The Accounts of Society

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THE ACCOUNTS OF SOCIETY

1. *The Role of Accounting Systems*

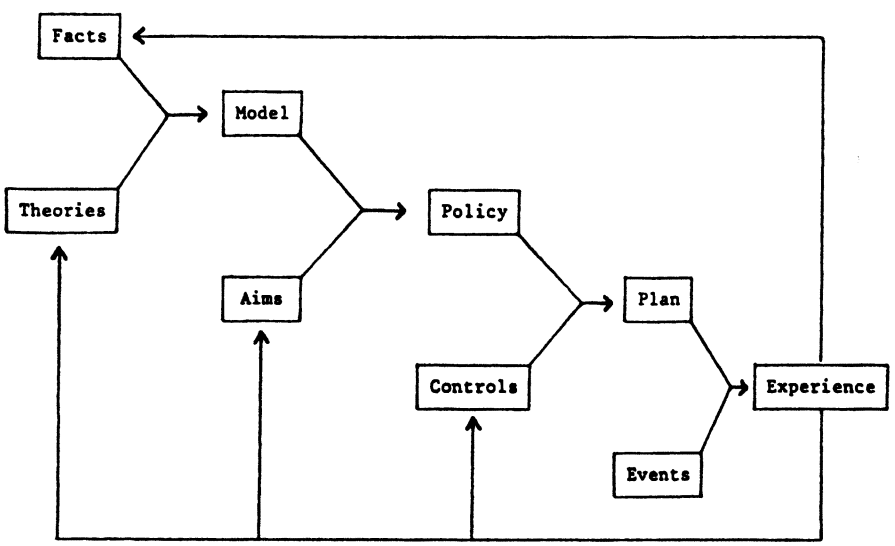
This morning I shall discuss how accounting can be useful in describing and understanding society. The three pillars on which an analysis of society ought to rest are studies of economic, socio-demographic and environmental phenomena. Naturally enough, accounting ideas are most developed in the economic context, and it is to this that I shall devote much of my time, but they are equally applicable in the other two fields. By organising our data in the form of accounts we can obtain a coherent picture of the stocks and flows, incomings and outgoings of whatever variables we are interested in, whether these be goods and services, human beings or natural resources, and thence proceed to analyse the system of which they form part. The function of the national accounts in this process can perhaps be better understood if I illustrate it with a diagram.

In the first box of diagram 1 we have our *facts*, organised as far as possible into a coherent set of accounts. Given this quantitative framework, we can formulate some hypotheses, or *theories*, about the technical and behavioural relationships that connect them. By combining facts and theories we can construct a *model* which when translated into quantitative terms will give us an idea of how the system under investigation actually works. Since no system works perfectly we may want to change ours in order to try to improve it. This implies formulating some *aims*, and by introducing these aims into our descriptive model we can sketch out a *policy*. But for practical purposes this is not the end. The policy model needs to be combined with a set of *controls* which specify the way in which we propose to realise the policy, thus enabling us to draw up a *plan*. This planning model can now be run through the computer to show us the probable repercussions of the intended changes throughout the system. But since no model-builder however sagacious can think of everything and no model however detailed can reflect all the complexities of the real world, it is likely that when the plan is actually put into practice, *events* will reveal its deficiencies. This *experience* will lead us to reconsider the facts we took into account and our methods of recording and measuring them, the theories we used in relating them, the precise aims we thought desirable, and the controls to be used in achieving these aims. As experience feeds back to modify facts, theories, aims and controls, so the whole picture will change and hopefully we shall get a better model, a better policy and a better plan.

The process I have described is not just the concern of the scientist. He is involved in collecting and ordering facts, in formulating theories and in building models. But aims and policies are primarily the concern of the politician, and controls and plans are primarily the concern of the administrator. It is not easy for these three to understand each other and there is a pressing need to diminish the difficulties of communication between them.

Diagram 1 brings out the ultimate purpose of the work which is my main concern in this lecture and is represented by the box labelled 'facts'. In the remainder of what I have to say I shall not stray far outside this box. But before describing its contents and discussing how they can be further

Diagram 1. Models, policies and plans



elaborated it may be of some interest if I place them in their historical perspective.

2. *Precursors*

To trace the origins of national economic accounting we must go back to seventeenth century England, an age of great intellectual vigour, scientific curiosity and inventiveness. William Petty, physician, chemist, land surveyor, cartographer, naval engineer, co-founder of the Royal Society, adviser both to the Cromwell government and after the Restoration to Charles II and, above all, political arithmetician, was one of the more remarkable products of that remarkable century. In 1664, largely with the object of making the tax system more equitable, he wrote a paper entitled *Verbum Sapienti* in which, after saying that 'just accounts might be kept of the People, with the respective Increases and Decreases of them, their Wealth and Foreign Trade', he proceeded to give the first known estimates of what may be called balances of the national economy [17].

Petty's figures, reached by ingenious extrapolation, are limited to a very small number of basic magnitudes but his ideas are sound. He equates income to expenditure, which he identifies with 'Expence for Food, Housing, Cloaths, and all other necessaries'. This he estimates at £40 million for the population of England and Wales, which he puts at 6 million inhabitants. He then estimates the income yielded by land at £8 million and that yielded by 'other Personal Estates' at £7 million. 'Now,' he says, 'if the Annual Proceed of the Stock, or Wealth of the Nation, yields but 15 Millions and the Expence be 40, then the Labour of the People must furnish the other 25'. The reasoning is impeccable. His figures can be set out as an account with four entries, as in table 1.

The only objection that can be made to Petty's figures is that the £25 million of labour income is not estimated independently but obtained as a residual in order to balance the account. However, he supports it by a calculation which gives an estimate for average daily earnings of 7 pence per head, and this seems reasonable enough for his time.

Table 1 is an example of Petty's 'political arithmetick', which his contemporary Charles Davenant defined as 'the art of reasoning by figures upon things relating to government' [7]. Although most of Petty's numerous writings on the subject were published posthumously, his manuscripts were widely circulated in his life-time and his method found a number of followers. Of these by far the most important in my context was Gregory King.

King was a herald by profession and seems to have worked out his estimates for his own curiosity. Had it not been for the invaluable Charles Davenant, who was a friend and great admirer of his and introduced many of his estimates, with due acknowledgement, in his own books, King's writings would have lain in obscurity until 1802, when they were rediscovered and published by George Chalmers [12]. One of his most fascinating tables relates to the income, expenditure and saving of the population of England in 1688, divided into twenty-six social classes ranging from temporal lords to vagrants [1, p. 31; 8, p. 23]. A version of it, slightly amended and converted to decimal currency, is set out in table 2.

