditure in the SNA, (55, para. 6.115), and this recommendation should be generally adopted. There are the usual difficulties but, with one exception, these are no greater than in the case of comparable expenditures by producers.

67. The exception is expenditures on military durables. The difficulty here is not due solely to an exceptional proneness to technical obsolescence; this feature is probably shared fairly widely with science-based industries. Rather it arises because the service to be supplied depends on world politics and so its precise requirements are highly uncertain. A country which has equipped itself to fight a nuclear war may find that its real trouble comes form guerrillas. Thus there is much sense in the convention, adopted by countries that recognize a category of government capital expenditure, of writing off expenditure on military durables in the year in which it is made, that is treating it as current expenditure.

2. Consumer durables

68. Apart from dwellings, which earn a return if rented and are deemed to earn a comparable return if owner-occupied, consumer durables are not treated as capital goods. There are significant advantages to extending capital expenditure to cover at least all major consumer durables. A study of the household economy requires the bringing together of information on the current purchases of households, the use of time by household members, the equipment in their possession and the characteristics of the dwellings in which they live. By combining these data with a theory of household behaviour, it should eventually become possible to see how to systematically describe and explain household activities. However, in extended discussions of this question in the course of revising the SNA and detailing the balance sheet accounts of the system, this proposal has been consistently rejected on conceptual and practical grounds. The concomitant extension of the production boundary of the national accounts to household uses of the consumer durables and the establishment of at least limited production accounts on these activities, was thought to be undesirable. The estimation of the expenses of using these goods, for example and repair and maintenance, and of their implacement value, was considered to be impracticable. However, in order to furnish the most essential information on household stocks of major durables, it was agreed that a supplementary table on these stocks should be included in the balance-sheet data or the SNA (see 56).

3. Non-reproducible tangible assets

69. Non-reproducible assets, such as land and mineral deposits, are part of the wealth of enterprises, the government and the nation, are used in the production of goods and a return for their use is included in the cost structure (operating surplus) of enterprises and in property incomes and retained savings derived therefrom. Concerns about the environment have emphasized the importance of paying attention to the use of non-reproducible assets and to the reclamation and recycling of what is used. Thus, non-reproducible tangible assets are included in capital assets - capital finance and balance-sheet accounts - in the SNA (55, paragraphs 7.83-7.85 and 56, paragraphs 4.6-4.7).

4. Expenditure on research and development

70. The treatment of research and development expenditure undertaken by producers in the expectation of obtaining new or improved products for manufacture and sale in the future was mentioned in (55) in connexion with the functional classification of inputs and in connexion with the distinction between capital and intermediate outlays. Since these expenditures, as opposed to similar expenditures made in the past, do not themselves contribute to current production, it is often suggested that they should be treated as capital expenditure. The difficulty with this idea is that it would then be necessary to resolve all the problems relating to service life, the pattern of depreciation over the life-time of the asset and the effects of uncertainty and valuation, which have already been mentioned in connexion with reproducible tangible assets. But in the present case these difficulties would seem altogether greater and while rules could no doubt be worked out for tax purposes, it is hard to see that they would have much economic significance.

71. It is possible to look at this matter in a different way. A going concern producing in a technically developing field must expect to introduce new products and this entails spending money on research and development before the new products can be marketed and yield a profit. From this point of view research and development costs are a current expense of remaining in business.

72. In view of the seemingly insuperable difficulties, arising largely from the effects of uncertainty, of working out meaningful depreciation charges in respect of this type of expenditure, it would appear that the best course is to show research and development costs as a separate category of current intermediate expenditure. This accords with treatment (a) mentioned in paragraph 50 above.

5. Human capital

73. The concept of human capital is something which most people probably associate with slavery, but in the hands of Becker (3a) and the writers who have followed him it has taken on a new lease of life in a somewhat different context.

74. Individual earning capacity varies greatly and this can be attributed to differences in endowment flowing from nature and nurture, that is to say from inherited qualities, early upbringing, education and so on. In the work just mentioned, Becker's particular interest was in the contribution of education and, while it is obvious that there are some virtually uneducated individuals who earn far more than the most highly educated, it is true that, on average and other things being equal, a higher level of education is associated with a higher level of life-time earnings.

75. If we combine this idea with the view that all income derives from wealth then the concept of human capital provides a means of explaining individual differences in earning capacity. It can of course be said that actual earnings also depend on the climate of opinion, political power and social arrangements which, in different societies, favour the relatively rich or the relatively poor; but earning capacity, in the sense of a capacity to contribute to a country's economic success, probably is associated with what can be termed human capital.

76. In the past, the national capital was frequently estimated, in part at any rate, from the discounted value of the expected flow of income from the property, based on going rates of interest. Although the point of doing this is clear, the method is not a very informative one in this case since it assumes what ought to be measured, the rate of return on different forms of capital. A similar method can be applied to the earnings in different occupations in order to yield an estimate of human capital. We could then try to discover how the capital values in different occupations are related to the level of such inputs as education, the outlays on which would now be treated as capital expenditure.

77. A number of studies, many of them brought together and examined by Psacharopoulos in (39) have been made all over the world on the association of earnings and education. The results of these studies are usually summarized by calculating rates of return to different levels of education. An example of the use of this kind of information in setting up an educational planning model for Northern Nigeria is given by Bowles in (8). In spite of the many difficulties, these studies provide some interesting pointers to educational priorities though it seems impossible, in the present state of knowledge, to demonstrate their superiority to other methods which often lead to different conclusions.