Table 1. William Petty's original estimates, 1664

Income		Expence	
From Land	8	Food, Housing, Clothes,	
From other Personal Estates	7	and all other	
From the labour of the People	25	necessaries	40
Total	40	Total	40

Evidently King's main purpose in drawing up this table was to find out the contribution made to wealth by the various groups in society. Thus we see that rather less than half the population, with a combined income of £34.5 million, saved, thereby increasing the wealth of the kingdom; while rather more than half, with a combined income of £9 million, overspent their income, thereby decreasing the wealth of the kingdom. Incidentally, I should perhaps explain that the term families is the equivalent of what we now call households; it does not mean that peers had an average of 38 children and bishops an average of 18.

Another of King's tables which is worth reproducing here is his comparison between England and her two political and commercial rivals, France and Holland [1, p. 55]. It is the first example of the use of national accounts for international comparisons and is set out with slight amendments in table 3.

Table 3 enables many comparisons to be made both over space and over time. France, with its relatively large population, has by far the largest income whereas Holland has the smallest; in terms of income per head, however, the position is reversed. The English appear as great consumers of meat and beer, the Dutch seem to prefer poultry and fish to meat, and the French definitely prefer wine to beer. In all three countries, saving falls in wartime but remains positive in Holland. Taxes are much higher in Holland than in the other two countries though in all three countries they increase greatly in wartime. King projected his estimates to 1698 and concluded that the war could not be continued beyond that date. He was quite right: the War of the League of Augsburg lasted from 1689 to 1697.

After this brilliant start all thoughts of balanced accounts seem to have evaporated. However, sporadic attempts at estimating some of their constituent parts, especially income, were made with increasing frequency throughout the eighteenth, nineteenth and early twentieth centuries. To begin with, two French contemporaries of King, Pierre de Boisguillebert and Marshal Vauban, working independently of each other, published estimates of the national income of France to support their contention that the tax system was injurious to the welfare of the country and needed reforming [2; 30]. Their efforts might have led to interesting developments if they had not been strangled at birth: Louis XIV disapproved, and their books were suppressed. Nothing of note happened in England until Arthur Young's income estimates of 1770, which were based on very loose calculations of output [31]. At the turn of the century three estimates based mainly on consumption were made in Russia [23] but met with the same fate as had befallen the early French ones.

The nineteenth century saw further progress, data became more abundant, and by the end of the century income estimates were available for some twenty countries, many of them prepared by M. G. Mulhall and published in £'s sterling in successive editions of his *Dictionary of Statistics* from 1884 onwards [16]. Some were based on income and some on output statistics and many of them were rather crude; but they served to stimulate interest in the study of national income and in international comparisons.

Apart from statistical estimates, two conceptual innovations which are relevant to my theme should be mentioned at this point. In 1758 François Quesnay, Louis XV's physi-

Table 2. A Scheme of the Income & Expence of the several Families of England Calculated for the Year 1688

Ranks, Degrees, Titles and Qualifications	Number of families	Heads per family	Number of persons	Income per family £	Income per head £	Expence per head £	Increase per head £	Totall income £'000	Totall expence* £'000	Totall increase £'000
Temporall Lords	160	40	6,400	2,800	70	60	10	448	384	64
Spirituall Lords	26	20	520	1,300	65	55	10	33.8	28.6	5.2
Baronets	800	16	12,800	880	55	51	4	704	652.8	51.2
Knights	600	13	7,800	650	50	46	4	390	358.8	31.2
Esquires	3,000	10	30,000	400	40	37	3	1,200	1,110	90
Gentlemen	12,000	8	96,000	240	30	27.5	2.5	2,880	2,640	240
Persons in greater Offices and Places	5,000	8	40,000	240	30	27	3	1,200	1,080	120
Persons in lesser Offices and Places	5,000	6	30,000	120	20	18	2	600	540	60
Eminent Merchants & Traders by Sea	2,000	8	16,000	400	50	40	10	800	640	160
Lesser Merchants & Traders by Sea	8,000	6	48,000	200	33.3	28.3	5	1,600	1,360	240
Persons in the Law	10,000	7	70,000	140	20	17	3	1,400	1,190	210
Eminent Clergy-men	2,000	6	12,000	60	10	9	1	120	108	12
Lesser Clergy-men	8,000	5	40,000	45	9	8	1	360	320	40
Freeholders of the better sort	40,000	7	280,000	84	12	11	1	3,360	3,080	280
Freeholders of the lesser sort	140,000	5	700,000	50	10	9.5	0.5	7,000	6,650	350
Farmers	150,000	5	750,000	44	8.8	8.55	0.25	6,600	6,412.5	187.5
Persons in Liberal Arts and Sciences	16,000	5	80,000	60	12	11.5	0.5	960	920	40
Shopkeepers and Tradesmen	40,000	4½	180,000	45	10	9.5	0.5	1,800	1,710	90
Artizans and Handicrafts	60,000	4	240,000	40	10	9.5	0.5	2,400	2,280	120
Naval Officers	5,000	4	20,000	80	20	18	2	400	360	40
Military Officers	4,000	4	16,000	60	15	14	1	240	224	16
	511,586	5¼	2,675,520	67	12.9	12	0.9	34,495.8	32,048.7	2,447.1
Common Seamen	50,000	3	150,000	21	7	7.5	−0.5	1,050	1,125	−75
Labouring People & outservants	364,000	3½	1,275,000	15	4.3	4.4	−0.1	5,460	5,587	−127
Cottagers & Paupers	400,000	3¼	1,300,000	5	1.5	1.75	−0.25	1,950	2,275	−325
Common Souldiers	35,000	2	70,000	14	7	7.5	−0.5	490	525	−35
	849,000	3¼	2,795,000	10.5	3.25	3.45	−0.2	8,950	9,512	−562
Vagrants	. . .	. . .	30,000	. . .	2	4	−2	60	120	−60
	849,000	3¼	2,825,000	10.5	3.19	3.41	−0.22	9,010	9,632	−622
So the General Account is										
Increasing the Wealth of the Kingdom	511,582	5¼	2,675,520	67	12.9	12	0.9	34,495.8	32,048.7	2,447.1
Decreasing the Wealth of the Kingdom	849,000	3¼	2,825,000	10.5	3.19	3.41	−0.22	9,010	9,632	−622
Neat Totalls [and averages]	1,360,586	4 1/20	5,500,520	32	7.9	7.55	0.33	43,505.8	41,680.7	1,825.1

*Note: This column does not appear in the original.

Source: Gregory King, *Two Tracts*, edited by G. E. Barnett, Johns Hopkins Press, Baltimore, 1936, p. 31 (amended).

cian, conceived his ingenious *Tableau Économique* [18] which is now regarded as the beginning of the analysis of intersectoral flows. And about a century later Karl Marx carried out his analysis of simple and extended reproduction which appeared in 1885, shortly after his death, in volume II of *Das Kapital* [15].