78. While the concept of human capital seems to be useful in the applications just mentioned, the suggestion that it should be introduced into the national accounts raises wider issues. It seems to imply that human beings should be regarded as what might be termed owner-occupied slaves since an individual is regarded as a capital asset of which he himself is the owner. Expenditure which is deemed to improve the asset is capital expenditure and expenditure deemed necessary to maintain the asset is intermediate current expenditure. The maintained asset earns a revenue which is sufficient to pay for its maintenance and improvement. Final consumption disappears from the national accounts unless we are prepared to set foot on yet another slippery slope and try to distinguish between maintenance expenditure and consumption. Each individual requires, according to taste or perhaps according to some standards laid down by welfare economists, so much food, drink, tobacco, clothing and everything else to maintain his human capital, that is himself, and the balance of what is now considered to be consumption expenditures other than outlays on education, consumer durables and some other items, which are capital expenditures, represents a residual which could be called consumption. However, this concept of consumption is equivocal, being closely akin to waste, since it serves no useful purpose (final output is simply net investment) and it could clearly be devoted to net investment thereby raising the indicator of economic performance. This is the ultimate position reached by reducing the whole of life to purely economic terms.

79. One way of avoiding these awkward consequences would be to introduce a convention that human capital involved no maintenance so that the whole of its earnings would be transferred to the income and outlay account, where they would be divided between consumption, direct taxes and saving. Everything would therefore be much as before except that the boundary between consumption and saving would have to be redrawn in recognition of the existence of expenditures, to be classified as capital expenditures, which improve human capital. This could not be done objectively in practice, since, even in the case of educational expenditures, it is clear that there is no simple relationship between these expenditures and the improvement of human capital. The teaching of remunerative skills and their prerequisites forms only a part of education and the success of any teaching methods depends to some extent on the capacity and receptivity of the taught. The best course would seem to be to show educational and similar expenditures as separate categories of current expenditure, as at present, but to classify them in considerable detail.

IV. THE DISTRIBUTION OF INCOME, CONSUMPTION AND WEALTH

80. It is hardly a criticism of the SNA that it does not contain information on these distributions since, apart from providing for the distribution of the national income between compensation of employees and income from property and entrepreneurship and also providing details of current transfers, it does not set out to do so. This function is performed by a complementary system of statistics the latest version of which is set out in (58). The detailed data contained in this system are designed to fit into the frameworks provided by the SNA as set out in (55), and by the System of Material Product Balances (MPS) as set out in (57).

81. There is no doubt about the desirability of information on the distribution of income, consumption and wealth and it is clearly more useful if it is fitted into the framework provided by the national accounts. The main reason for this is that for policy purposes it is necessary to be able to relate the distributions to variables, such as tax rates and conditions, social security arrangements and so on, which might be used to modify them.

82. In the SNA, incomes arise as components of value added in the various branches of production and are distributed to a set of accounts for institutional sectors of origin. From there they are redistributed by way of a set of accounts relating to specific forms of income to a set of accounts for institutional sectors of receipt where they provide the income for spending, saving and the payment of direct taxes on income. These sector accounts are not further subdivided and the main purpose of the complementary system is to set out a number of criteria by which the accounts for the household sector, could usefully be classified so as to obtain distributions by size and other characteristics.

83. The establishment of a set of distribution statistics useful for analysis of, and policy formation concerning economic welfare and other questions can be described in a sequence of steps. As an illustration let us take the case of the distribution of income. First, it is necessary to collect data on individual and household incomes at various stages of their formation and redistribution so that we can see how the initial distribution arising in the productive process is modified by taxes and other transfers and how sizable the incomes of various population groups are. Second, it is desirable to have a means of summarizing the distribution and, in particular, of measuring its dispersion in a way which corresponds to our notions of inequality. Third, it would be useful to have a manageable method of describing how distributions change. Beyond this point, the use of distribution statistics is largely a question of building them into a general econometric model in order to study the repercussions of distributional changes on the economy. Without going more deeply into this last question, let us examine the first three requirements just mentioned.

A. Statistics of distributions

84. The main proposals of the complementary system of statistics of the distribution of income, consumption and accumulation in (58) can be summarized as follows.

85. The first stage of the system consists of classifying in various ways the income arising from economic activity accruing to individuals and to households. This income is itself divided into two main parts: (a) primary income which consists of compensation of employees, income of members of producers' co-operatives and entrepreneurial income, including net rent actual and imputed; and (b) property income which consists of net interest and dividends. The sum of these two types of income is termed distributed factor income.

86. From this point onwards, the variables classified relate only to households. The second stage consists of moving from factor income distributed to households to the income total, termed available income, which can be used for final consumption expenditures and saving by households. The main transfers linking these two income concepts are all forms of benefits for the most part in cash, received from the state enterprises, direct taxes and social security contributions, gifts and remittances, and premiums and benefits connected with casualty insurance, pension funds and annuity policies.

87. At the third stage, available income, adjusted for net contributions and premiums in respect of private pension funds and annuity policies, is divided between final consumption expenditures and saving.

88. At the fourth stage, saving, together with provisions for the consumption of fixed capital and net capital transfers received, is shown as financing gross capital formation and net lending; and the latter is set out as the excess of net financial assets acquired over net financial liabilities incurred.

89. Finally, the total consumption of the population is tabulated and compared with the sources of its finance. This expenditure total includes final consumption expenditure which can be assigned to households though undertaken by private non-profit bodies and industry as well as by general government and also subsidies paid by government in respect of items in this total. It thus completes the picture of the redistribution shown in available income.

90. These proposals cover the transactions in the income and outlay accounts and in the capital finance accounts but do not extend to the assets and liabilities that appear on balance sheets. The wealth (or net worth) of households represents the excess of their assets over their liabilities at a given point in time; it is increased through the sector's saving and net receipts of capital transfers, the upward revaluation of its assets and the downward revaluation of its liabilities. While national and sector balance sheets form an integral part of the SNA, as set out in (55, tables 2.1, 2.15 and 2.16), detailed proposals in respect of definitions, classifications and standard compilations of balance sheet statistics were deferred for the time being pending further discussions.

91. In view of the importance of the distributional aspects of household incomes, consumption and wealth to economic welfare, there seems no doubt that the establishment of these kinds of data by countries, as far as possible within a national accounts framework, should be given a high priority.

B. Forms of distributions and measures of inequality

92. For purposes of summary and comparison it is a great convenience to be able to express the form of a distribution in terms of a small number of parameters and to formulate a suitable measure of inequality.

93. Attempts to describe the form of income distributions by means of a mathematical expression go back to Pareto's famous "law" which appeared in (37, volume 2) and states that the logarithm of the number of incomes exceeding a given level is a downward-sloping linear function of the logarithm of that level. As is well-known, this relationship often gives a reasonable approximation to the upper tail of a distribution though it cannot describe the whole distribution.

94. The next step forward was the application of the log-normal distribution to many economic phenomena by Gibrat in (19, 20) under the name of the law of proportional effect. This distribution has been extensively analysed and illustrated by Aitchison and Brown in (1), where it is shown that it provides a good description of the distribution of earnings by homogeneous groups of workers and, in general, that it is a strong candidate whenever a statistical description of income size distribution is required.

95. In 1936, Champernowne described to a meeting of the Econometric Society a different form of expression for the graduation of income distributions but it was only later published in full by Champernowne in (9). Thatcher in (50), paper concerned

with the earnings of employees in which men and women are treated separately and full-time workers are distinguished from part-time workers, shows that there is evidence for the log-normal distribution for manual workers and the Champernowne distribution for full-year workers.

96. If a distribution can be adequately described by a simple mathematical function, an acceptable index of inequality is provided by one of the usual measures of dispersion such as the standard deviation of the logarithms. But, in more complicated cases and if the data are only available, as is often the case, in truncated form, difficulties may arise; and problems are still more likely to be encountered if the distribution cannot be graduated satisfactorily. In all such cases a more empirical approach is usually adopted based on the diagram proposed by Lorenz in (30) and the coefficient of mean difference proposed by Gini in (23).

97. In recent years much work has been done on measures of inequality of income distribution. Reference may be made to the work of Atkinson. He adopts a social welfare approach and introduces a concept of the equally distributed equivalent level of income per head, that is the level of income per head which, if equally distributed, would give the same level of social welfare as the present distribution. His measure of inequality is the complement with respect to 1 of the ratio of the equally distributed equivalent level to the actual level of income per head; and this measure, like the measure derived from the Lorenz diagram, lies between 0 (complete equality) and 1 (complete inequality). The main assumptions made by Atkinson about the social welfare function are that it is an additively separable and symmetric function of individual incomes and that the relationship between welfare and income is increasing and concave. Further, in conformity with most conventional measures, he requires his measure of inequality to be invariant with respect to proportional shifts in income. On these assumptions, his measure depends on one non-negative parameter which can be interpreted as a coefficient of "inequality aversion".

98. The proposed measure is compared, for ten countries, with conventional measures, such as the Gini coefficient and the standard deviation of the logarithms, and it is found that the ranking of the countries is similar to that given by the Gini coefficient if the coefficient of inequality aversion takes the comparatively low value of 1, and is exactly equal to that given by the standard deviation of the logarithms if the coefficient takes the comparatively high value of 2. It appears, therefore, that the measure of inequality depends not only on the form of the social welfare function but also on the degree of aversion to inequality which is assumed.

99. This analysis suggests that conventional measures of inequality in the distribution of income, consumption or wealth should be treated with reserve and that efforts should be made to replace them with a more subtle form of measure.

C. The process of income formation

100. Individual incomes vary considerably from year to year while at the same time the inequality of the distribution of income tends to remain constant or to change only gradually. This suggests that the process of income formation might be represented by a Markov or similar stochastic process in which incomes change in size from year to year in accordance with the entries in a probability matrix. If the probabilities of movement from a given income group apply to all members of that group and if they remain constant over time, then the community will eventually reach a steady state with an unchanging distribution of incomes. This line of approach is developed by Champernowne in (10, 11, volume 2, chapter 18) but in fact dates back nearly forty years, since the publication in 1973 is an expanded and updated version of a work completed in 1936 but not published at the time.

101. Applications of these models and discussions of the data needed to implement them have been provided by many writers: for instance, by Vandome in (61) and by Thatcher in (51) in the case of Britain, by Esberger and Malmquist in (17) and by Eriksen in (16) in the case of Sweden and by Mustert in (35) in the case of the Netherlands. From the point of view of applicability, Eriksen's study is of particular interest. He is concerned with building the forecasting model now used to estimate the future liabilities of the Swedish supplementary pensions scheme and states that, after a thorough examination, the Markov model was accepted as sufficiently accurate for describing individual income processes.