After the first world war the statistical pace accelerated. In the early 1920's, the Central Statistical Administration of the Soviet Union compiled a large body of data on material outputs and their uses, cast in the form of an input-output table for 1923–24, as a basis for planning production. This was published in 1926 and the names associated with it are those of V. G. Groman and P. I. Popov [28; 9]. Similar work continued until 1932.

By this time national income estimation was flourishing. I shall mention in particular the contributions of A. L. Bowley in England [3] and of Simon Kuznets in the United States [14]. But the restoration of the synthetic vision of the political arithmeticians came in the 1930's with the work of Colin Clark who in 1937, in his *National Income and Outlay* [5] brought together estimates of income, output, consumers' expenditure, government revenue and expenditure, capital formation, saving, foreign trade and the balance of payments. Although he did not set his figures in an accounting framework it is clear that they came fairly close to consistency. Clark was my teacher at Cambridge and his work was the main source of inspiration for mine. Early in the second world war his estimates were updated by Erwin Rothbarth for Keynes, who used them as the statistical framework of *How to Pay for the War* [11].

In 1941, estimates of British national income and expenditure, which James Meade and I had worked out as civil servants in the War Cabinet offices, were published at the instigation of Keynes in a White Paper entitled *An Analysis of the Sources of War Finance and an Estimate of the National Income and Expenditure in 1938 and 1940* which was issued at the time of the budget [25]. In the same year Gruenbaum (Gaathon) published his *National Income and Outlay in Palestine, 1936*, which was also set in an accounting framework [10], and Van Cleeff in Holland published two papers on a system of national bookkeeping [29].

Thus, as so often happens, the idea was in the air and made its appearance in several guises at the same time. At this point I shall conclude my historical narrative and turn to the theory and practice of national economic accounting as it is today.

3. *Concepts and Definitions*

An economic system is one in which goods and services are produced with the ultimate object of satisfying human wants. *Production*, the bringing into being of goods and services, takes place in farms, factories, shops and the like, and the total product of any period is divided into two parts:

Table 3. The General Account of England, France & Holland for the Years 1688 & 1695

	Totals (£ million)						Per head (£'s)					
	1688			1695			1688			1695		
	England	France	Holland	England	France	Holland	England	France	Holland	England	France	Holland
Bread . . . & all things made of Meal or Flower				4.3	10.1	1.40				0.79	0.75	0.63
Beef, Mutton, Veal . . . Venison, Conies				3.3	5.3	0.80				0.62	0.39	0.36
Butter, Cheese & Milk				2.3	4.0	0.60				0.42	0.30	0.27
Fish, Fowle & Eggs				1.7	3.7	1.10				0.31	0.27	0.49
Fruit, Roots & Garden Stuff				1.2	3.4	0.40				0.22	0.25	0.18
Salt, Oyl, Pickles . . . & confectionery Ware				1.1	2.8	0.30				0.20	0.21	0.13
Beer & Ale				5.8	0.1	1.20				1.06	0.01	0.54
Wine, Brandy Spirits . . . & made Wines				1.3	8.6	0.40				0.24	0.64	0.18
Dyet [food and drink]	21.3	41.0	64.0	21.0	38.0	6.20	3.87	2.93	2.91	3.85	2.82	2.78
Apparell [clothing]	10.4	18.5	3.00	10.2	16.0	2.80	1.89	1.32	1.36	1.87	1.19	1.25
Incident Charges [expenditure n.e.s.]	10.0	21.0	6.35	14.3	26.0	8.40	1.82	1.50	2.89	2.62	1.93	3.75
Increase [saving]	1.8	3.5	2.00	−3.0	−6.0	0.85	0.33	0.25	0.91	−0.55	−0.44	0.38
General Expence	43.5	84.0	17.75	42.5	74.0	18.25	7.91	6.00	8.07	7.80	5.49	8.15
Rent of Land, Buildings & other Hereditaments	13.0	32.0	4.00									
Produce of Trade, Arts & Labour	30.5	52.0	13.75									
General Income	43.5	84.0	17.75	42.5	74.0	18.25	7.91	6.00	8.07	7.80	5.49	8.15
Consumption besides Taxes	39.7	70.0	11.0	39.0	62.5	10.50	7.22	5.00	5.00	7.16	4.63	4.69
Publick Revenue & Taxes	2.0	10.5	4.75	6.5	17.5	6.90	0.36	0.75	2.16	1.19	1.30	3.08
Increase	1.8	3.5	2.00	−3.0	−6.0	0.85	0.33	0.25	0.91	−0.55	−0.44	0.38
General Expence	43.5	84.0	17.75	42.5	74.0	18.25	7.91	6.00	8.07	7.80	5.49	8.15
Population (millions)	5.5	14.0	2.2	5.45	13.5	2.24						

Source: Gregory King, *Two Tracts*, edited by G.E. Barnett, The Johns Hopkins Press, Baltimore, 1936, p. 55 (amended).

intermediate product, which is absorbed in the productive process, and final product, which is sold outside the productive system.

Final product in its turn is divided into two parts. The first and largest flows into *consumption*, the using up of goods and services within the period of account, say a year. The second flows into *accumulation* for use in the future and constitutes an addition to wealth. Most of this second flow goes to maintain and increase the country's stock of fixed assets, such as buildings, machinery, vehicles and so on; the remainder consists of stocks of products intended for intermediate or final use which have not in fact been used up in the year and so are available for use in the future. Since the whole of final product is either consumed within the period or accumulated for the future, it follows that final product equals consumption plus accumulation.

Production, consumption and accumulation are the three basic forms of economic activity; in an isolated economy they would form a closed system of flows. But the economies of actual countries are not isolated, and so transactions with other economies have to be brought into the picture. The production of a given country is supplemented by imports, and all the final product of a country is not exhausted by domestic consumption and accumulation but in part flows abroad as exports. Thus we must record all transactions of that country's production, consumption, and accumulation with the *rest of the world* as well as with one another.

This network of flows can be set out in four interlocking accounts which show the basic structure of a country's economic system. A highly concentrated version of these accounts is given in table 4. Before considering it, however, we should try to define our terms.

To begin with production, what should we include in it? We might agree that we wanted to include in it all the goods and services intended for sale valued at their market price. But this leaves out non-market activities which are important in all societies. Consider first the non-trading activities of government, such as public administration, defence, education and health services. Since these services are not sold they can only be valued at cost. In the present state of knowledge it is virtually impossible to approximate their value to their users in any other way. In adopting this basis of valuation we must accept the fact that nothing like a profit or loss can appear in respect of these services: clearly, if a service never comes on the market there cannot be a market criterion of the scale on which it should be provided. Nevertheless it is agreed that the output of these services, valued at cost, should appear as part of production in the national accounts.

Household and amateur activities present an even more difficult case. Although these activities often take the form of production, as in cooking a meal or redecorating a house, their output does not have a measurable cost, since household members and amateurs give their services for nothing; these services are innumerable and unrecorded; in general they are not very well defined and merge imperceptibly into the activity of living. This being so, until recently it has been generally agreed that household and amateur activities should not be included in production and should not be accounted for.

This treatment, whereby commercial products are valued at market price, government services are valued at cost and unpaid household activities are simply ignored, is not a matter of principle but of practical convenience. It can be defended, therefore, only on practical grounds. First, the market economy, augmented by government services, is an interesting and useful object of study in itself. Second, the methods suggested for valuing the output of non-market activities, though they do not provide an independent measure of their value either to the user or to the community at large, tend to improve the measurement of costs. And third, there is very little information for measuring or valuing unpaid household and amateur activities. The position is changing, however, partly through the collection of more information, for example on the use of time, and partly through the development of optimising models which can distinguish between cost to the producer and value to the user, so we may hope to be able eventually to increase the coverage of the concept of production.

Obviously the task of measurement is eased in societies in which the bulk of production takes place in producing units such as factories which are clearly distinguished from consuming units such as households, and where the division of labour and the use of money have been developed. In general, the existence of institutional distinctions is helpful in collecting data, whereas if there is only one type of institution, the household, in which everything takes place, we run into the difficulties I have outlined.

The next question is, what is consumption? We might define it as the purchase of final products for use within the period of account. As far as perishable goods are concerned this would not lead to much error. But with the increasing importance of durable goods such as private cars, domestic appliances, television sets and so on, what is bought in a year will not be wholly consumed in it but will be available at the end of the year to render further services in the future. Yet by convention all such goods are included in consumption. It would be better to treat at least the major durables as capital goods and include in consumption only the year's depreciation. The excess of their purchase price over their depreciation would then appear as part of saving on the outlay side of the account.

What I have just said brings me to accumulation. Here again we are on shifting ground. Formerly it was usual to restrict capital goods to income-earning assets such as buildings, plant, and machinery and industrial vehicles. Later it was decided to include also government assets which do not yield an income, such as roads, bridges, schools and hospitals. Only now is there a move to include consumer durables among capital goods. In fact the distinction between consumption goods and capital goods is coming more and more to depend on durability rather than on the existence of a money return.

An important conceptual problem in connection with accumulation is the measurement of depreciation. This depends on the expected life of the asset, the rate at which it is likely to wear out and the price at which each successive stage is to be valued. Estimates of useful life can never be certain: with well-established types of asset, past experience is quite a good guide, but with new types the estimate can be little more than a guess. The rate at which assets wear out is usually estimated on one of two assumptions: either that this rate is uniform throughout the expected life, or that at each successive stage it represents a uniform proportion of the remaining life. It makes a good deal of difference which method is chosen. In private accounting it has been customary to value depreciation by reference to the original cost of the asset. This works well enough in times of stable prices, but in times of changing prices,

particularly if the changes are predominantly in one direction, it is better to use replacement cost, and this is the practice followed in national accounting.

The valuation of investment in stocks also presents a problem. This part of investment represents the value of the increase or decrease in the quantities of unused or unsold products held by the productive system at the end of the period. This must be distinguished from stock appreciation, which reflects the increase or decrease that has taken place during the period in the prices of the goods held in stock. Stock appreciation is a capital gain and belongs among capital transactions and not among the sources of income. The sum of investment in stocks and stock appreciation is equal to the increase in the value of stocks.

After what I have just said you may well ask, what then is the exact definition of production, consumption and accumulation? The answer is that the matter is still being debated but that in the meantime most people are agreed that the definitions adopted in the United Nations system of national accounts are serviceable and flexible enough to cover a wide range of situations.

4. *The National Economic Accounts*

I shall now describe the national economic accounts as they are now. By way of illustration I shall make use of the numerical examples given in *A System of National Accounts* (or SNA for short) published by the United Nations in 1968 [26]. My first example is shown in table 4.

The accounts in table 4 form a closed system which includes the whole world. What I have termed 'our country' is a fictitious country, and the figures, although derived from actual data, are to be taken only as examples. There are ten independent entries, but as each entry appears twice, once as an outgoing and once as an incoming, the numbering of the items goes from 1 to 20; the position of the contra-entries is indicated by the numbers in brackets.

The first panel contains the flows into and out of production. On the left are costs; the first item consists of income, that is wages, salaries, interest, profits, and rent, paid to the factors of production, labour, capital, and land, plus provisions for depreciation plus indirect taxes (net) paid to government; the second item represents purchases of imports. On the right are revenues, consisting of the proceeds from sales of goods and services to consumption, sales of capital goods to accumulation and sales of exports to the rest of the world. The account is presented in consolidated form, that is to say all transactions occurring inside it, such as purchases and sales of intermediate products between industries, are cancelled out. Thus the value of intermediate products does not appear; however, as we shall see, it can be retrieved by disaggregating the single account into two or more.

The second panel contains the flows into and out of consumption. On the left are outlays: the first is expenditure on goods and services, which we have already met as a source of revenue in the production account; the second is saving, which is simply the excess of income over outlay; and the third represents gifts and other remittances to the rest of the world. On the right are the constituents of income: by fat the largest is the income received from production; to this is added factor income received from the rest of the world, that is dividends, profits, interest and rent arising from property owned abroad; finally there is a negative figure representing provisions for the depreciation of fixed assets, which must be subtracted from gross income to obtain the true, net value of the national income. Again, all flows

Table 4. The four economic accounts of our country in year ϑ (money values)

1. Production (Domestic Product Account)

Outgoings		Incomings	
1. Gross income payments (value added) (9)	255	3. Sales of consumption goods (6)	210
2. Purchases of imports (18)	54	4. Sales of capital goods (12)	47
		5. Sales of exports (16)	52
Total	309	Total	309

2. Consumption (Income and Outlay Account)

Outgoings		Incomings	
6. Purchases of consumption goods (3)	210	9. Gross income receipts from domestic production (1)	255
7. Saving (15)	27	10. *less* Provisions for the consumption of fixed capital (13)	−19
8. Net current transfers abroad (19)	4	11. Net distributed factor incomes from abroad (17)	5
Total	241	Total	241

3. Accumulation (Capital Transactions Account)

Outgoings		Incomings	
12. Purchases of capital goods (4)	47	15. Saving (7)	27
13. *less* Provisions for the consumption of fixed capital (10)	−19		
14. Net lending abroad (20)	−1		
Total	27	Total	27

4. The Rest of the World (Balance of Payments Account)

Outgoings		Incomings	
16. Purchases of exports (5)	52	18. Sales of imports (2)	54
17. Net distributed factor income payments (11)	5	19. Net current transfers (8)	4
		20. Net borrowing (14)	−1
Total	57	Total	57

occurring inside the account, such as taxes paid by companies and persons to government, and subsidies and benefits paid by government to companies and persons, are consolidated away but can be retrieved by disaggregation.