102. It is likely that further experience will show the need for, and the possibilities of, making improvements to the simple Markov model. Indeed, in an application to American data, by McCall in (31) showed the desirability of introducing the mover-stayer variant of the simple model originally formulated by Blumen, Kogan and McCarthy in (7), in connexion with the study of the industrial mobility of labour.

103. At the present time it may be thought that the improvement of models of income formation is mainly a matter of research. But the subject is an important one and the research would be greatly helped if data on income transitions were collected regularly.

V. SOCIO-DEMOGRAPHIC STUDIES

A. A system of social and demographic statistics

104. Although a number of the suggestions examined in this report are not recommended for incorporation in the national accounts, they may be included in other bodies of data. At this point, therefore, it may be useful to consider the ideas for the systemization of social and demographic statistics contained in (59), referred to hereafter as the SSDS. There are several reasons for this: there are a number of topics common to the SNA and the SSDS; research on subjects which are not suitable for inclusion in the SNA would fall more naturally in the area covered by the SSDS; the SSDS is specifically designed to deal with the levels and distribution of welfare; and all these developments inevitably compete for limited statistical resources so that it is desirable to consider them jointly.

105. The SSDS is concerned with stocks and states of living conditions of human beings at a succession of points in time and with the connecting flows and changes over the intervals between them. Different aspects of life are treated in various subsystems dealing, for example, with the demographic aspects of the population, with their education, work, health, housing, incomes, consumption and wealth, security, use and allocation of time, including leisure and social stratification and mobility, and with the correlated social services. The scope of the subsystems is defined, a number of classifications are suggested in each case, some common to the system and others specific to a subsystem, and many linkages within and between subsystems are suggested. For each subsystem, basic data series, classifications and social indicators are suggested.

106. The data on welfare conditions are connected with economic data at two points: production (or cost) and consumption (or benefit).

107. In the first case, the economic accounts of educational services, for instance, are classified by branches of the educational system and related to the number of pupils and students in those branches so that the educational cost per head in each of the branches can be calculated. In principle further divisions can be made so that, for example, students following science courses are distinguished from students following courses in the humanities; and these data can be assembled to show the total cost of various kinds of completed education.

108. In the second case, the detailed classification relates not to the cost of the service but to the characteristics of the recipients of the benefit. To continue with the educational example, we should like to find out the kinds of families that make use of different educational services, the extent to which, in any case, these services are free or paid for and the extent to which attendance is wholly or partly financed out of awards or grants.

109. By assembling data on the costs of individual services and on the circumstances of the various classes of user, the SSDS provides material highly relevant to the formation of welfare policies. It would be convenient for many purposes if summary social indicators could be constructed from this material, and to some extent they can. For example, various series of the quantity, and up to a point the quality, of education received are formulated and indexes on the inputs into and costs of various types of completed education are proposed. But the old problems of how to measure and value education remains. The new data might help with these problems too but their main purpose is to provide a more complete description of a complicated and costly process which has many seemingly incommensurable outcomes.

110. By way of further illustration of how the kind of information proposed in the SSDS can be used let us consider two specific topics: international comparisons of levels of living and the analysis of the household economy.

B. International comparisons of levels of living

1. National accounts aggregates

111. Statistics of the gross product per head expressed in a common currency (usually United States dollars) are widely used. Information of this kind, in which the conversion is made by means of exchange rates, is published regularly in (54) for a wide range of countries; while the limitations of this means of conversion are well-known, the resulting estimates do help to account for a variety of differences between countries as is shown, for example, by Stone in (47).

112. A better means of international comparison of the gross product and of final consumption, gross capital formation, etc., can be obtained if it is possible to construct price and quantity index-numbers between countries on much the same lines as the familiar index-numbers between points of time in a given country. An extensive study on these lines is set out by Clark in (13) and an intensive study of the United States and some of the countries in Western Europe is presented by Gilbert and Kravis in (22) and by Gilbert and associates in (21). Several similar studies have been conducted of which the latest is the United Nations International Comparison Project. It is discussed in (26).

113. The purpose of the United Nations International Comparison Project, which is a co-operative undertaking of the United Nations, the International Bank for Reconstruction and Development and the University of Pennsylvania, at this stage is to make multiple binary comparisons of the prices and per capita volume of final private and government consumption and of gross fixed capital formation of various countries and of the purchasing power of their currencies. The United States is being used in binary comparisons with each of the other countries covered in the project. The project is being carried on in co-operation with participating countries, who gather and submit the basic series of data on the quantity and/or average purchasers' prices during given years (1970 and 1973) of the same representative goods and services which enter into the categories of the aggregates being compared. Private consumption expenditure is classified into 114 detailed categories; government final expenditure is

divided into five categories; gross fixed capital formation is classified into 38 categories. Ten countries - six developed market economies, three developing economies and one centrally planned economy - were covered in the first phase of the project, which has been completed. Eight additional countries are to be included in the second phase. It is hoped to expand the coverage of the project, as resources permit, to cover a wide selection of countries. Once benchmark comparisons are established, it is likely to be much less burdensome and time consuming to carry them forward in time.

114. Four sets of Laspeyres' index-numbers are computed for each of the categories of expenditure - detailed and summary - mentioned above in the case of each binary comparison - two on volume, using weights based on the pattern of expenditure of each member of the pair, respectively, and two on prices, using the same kind of weighting. When series of indicators on quantities are not available, they are compiled by dividing weighted price indexes into the corresponding expenditure indexes for each category.