The third panel contains the flows into and out of accumulation. On the left, the first item represents gross investment in tangible assets; the second shows the depreciation which must be subtracted to obtain net investment; and the third represents net lending abroad, where the minus sign indicates that in the period of account our country borrowed from the rest of the world more than it lent. On the right is saving, which finances net investment. All lending and borrowing between different transactors inside the account are consolidated away.

The fourth panel contains the transactions between the rest of the world and our country. These are presented from the point of view of the rest of the world, so that all the items which appear as outflows on the left of this account will be found as inflows in the three domestic accounts and *vice versa*. The myriads of transactions occurring outside our country do not appear at all.

With only four accounts it is a simple matter to follow the relationships between the entries, but as the number of accounts is increased this becomes more and more difficult and it is convenient to display the accounts in the form of a matrix in which each row-and-column pair represents an account, with incomings in the rows and outgoings in the columns. This is done in table 5.

The entries in this table are the same as those in table 4. The advantage of this form of presentation is obvious: there is no need for contra-entries. Each item appears only once, at the intersection of a row and a column; read horizontally it represents an incoming into the account specified on the left of the row; read vertically it represents an outgoing from the account specified at the top of the column. Thus the entry of 210 in row 1 and column 2 represents sales of consumer goods and services, which is an incoming into production and an outgoing from consumption.

Table 5. The four economic accounts of our country in matrix form (money values)

	1	2	3	4	Total
1. Production		210	47	52	309
2. Consumption	255		−19	5	241
3. Accumulation		27			27
4. The rest of the world	54	4	−1		57
Total	309	241	27	57	

I shall now show how the content of the system can be increased and how it is possible to introduce balance sheets for assets and liabilities (stocks) alongside the transactions (flows) which appear in the accounts. This is done by dividing each account into two or more and at the same time bordering the original matrix with rows and columns containing assets, liabilities and their revaluations. The rest is shown in table 6.

In this table the central square contains a minimal disaggregation of the accounts shown in table 5, and the outer rows and columns contain the balance sheets and revaluations. As a result of disaggregation it becomes possible to fill in the four diagonal submatrices which were empty in table 5. In order to indicate how a matrix of this kind is to be interpreted I shall give a brief explanation of the entries in rows and columns 3 and 4, which taken together constitute the production account.

Row and column 3 relate to commodities, that is to goods and services produced by industries for the market; row and column 4 relate to activities, that is to the production of market commodities by industries and of non-market services by government. Purchasers buy market goods and services from the commodity account and government services from the activity account; incomes are paid out of the activity account. The reason for showing commodities and activities separately is that most industries produce more than one commodity, so that the distinction is useful in input-output analysis.

Row 3 shows the destinations of commodities: 245 money units flow into activities as intermediate inputs; 166 flow into consumption as current goods and services; (6 + 41) = 47 flow into accumulation as capital goods; and 50 flow to the rest of the world as exports. Column 3 shows the sources of these commodities: 443 are produced by domestic activities; and 65 flow in from the rest of the world, their value being made up of 51 units of imports before tax plus 14 units of import duties. A little arithmetic shows at once that the row and the column balance: (245 + 166 + 6 + 41 + 50) = (443 + 14 + 51) = 508.

Row 4 shows the total output of commodities by industries, which amounts to 443 money units, and of non-market services by government, which amounts to 44. Column 4 shows the inputs, or costs, connected with these activities: purchases of intermediate products, amounting to 245;

Table 6. A primary disaggregation of our country's accounts, including balance sheets (money values)

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Opening assets	1	Financial claims										1,249		165				
	2	Net tangible assets										661						
Production	3	Commodities				245	166		6	41			50					
	4	Activities			443		44											
Consumption	5	Consumer goods/purposes						210					2					
	6	Income and outlay			14	241						−19	13					
Accumulation	7	Increase in stocks										6						
	8	Fixed capital formation										41						
	9	Financial claims										58		18				
	10	Capital finance	1,217	693				27			59				−23	44	1,253	764
The rest of the	11	Current transactions			51	1	2	12										
world	12	Capital transactions	197	−32							17		1		0	−2	214	−33
Revaluations	13	Financial claims										−21		−2				
	14	Net tangible assets										42						
Closing assets	15	Financial claims										1,286	181					
	16	Net tangible assets										731						

payments of factor incomes, depreciation and indirect taxes (net), amounting to 241; and factor income paid abroad, amounting to 1. Again, the row and the column balance: (443 + 44) = (245 + 241 + 1) = 487.

By a suitable grouping of the domestic flows in the central square of table 6 it is possible to revert to the figures of table 5. If the diagonal entries are removed and the off-diagonal ones are added together, submatrix by submatrix, we obtain: for the first row, (166 + 44) = 210 and (6 + 41) = 47; for the second row, (14 + 241) = 255 and −19; for the third row, 27. The flows in which the rest of the world is involved do not tally, however; the reason lies in the simplified treatment of the flows in table 5.

Turning to the balance sheets and revaluations that surround the central square of table 6, a full explanation of all the entries would be out of place here, so I shall again limit myself to a few indications. The purpose of balance sheets is to show the value of the stocks of financial claims and tangible assets at the beginning and end of the period of account. The opening value of these stocks is shown from different points of view in rows and columns 1 and 2. Their closing value, after the transactions of the period and after revaluations, is shown in rows and columns 15 and 16.

We see in column 1 that at the beginning of the period the value of all financial claims, that is shares, loans, bank deposits, money etc., issued as liabilities by our country was 1217, and the value of claims issued by the rest of the world but held in our country was 197. Conversely, we see in row 1 that the value of claims held as assets in our country irrespective of where they were issued was 1249, and of claims held in the rest of the world but issued in our country was 165. Thus the total opening value of these financial claims was (1217 + 197) = (1249 + 165) = 1414, but our country's holding of its own claims was (1249 − 197) = (1217 − 165) = 1052.

Net tangible assets, valued at written-down replacement cost, appear in row 2. In this example they are restricted to assets located in our country, irrespective of ownership. Thus if a foreign company owns a factory in our country, this forms part of our stock of tangible assets; at the same time its value is included among our liabilities in column 1 and among the rest of the world's holding of financial assets in row 1. The example implies that while the rest of the world may own tangible assets in our country, we do not own tangible assets abroad. If we did they would appear at the intersection of row 2 and column 12 and their value would be added to the rest of the world's liabilities on one side and to our holding of financial assets on the other.

Net tangible assets in row 2 are balanced by net worth (or wealth) in column 2. Net worth measures the excess of all assets, tangible and financial, over liabilities. Our country's net worth is shown to be 693; and the net worth of the rest of the world in so far as its dealings with us are concerned is shown as −32, indicating that our holding of foreign claims is larger by 32 than the rest of the world's holding of our claims.

Row and column 13 show the revaluation of issues and holdings of financial claims so as to bring them to a common basis of current value. Row 14 shows the revaluation of net tangible assets for the same purpose. The revaluation of net worth cannot be estimated independently and the figures depend on the revaluation of tangible assets and claims.

The system of table 6 can be further elaborated by introducing more classifications into the basic framework. Anyone interested in pursuing the matter will find a full discussion of it in [26, pp. 8–11].

5. *Statistical Problems*

Filling the framework of the national accounts with figures means solving a large number of statistical problems. There are two stages in this process.

The first is to bring together the relevant information. In many countries accounting data proper are likely to be available for government activities, and in some cases the accounts of large companies may also have been standardised. But apart from this the data will be mainly statistical; they are likely to be very voluminous and mostly collected for other purposes; and as sources for the construction of national accounts they are sure to be incomplete, inconsistent and of varying reliability. Consequently, when we bring together all this material we shall always find discrepancies and gaps.

The second stage is to find some way of dealing with these discrepancies and gaps. The gaps can often be filled residually. For instance, if we can estimate all the entries in the personal income and outlay account except saving, then this can be measured as the excess of income over the sum of all the other outlays. This is not very satisfactory, however, since it means that we use up one of the constraints of the system to estimate saving, and so this constraint is no longer available to help in checking the accuracy of the system as a whole.

As regards discrepancies, the common practice is to add them in on one side of the account. For instance, if the data on expenditure yield a total greater than the total yielded by the data on income, the difference is often added to the income side of the account as an unidentified item. This is not very satisfactory either, since it is most unlikely that the statistics of expenditure are accurate and all the error lies in the statistics of income, and again we waste a constraint. A better approach is to find some means of adjusting all the entries in the light of our ideas about their reliability.

This can be done by the well-known procedure of adjusting conditioned observations by the method of least squares. In 1942 David Champernowne and James Meade joined me in writing a paper in which we proposed the application of this method to the adjustment of the national accounts [22]. The method requires a knowledge of the relative reliability of each entry in the accounting matrix and this information can be set out in a variance matrix of order equal to the number of entries. Given this, we can calculate the adjustments to the entries which will minimise their sum of squares weighted by the reciprocals of their variances so that the adjusted estimates satisfy the constraints of the system, namely that accounts balance, components sum to totals, final estimates are single-valued, and so on. This application has only been taken up in recent years, partly, I think, because the only available estimates of reliability are subjective ones based on the impressions of their compilers and partly because of the amount of computing involved. As far as I know, the first application was published by Ray Byron in 1978 [4].

As an example of the method, table 7 sets out the results of my attempt to balance an aggregated version of the British national accounts for the year 1969 [21].

The entries in table 7 are arranged in pairs; in each pair the upper figure (in roman type) is derived from the official estimates for 1969 published in [24], and the lower (in italics) gives the adjusted value. The effect of the adjustments can be seen in row E at the bottom of the table: the upper row of figures shows the residual error and other unidentified items included in the official estimates in order to balance the

Table 7. A version of the British national accounts with the errors shown explicitly: initial and finally adjusted estimates for 1969 (£ million)

			1	2	3	4	5	6	7	D	8	9	10	11	12	13	E	Totals
Production	1.	Britain		10,109	29,233			7,997			1,297	4,167	1,414	2,286				56,503
				10,117	*29,286*			*7,999*			*1,316*	*4,320*	*1,414*	*2,286*				*56,738*
	2.	Rest of the world	9,930															9,930
			9,922															*9,922*
Income and outlay	3.	Persons	31,290			35		3,937	341	3,864								39,467
			31,230			*35*		*3,936*	*341*	*3,864*								*39,406*
	4.	Companies	3,815						1,161	1,619								6,595
			3,798						*1,164*	*1,619*								*6,581*
	5.	Public corporations	445						15	80								540
			445						*15*	*80*								*540*
	6.	General government	7,488		7,420	1,131	610		203	176								17,028
			7,487		*7,422*	*1,131*	*610*		*203*	*176*								*17,029*
	7.	Rest of the world		−179	416	458		554										1,249
				−195	*415*	*458*		*554*										*1,232*
	D.	Dividends and interest n.e.s.			761	3,306	120	1,552										5,739
					761	*3,306*	*120*	*1,552*										*5,739*
Capital transactions	8.	Persons	812		1,637									186				2,635
			804		*1,522*									*186*				*2,512*
	9.	Companies	1,553			1,665								606				3,824
			1,532			*1,651*								*606*				*3,789*
	10.	Public corporations	1,024				−190				6	14		50				904
			1,024				*−190*				*6*	*14*		*50*				*904*
	11.	General government	496					2,988			577	48	0					4,109
			496					*2,988*			*577*	*48*	*0*					*4,109*
	12.	Rest of the world							−471					0				−471
									−491					*0*				*−491*
	13.	Net acquisitions of fin. assets									1,810	−1,407	−514	975	−864			0
											613	*−593*	*−510*	*981*	*−491*			*0*
	E.	Errors	−350								−1,055	1,002	4	6	393			0
			0								0	0	0	0	0			0
		Totals	56,503	9,930	39,467	6,595	540	17,028	1,249	5,739	2,635	3,824	904	4,109	−471	0	0	
			56,738	*9,922*	*39,406*	*6,581*	*540*	*17,029*	*1,232*	*5,739*	*2,512*	*3,789*	*904*	*4,109*	*−491*	*0*	*0*	

Note. The noughts in cells 11.10 and 12.11 refer respectively to net capital transfers to general government from public corporations and net capital transfers abroad from general government. In 1969 these items happened to be zero but this is not always the case.

accounts; the lower row is composed of zeros. This is a step in the right direction. But consistent estimates are not necessarily accurate estimates. Accuracy depends on the correctness of the variance matrix, the importance of systematic errors, which could be allowed for but are not in the above example, and experience, which may bring out unforeseen difficulties.

6. *Regional Accounts*

The accounting system I am describing is usually applied to individual countries, but with some elaboration it could be applied to the regions of a country or to the regions of the world. Whichever way we go, new problems arise. I shall mention some of these but not discuss them in detail.

If we consider the regions of a country, there is first the definition of the regions to be decided on; then it must be recognised that some transactors, such as the central government, have no obvious regional location; and, again, information on many interregional flows is not generally available and may be costly to collect. In spite of this a number of countries have succeeded in constructing regional accounts. Indeed, regional accounting was one of the topics considered when the 1968 revision of the SNA was being discussed, but with the many other more pressing extensions to be carried out this one was left over for the future.