115. A number of attempts have been made to get away from comparisons based on national accounting data and to make use of various physical indicators which are available for many countries. An early example of the application of this method can be found in Bennett (5). The difficulty in this case is that the series used are not united by a common conceptual framework and so it is impossible to say how they ought to be combined.

116. Beckerman and Bacon in (4) have used physical indicators to apply the results of comparisons for selected countries such as are discussed in paragraphs 112 and 113, for purposes of estimating "real" private consumption in comparable units for a larger number of countries. The starting point is the set of estimates given by Gilbert and associates in (21), which cover nine countries in each of the two years 1950 and 1955, and calculations made by other writers relating to China, India, Japan and the USSR. The next step is to choose a form of regression equation and a set of widely available physical indicators which will enable the twenty-two observations to be reproduced to a high degree of accuracy. Private consumption in real terms for other countries is then estimated from the regression equation, which may however vary from one group of countries to another. The results show that fairly high correlations are obtained using double-log regressions and not more than three determining physical variables. The set of physical indicators considered for inclusion was kept small in order to avoid series which are sensitive to inter-country differences in relative prices.

117. While the object of this restriction is clear, it is important to see what happens if a much larger number of series were allowed to influence the outcome. As the number of potential series is very large, it would be necessary to reduce their number by a preliminary analysis into principal components and then regress the observations of private consumption in real terms, or other suitable dependent variable, on the first few principal components.

2. Other approaches

118. A preliminary analysis, which is of considerable interest in the present context, is provided by Berry in (6) based on data for forty-three economic and demographic variables in ninety-five countries. Berry found that the first five factors accounted respectively for 84.2, 4.2, 2.5, 1.9 and 1.2 per cent of the total sum of squares, making 94.0 per cent in all. Since these factors are mathematical constructs,

there is no reason why they should have a simple interpretation. However, by further analysis, and in particular by looking at the way in which the primary series contributed to them, Berry reached the conclusion that the data he was studying suggested a fundamental structure of three basic dimensions: (a) a technological scale; (b) a demographic scale incorporating features of population pressure; and (c) a scale which would enable a group of poor, trading nations to be picked out. The fourth and fifth factors are not interesting from this point of view: the fourth simply distinguishes large countries from small ones; and the fifth is randomly distributed over countries, suggesting that no further significant variation can be extracted. To provide factors suitable for the regression analysis, the calculations should in principle be reworked so as to exclude the series for total and per capita gross product included among the forty-three variables. Further, since the basic data contain both aggregate and per capita data, problems of scaling and deflation of the kind discussed by Stone in (42) arise.

119. Up to this point most of the work that has been described is directed to estimating national accounts magnitudes in comparable units of measurement. But in the field of international comparisons, as in the field of estimates for a single country, there are expressions of dissatisfaction with national accounts magnitudes and a search for measures which are more comparable internationally relating to what is often referred to as the level of living. The arguments are much the same as those used by the advocates of including households within the production boundary. First, institutional arrangments differ greatly between countries and many products that are supplied by the market economy in developed countries are supplied by family members in under-developing countries. Further, as development and the concomitant expansion of the market proceeds, shifts occur from household activities to market activities and the growth of the economy is overstated. Second, output measures take account of expenditures on, say, education or health but they do not take account of the benefit to a society arising from the level of education of its adult members or from the fact that the expectation of life at birth is seventy rather than thirty-five years. And, third, welfare depends on needs as well as on the means available for satisfying needs and so an apparently high output may simply be a reflection of high needs and not of the extent to which needs are satisfied relative to the position in other countries. There are, for example, major differences in the needs of the population between the developed, highly urbanized societies and the developing, more rural societies.

120. The conceptual and practical difficulties of dealing with these issues and of combining all the elements envisaged into a single synthetic national accounting indicator have already been discussed: the assumptions and disadvantages of incorporating the required extensions in the national accounting framework and the lack of acceptable means of measurement and valuation in monetary terms. The need to furnish more satisfactory data for the international comparison of levels of living than can be furnished by the national accounts is however recognized; it led to work on the SSDS. The SSDS is designed to furnish comparable basic data and the social indicators for the most part, direct measures in physical terms - concerning the state of, and trends in, various facets of the level of living without restrictions on the involved institutional arrangements or resources. However, the SSDS does not include overall synthetic indicators on each aspect of the level of living, for example nutrition, health, education, or on the level of living as a whole. Nor does it furnish information on the extent to which the needs either, comprehensive or basic, of the population are met. In order to compile the overall synthetic index-numbers, it is necessary to weight the constituent indicators in the light of their relative contribution to the level of living in question. Objective weights are not available; in the few

instances where such weights have been assigned, they have been based on the subjective valuations of experts or broader groups of the population. The definition of needs is also a matter of judgement. A comprehensive example of the use of series of social indicators, such as those of the SSDS; to construct overall synthetic index-numbers which scale level of living is given by Drewnowski and Scott in (15) and by McGranahan and others in (32).