If we try to integrate the accounts for individual countries into an accounting framework for a region of the world, say Europe, or for the whole world, we come up against the problem of national diversity. First, the statistics of different countries do not form a coherent system: thus, the exports from country A to country B as recorded by A may not agree with the imports of B from A as recorded by B, even when adjusted for differences in valuation. Second, it is necessary to find a common unit of account; crude results can be obtained by using exchange rates to convert all national currencies to a single one, but exchange rates do not necessarily reflect purchasing power. What is required are the methods of comparing currencies pioneered by Colin Clark in *The Conditions of Economic Progress* [6], which find their latest expression in the UN's *International Comparison Project* [13]. Third, different countries use different accounting systems. Most market economies use systems sufficiently close to the SNA to make harmonisation fairly easy, but for a world picture it would be necessary to relate these accounts to those of the centrally planned economies, which make use of the alternative System of Material Product Balances (MPS) going back to Marx and based on Adam Smith's restricted concept of production. The connections between the two systems have been studied by the Conference of European Statisticians in Geneva and, as I tried to show in 'A comparison of the SNA and the MPS' [19], it is possible to construct an enlarged system from which either of the two can be obtained by an appropriate grouping of the entries. To do this, however, rather more information is needed than is normally provided in either system. In a co-operative world this information would not be difficult to obtain, so in the end we may hope to see accounts for the world economy drawn up on common principles.

7. *Demographic Accounts*

I shall now leave the economic accounts and turn to demographic accounts. Demographic accounts, like any other type of account, are based on the equality of inflows and outflows over a period of time. In the demographic case the inflows and outflows are composed of human beings who in a given period enter or leave a country. These human flows move in two dimensions, time and space. Thus, for any country, this year's population flows in partly along time from last year, through survival, and partly along space from the outside world, through birth and immigration; and flows out partly along space into the outside world, through death and emigration, and partly along time into next year, through survival.

The survivors from the preceding period constitute the opening stock of population and the survivors into the succeeding period constitute the closing stock. In any period, the equality of inflows and outflows implies that the difference between the opening and the closing stocks is equal to the net inflow from the outside world.

The first step in the construction of a system of demographic accounts is to divide the population into age-groups and, within each age-group, into categories reflecting any characteristic we may be interested in: activity, socioeconomic position, health, and so on. Once the data have been organised within a taxonomic framework they can be presented as entries in an account, showing on one side in what formation each age-group enters the period, and on the other how it redistributes itself among the various categories before leaving the period. The accounting identities connecting flows and stocks will ensure that the same number of people will flow out of a category as have flowed into it.

The interaction of different classifications forms a number of composite categories, of 'states', which enable us to subdivide the population into clearly differentiated groups. Thus if our primary classification is by age, our secondary classification by centre of activity and our third by occupation, examples of states are: being aged 17, attending grammar school and preparing for advanced-level examinations; or being aged 30, employed in a brick factory and working as a clerk.

In a system as complex as the one we are dealing with, even a relatively modest degree of cross-classification can lead to an immense amount of statistical detail which will be very hard to handle unless we find some means of keeping it under control. This can be achieved by devising a comparatively simple set of basic data, which might be thought of as the master set, supported by a number of subsidiary sets linked to each other and to the master set by the conceptual framework. These subsidiary sets can take the form of 'life sequences', each sequence reflecting a particular dimension of life and requiring only a limited number of classifications for its description. At the same time, each sequence must be so conceived as to be demographically self-contained, that is, to be capable of including the whole population.

In the present state of statistical information the sequence which is most amenable to an accounting treatment is that which I have called the 'active' sequence, in which people first learn, then earn and finally retire. In this sequence the population can be divided into three main groups: schoolchildren and students, members of the labour force, and the rest. This third group contains all the educationally and economically inactive: babies, housewives, the idle rich, the idle poor, chronic invalids and old-age pensioners. None of these people, except perhaps the very young, the very sick and the very old, can really be said to be inactive; but their activities cannot formally be listed under the headings of learning or earning.

While flowing through their active sequence, individuals

also flow through a 'passive' sequence, in the sense of a succession of socio-economic groupings to which they belong at different times in their life; some of the classifications appropriate to this sequence are family size, social class, income group, place of residence, race, religion. Another important sequence is the medical sequence, in which the population is classified in terms of physical and mental characteristics. Yet another is the sequence of delinquency, in which the classifications can range from shop-lifting to murder.

Having found a practical means of representing each sequence separately, it then becomes possible to introduce a certain amount of interaction between the different sequences. For instance, at the educational stage, family background is an important determinant of educational aspirations and achievement; at this stage of the active sequence, therefore, it is desirable that some of the classifications of the passive sequence should interact with those of the active sequence.

Let us consider a simple example in which the population of our country is classified by age and occupation. There are two categories in each class: age is divided into 0–15 and 16+; and occupation is divided into attending school and all other. Each year individuals can enter a state in several ways: by survival in that same state from last year, by moving into it from a different state in the course of the year, by birth or by immigration; and they may leave it by survival into the next year, by moving into another state during the year, by emigration or by death. We can represent this system by a set of five accounts analogous to the four economic accounts given in table 4. This is done in table 8.

In this table I have set out the accounts for the four socio-demographic states distinguished in the system and for what I have called 'the outside world', a term which must be interpreted very widely as it includes (a) all countries other than ours, (b) last year and next year, and (c) the great unknown. As in table 4, each entry appears twice, once as an inflow and once as an outflow, and the contra-entries are indicated by the numbers in brackets. The last account brings together all the entries that do not constitute interstate flows and corresponds to the account for the rest of the world in table 4. Thus table 8 represents a closed system of balancing accounts just as table 4 did.

By way of introduction to what may seem very unfamiliar concepts I shall give a detailed explanation of the contents of the first panel. This panel relates to children aged from 0

Table 8. The demographic accounts of our country in year ϑ classified by age and occupation (thousands)