C. The household economy

121. We have already seen that a major deficiency in the national accounts in measuring output from the point of view of welfare, and on a comparable international basis, stems from the exclusion of household activities, such as domestic services, education of members of the household and even the use of leisure. Household production for own use of primary products, such as the outputs of agriculture, fishing, forestry and logging and mining and quarrying, and of goods processed from these products and of all types of capital goods, for example structure, water wells, improvement to agricultural land, and the output of community self-help projects, such as wells, roads and sanitary and irrigation facilities, are covered in the national accounts. However, this is not the case for the household activities mentioned above though the extent to which those services are produced in households or by enterprises and government and private non-profit services varies from one country to another. While the disadvantages and difficulties of extending the national accounts to include those household activities are substantial and the possibilities are slight, it is desirable and feasible to account for them in the SSDS. This may be accomplished through the collection and compilation of data on the use of time by household members. In fact, the proposed SSDS brings together the information in (a) the consumption goods and services acquired by households, (b) their dwellings and durable equipment and (c) the use of time by household members and hired hands that is required for purposes of constructing the models suggested by Becker in (3a) and other writers. In this way, we can try to discover how households put together their resources to satisfy the needs and wishes of their members.

122. What has been described amounts to a large programme of data collection and analysis. In advance it is hard to say how successful it will be. As is shown by Deaton in (14), experience with coherent market demand systems suggests that a sophisticated formulation is needed if they are to approximate the complexity of real life; and it seems unlikely that non-market systems will be any simpler. Further, it is shown in the discussion of household production functions by Pollak and Wachter in (38) that unless these functions are homogeneous and there are no joint products it is likely that the prices of the final products will be different for each household; a conclusion which seems to remove altogether the basis for conventional accounting. This is not of course an argument against carrying out research in this field but only a warning that it may take longer than is often supposed to reach acceptable results. In the meantime, as was argued above, the unacceptable short cuts that have been proposed should not be incorporated in the national accounts.

VI. CONCLUSIONS AND A SUMMARY OF RECOMMENDATIONS

123. In this report an attempt has been made to examine the many questions that have been raised in recent years about the concepts and scope of the national accounts. The review has been conducted by reference not only to the national accounts themselves but also to the complementary system of distribution statistics, to a system

of social and demographic statistics and to a coherent body of environmental statistics. There are two main reasons for widening the perspective in this way. First, the different systems are closely related and information which is not envisaged in one may be provided for in another: for instance, many social indicators are suggested in the SSDS which naturally do not figure in the national accounts. And, second, in setting up their programmes, statistical offices need to see potential developments in economic, social and environment statistics as a whole so that priorities are not assigned with regard to unduly narrow ranges of subject matter.

124. In the recommendations that follow, which are no more than a summary of the views expressed in the main body of the report, problems are looked at from two points of view: can they be solved with our present knowledge and how? and, if so, is the gain from solving them likely to be commensurate with the costs involved? Regarded in this way the main questions may be allocated to one of four categories: (a) those which could and should be incorporated in the national accounts or in complementary data organized within the framework of the accounts, where this is not already done; (b) those which can and should be incorporated in a system of social and demographic statistics or a body of environment statistics; (c) those which, with our present knowledge, cannot be implemented in any of the aforementioned systems in an informative way; and (d) those, largely the same group as (c), on which further research is needed before the best course of action is clear.

A. Proposals which could be implemented in the national accounts or in complementary bodies of data

125. The following suggestions are important and could be incorporated in the national accounts or in complementary data to the accounts where this is not already done.

1. Depreciation

126. Measures of economic depreciation could be calculated in respect of reproducible tangible assets. This would enable more emphasis to be placed on net measures of product than is usual at present.

2. Functional classification

127. As we have seen, this question was discussed at the time of the revision of the SNA. Apart from "pure" production costs the following three categories were considered; the development of the appropriate functional classifications is already included in the programme of work of the Statistical Office.

128. First, there are expenditures for the welfare of employees, obvious examples being expenditure on facilities for medical care and recreation. It is necessary to separate out these outlays for purposes of determining the total consumption of the population, which is included in the complementary system of statistics of the distribution of income, consumption and accumulation, and the role that producers play in the welfare of their employees. Data on these outlays might also be part of a wider study of job satisfaction and industrial morale in the SSDS. In view of the difficulties of measurement, this study should not be assigned a high order of priority.

129. Second, there are expenditures which benefit the general public: the usual example is entertainment on television financed from advertising budgets. These costs could and should be separated out for purposes of considering their inclusion in the concept of total consumption of the population. However, they should not be excluded from the intermediate consumption of industries and included in a form of final consumption, "industrial final consumption expenditure". This would result in duplication in final consumption outlays as the costs of industries finance of the services are already included in the prices of their products. It would also distort the concepts of operating surplus and of income.

130. Third, there are expenditures on research and development. Here there is also a good case for showing these expenditures separately from other expenses which producers meet. However, the expenditures should not be treated as capital outlays in view of the uncertainities of the outputs (results) of research and development and the serious conceptual and practical problems of valuing and depreciating any outputs.

3. Income distribution and related statistics

131. There is no disagreement about the importance of information on the distribution of income, consumption and wealth. This heading is included here to emphasize the desirability of income distribution and related statistics which can be fitted into the framework of the national accounts and which enable a coherent picture to be given of the successive stages of the process of redistribution, as in the case of the United Nations complementary system.

4. Non-reproducible tangible assets

132. The proposed SNA accounts on balance sheets and on the reconciliation between successive balance sheets in (56) include data on the value, expansion and deterioration (depletion) of holdings of non-reproducible tangible assets, such as land, mineral deposits and fisheries owned and/or subject to exclusive rights of exploitation by institutions. The capital transaction accounts of the SNA already include data on the improvement of and transactions in non-reproducible tangible assets. It is important to cover non-reproducible assets in the national accounts as they are important elements of wealth and the reserves for production and are the subject of major questions concerning man's environment.

5. Household durables

133. It is not feasible to treat outlays on household durables as an integral part of gross fixed capital formation in the national accounts because of the difficulties and inconvenience of valuing and depreciating these stocks and of establishing production accounts on their use. However, it is proposed to furnish data on household holdings of major durables in a supplementary table of the balance-sheet accounts of the SNA and in the SSDS subsystem on the distribution of income, consumption and wealth. The military durables of government are also to be shown in the former table.

6. International comparisons of national accounting aggregates

134. It is generally agreed that the international comparisons of national accounting aggregates based on the use of exchange rates to convert national currencies into a common unit of value is unsatisfactory. It is important to continue the work on, and extend the scope of, the United Nations International Comparison Project for this purpose. It would also be valuable to explore and develop short-cut and less burdensome methods of making the benchmark comparisons and of extrapolating the results to later periods.

B. Proposals which could be implemented in social and demographic statistics or in environment statistics

135. Most of these proposals call for the collection and compilation of new data.

1. Pollution

136. While treated pollutants are already accounted for, arrangements ought to be made in a body of statistics on the environment that is linked to the national

accounts, for comprehensive and coherent recording of information on pollution, including treated and untreated pollutants. The development of statistics on the emission and treatment of pollutants is a complicated problem, which is best approached in at least two steps. First, it should be possible to compile information on the emission of pollutants from equipment, including equipment such as heating systems and motor cars in the possession of households, and from industrial processes. Second, it should be possible to gather at least some data about the inputs and costs involved in preventing or treating pollutants, but this information would probably be incomplete and imprecise unless polluters were required to deal, at least to some extent, with the pollution for which they were responsible. This consideration suggests that comprehensive and reliable accounting for pollution may only be practicable within the framework of comprehensive provisions for the control of pollution.

137. There does not seem to be any compelling reasons why all the costs of pollution should be treated either as intermediate or as final expenditure. On the contrary, it would seem reasonable to treat the costs of control arising from industrial processes and equipment, including, in concept, equipment owned and operated by consumers, as intermediate expenditure and to treat the costs of control arising from everyday human functioning as final expenditure. This treatment would conform with the principle that the polluter pays. The suggestion above concerning equipment owned and operated by consumers implies that purchases of such household durables as motor cars should be treated as fixed capital formation in the national accounts and that a limited production account should be established therein for them; as has been indicated above, it appears to be, on the whole, impractical to do this. While it seems impracticable to treat current outlays on the control of pollution from household motor cars as intermediate consumption and purchases of these durables as capital formation in the case of the national accounts, the emission and the costs of control of pollutants from such household durables should and could be covered in statistics of the environment.

2. Levels of living

138. Relatively few improvements in the national accounts to yield more useful measures of levels of living for national or international use appear to be desirable or practical. However, the SSDS that is being formulated provides useful guidance for purposes of developing comparable, comprehensive, coherent and interrelated basic data, social indicators and other measures on the various aspects of levels of living and on the correlated social services. The SSDS data are linked with the national accounts through its subsystems on the social services, income distribution and related statistics and housing statistics. However, work is not being conducted on the design of indicators which summarize the data for each of the subsystems or for the level of living as a whole.

3. The household economy

139. While there are disadvantages and serious difficulties in incorporating such activities as domestic, educational and leisure-time services which household members carry on for their own benefit in the national accounts, data on their use of time in these and other activities are included in the SSDS. These data, coupled with information on the dwelling and possession of durable equipment of households from the SSDS and data on the consumption goods and services acquired by households from the national accounts, might furnish the basis for developing models for assessing the output of the household services in question.

C. Suggestions which cannot be implemented in the present state of knowledge

140. Many of the questions raised concerning the national accounts consist of drawing attention to a problem, often one which has been recognized for some time, and offering what is frequently admitted to be a short-cut solution. Much of the discussion in the earlier part of this report was directed against the nature of the solutions rather than against the interest of the problems. Accordingly in this subsection problems are listed for which either no solution is proposed or for which the solutions suggested are unacceptable; and in the following subsection a number of areas of research are listed which might eventually contribute to the solution of some of the problems. Some of these questions are already dealt with in the earlier parts of this section of the report.

1. Measurement of the output of non-market activities

141. It is often said that input measures of output should be abandoned in favour of output measures of ultimate output, that is benefits. The desirability of following this advice is so obvious that it would always be followed if it were possible to do so; but it is not possible in the case of non-market activities with the methodology and data that are at present available. The concept of ultimate output (benefits) is unclear in the case of non-market activities and it is difficult to see how it can be valued. Furthermore, the benefits derived from the non-market activities are likely to reflect a number of additional circumstances and characteristics of the recipients. The suggestions for devising better measures of the ultimate output of the non-market activities generally lead to extended input measures of output. It seems possible to make some progress in this direction by basing the measures on indicators of the volume of the various facets of the activities of non-market services, weighted by the costs of the inputs into the activities. Indicators of the changes in the correlated state of welfare (the benefits) may then be regressed on the synthetic measures (index-numbers) and on data on other factors underlying these changes in order to assess the contribution made by the non-market services. This is the approach being taken in the work on the SSDS. However, this approach is somewhat artificial because the use of the input costs of the activities involved in rendering non-market services does not call in question the existing allocation of resources, whatever that may be.