Inflows		Outflows	
State (i). Age-group 0–15 not at school			
1. Survivors from last year (opening stock) (34)	2,125	5. Deaths (29)	3
2. Births surviving into next year (32)	435	6. School entrants (11)	396
3. Immigrants (net) (33)	1	7. Movers to age 16 not at school (23)	140
4. School leavers (13)	122	8. Survivors into next year (closing stock) (30)	2,144
Total	2,683	Total	2,683
State (ii). Age-group 0–15 at school			
9. Survivors from last year (opening stock) (34)	3,798	12. Deaths (29)	2
10. Immigrants (net) (33)	−5	13. School leavers (4)	122
11. School entrants (6)	396	14. Movers to age 16 at school (18)	106
		15. Movers to age 16 not at school (24)	115
		16. Survivors into next year (closing stock) (30)	3,844
Total	4,189	Total	4,189
State (iii). Age-group 16+ at school			
17. Survivors from last year (opening stock) (34)	198	19. School leavers (25)	107
18. Entrants from age 15 at school (14)	106	20. Survivors into next year (closing stock) (30)	197
Total	304	Total	304
State (iv). Age-group 16+ not at school			
21. Survivors from last year (opening stock) (34)	17,020	26. Deaths (29)	269
22. Immigrants (net) (33)	20	27. Survivors into next year (closing stock) (30)	17,133
23. Entrants from age 15 not at school (7)	140		
24. Entrants from age 15 at school (15)	115		
25. School leavers (19)	107		
Total	17,402	Total	17,402
The outside world			
28. Deaths: infants (31)	8	31. Births: infant deaths (28)	8
29. Deaths: all others (5+12+26)	274	32. Births: surviving (2)	435
30. Survivors into next year (our country's closing stock) (8+16+20+27)	23,318	33. Immigrants (net) into our country (3+10+22)	16
		34. Survivors from last year (our country's opening stock) (1+9+17+21)	23,141
Total	23,600	Total	23,600

to 15 who are not at school. The great majority are little ones who have not yet started school. At the other end there are boys and girls who have left school on reaching the school-leaving age and many of whom may already be in employment. In between there is a small number of children who do not go to school either because they are being educated at home or because of some physical handicap.

On the left side of the account the first entry shows the stock of children not at school present in our country at the beginning of the year, amounting to 2125; these flow in through time from last year. The second entry shows the babies born this year who survive to the end of the year, amounting to 435; these flow in from the great unknown. The third entry shows the net immigrants of the year, amounting to 1; these flow in through space from other countries. Immigrations are shown net of emigrations. The contra-entries for items 1, 2 and 3 all appear as outflows from the outside world in the last panel at the bottom of the table. The fourth entry, 122, shows the children who leave school in the course of the year; these flow in from state (ii) and the contra-entry appears as one of the outflows in the second panel.

On the right side of the account the fifth entry, 3, shows those who die and thus flow out to the great unknown; the contra-entry appears as an inflow in the last panel. The sixth entry, 396, shows the children who enter school for the first time and thus flow out to state (ii); the contra-entry appears as an inflow in the second panel. The seventh entry, 140, shows the 15-year-olds who become 16 in the course of the year and thus flow out to state (iv); the contra-entry appears as an inflow in the fourth panel. Finally, the eighth entry, 2144, shows the children who survive to the end of the year and flow out into next year without changing state; the contra-entry appears as an inflow in the fifth panel.

The remaining panels are to be interpreted in the same way. The only anomaly is the entry of 8 which appears on both sides in the panel for the outside world: this represents those who enter and leave our country within the year, mainly babies born in the year who die before the end of it.

The data in table 8 can be used to construct a dynamic matrix which shows how the opening and closing stocks of population in each state are connected to one another by the movements occurring during the period. This is done in table 9.

It is convenient to begin an explanation of table 9 with the column and row for state (i). In the column we see that at the beginning of the year the opening stock of children aged 0 to 15 who were not at school was 2125. Of these, 3 died in the course of the year; 1586 remained in state (i) throughout the year, though of course growing a year older; 396 entered school and thus moved to state (ii); and 140, who had entered the year aged 15, became 16 in the course of it and thus moved to state (iv). In the row we see that at the end of the year the stock in state (i) is 2144 and is composed of: the surviving births and net immigrations of the year, $(435 + 1) \mp 436$; the children who have not changed state, 1586; and the children who, though remaining in the same age-group, have left school in the course of the year, 122. A similar statement can be made for each of the other columns and rows for our country.

If we divide the numbers in a column for our country by the column total we obtain the proportions in which individuals in the state specified at the head of the column stay where they are or move to other states in the course of the year. This matrix of transition coefficients is formally similar to a matrix of input-output coefficients in economics.

If the transition matrix contains a fine classification by age or can be reduced to what would have been observed had the population been in stationary equilibrium, and if the proportions can be interpreted as probabilities, then the Leontief inverse of this matrix can be considered as the fundamental matrix of an absorbing Markov chain. After an adjustment of the entries to allow for the fact that people may die at any time rather than always at the end of an interval, this fundamental matrix can be related to the lifetable, which plays such an important role in demography. The entries in the matrix represent times and each column total represents the life expectancy of an individual entering the state specified at the head of the column. In the body of the matrix this total is divided into time spent on average in each state from the one just entered to the end of life. Thus if in the demographic matrix we distinguished one or more states relating to, say, childhood, school days, further education, employment and retirement, we could divide the life-expectancy at any stage in this progression into times spent on average in the different states.

The same method can be used in innumerable other applications such as regional migration, changes of marital status, forms of tenancy, and so on. Although a classification by age is highly desirable, it is not essential. If it is absent, however, the problem arises of adjusting the observations to approximate the conditions of a stationary population. The method can also be applied to a vintage, that is all the people born in a particular year, and in this case it is useful to have longitudinal data which make it possible to trace a given sample of individuals in their progression through life.

The statistical problems encountered in constructing socio-demographic matrices are, *mutatis mutandis*, similar to those encountered in constructing economic matrices. There is first the assembly of the available information and the building up of initial estimates; and then the use of an

Table 9. A socio-demographic matrix for our country in year ϑ based on table 8 (thousands)

			Our country				
		Outside world: births and net immigrations	Ages 0–15 Not at school (i)	Ages 0–15 At school (ii)	Ages 16+ At school (iii)	Ages 16+ Not at school (iv)	Closing stocks
Outside world: deaths		8	3	2	0	269	23,318
Our country	(i) Ages 0–15 not at school	436	1,586	122			2,144
	(ii) Ages 0–15 at school	−5	396	3,753			3,844
	(iii) Ages 16+ at school	0	0	106	91	0	197
	(iv) Ages 16+ not at school	20	140	115	107	16,751	17,133
Opening stocks		23,141	2,125	3,798	198	17,020	

adjustment procedure to fill in gaps and obtain the consistency desirable in final estimates. In both the economic and the demographic case it is likely that coefficients will change over time and allowance must be made for this in building models for forecasting.

There is much more I could say about demographic accounting but this is not the place for it. Anyone interested in pursuing the subject will find a full discussion in the reports I wrote for the OECD and the UN, which were published in 1971 and 1975 respectively [20, 27].

8. *Concluding Remarks*

Environmental issues, such as pollution, land use and non-renewable resources, offer plenty of scope for accounting. But I have one little work in this area and so I shall do no more than mention what I called at the beginning of my lecture the third pillar on which the study of society should rest.

I should also have liked to say something about model-building in the economic and social fields, but I felt that this subject lay outside my brief. In any case my time is coming to an end and so with my warmest thanks to the Nobel Foundation for the great honour they have done me in inviting me to give this lecture and to you for listening to me so patiently, I shall come to a full stop.

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