2. Imputed rates of return

142. In the great majority of cases no basis exists for imputing a rate of return to unpaid factors of production engaged in non-market activities. The most that can be done is to impute a figure of average cost based on an analogy, often rather tenuous, with some market activity. But this is quite different from a rate of return unless it is assumed that factors are employed in non-market activities up to the point at which their imputed cost is equal to their contribution to the value of output. This seems a very bold hypothesis.

143. There are cases, such as the rental value of government office buildings, in which the market analogy is fairly strong. But even in such cases if seems questionable to recommend imputations: the cases are so limited that the critics would not be satisfied; and in the lengthy discussions which preceded the revision of the SNA, the weight of opinion was strongly against all such imputations.

144. This is also one of the important objectives to the proposals to include household services, including leisure services, within the production boundary of the national accounts.

3. Regrettable necessities

145. It is considered that the output and consumption of so-called "regrettable necessities" should continue to be included in the national accounts and even in specifically designed measures of welfare. Not only is the identification of regrettable necessities a matter of individual judgement of the proponents of this concept but their acquisition is part of choices that individuals make in order to improve their welfare, given the circumstances which they face. While these circumstances may be man-made, as well as natural, it is pointless to base accounting on what might happen if the circumstances did not exist. The result would no doubt be changes in patterns of output and consumption of much more goods and services than what some call regrettable necessities.

4. Human capital

146. It is considered that the concept of human capital as a measure of discounted earning capacity over a lifetime and that the concomitant treatment of educational and other outlays thought to increase this capacity as fixed capital formation, should not be introduced in the national accounts. Forbidding problems and difficulties arise in attempts to evaluate the stream of future earnings of individuals; the contributions of various outlays and other factors to bringing about long-term improvement in this capacity have not been clearly established; at least an undetermined and varying portion of the outlays on, for example, education are a form of consumption, that is do not increase the earning and related performance capacities. These questions should undoubtedly be explored; the co-ordinated and linked data called for in the SSDS on the lifetime education, employment, earnings and consumption, and health of individuals and on their personal and family characteristics, should yield useful information for this purpose. It should also be noted that the outlays on education and on other services which may contribute to the maintenance and/or improvement of earning capacity are distinguished in the case of both the SSDS and the SNA.

D. Suggestions of topics on which more research is desirable

147. As has been said above, implementation of some of the improvements and extensions that might be made in the information available to assess welfare calls for more research. Whether this should be regarded as a responsibility of statistical offices or as something to be done in research institutes or universities is a matter which is likely to be handled differently in different countries. The following lists the main topics on which further research is needed.

1. Measurement of the output of non-market activities

148. Further research is needed on the nature and content of the measures of the output of non-market services based on quantity indicators of their activities that are discussed in paragraph 141 above. However this approach falls short of overcoming the deficiencies of using inputs as the best available measure of ultimate output and costs as the best available measure of value. If we are to get away from this position we must devise new methods of measurement and this would seem to imply the construction of programming models of non-market activities since these are designed to optimize the use of resources by reference to some statement of aims expressed in terms of a welfare or utility function.

149. As an example, suppose we were willing to allocate an educational budget with the sole aim of maximizing the contribution of education to future output as measured by the sum of the returns to the various levels of education. We could represent the structure of the system in terms of admissible movements through it and we should find it necessary to introduce constraints dictated by policy considerations as well as by logical necessities. On this basis we could calculate the activity levels of the different branches and their values if run at optimal levels. Sensitivity analysis could be used to show how the values would be affected by departures from the optimum. Great difficulties would be involved but the method offers some hope of a solution to the problems of measuring and valuing non-market services.

2. Aggregates on the levels of living

150. As is indicated in paragraph 138 above, the work thus far carried on the SSDS has not dealt with summaries of the data of the subsystems into overall synthetic indicators for each subsystem or for the level of living as a whole, as, for example in the studies mentioned in paragraph 120 above. Research is required into the potentialities, methodologies, information requirements and problems of that and other approaches to constructing comprehensive aggregates on the level of living, based on the data of the SSDS and correlated series from the national accounts.

3. The household economy

151. Reference has been made in paragraphs 121 and 139 to work on modelling the household economy, including the use of leisure time, based on data of the SSDS. Though promising, this work is far from being operational and more research is needed before we can know whether or not it provides a useful and practical basis for portraying the household economy and depicting the statistics required for this purpose. It should be noted that the models in question make assumptions about the aims of household non-market activities.

4. Statistics of the environment

152. Work on a coherent body of statistics of the environment which is linked with the national accounts and the SSDS began very recently. The topics discussed in this report call for developing data on such questions as (a) the emission of, and the costs of reducing, recycling etc., pollutants by industries, government and households, in relation to their activities and (b) the flow of the pollutants through environmental media, the states of pollution of the media and the significance of these conditions for the welfare of the population. A framework for organizing data on (a) is outlined in paragraphs 34-37 above. A programme of work on statistics of the environment that encompasses the topics mentioned above is detailed in document E/CN.3/452, which is before the eighteenth session of the Statistical Commission.

5. The distribution of income, consumption and wealth

153. Attention is drawn in paragraph 99 above to reservations concerning the conventional measures of inequality and to the need to develop more suitable measures. More research is also needed on the refinement of simple, Markovian models of income generation; but this should not hold up the work of collecting information on income transitions.

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