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The quantitative aspect of a development plan: the macrophase

1 Planning in stages

The biggest task in development planning is that of presenting quantitavely the most desirable economic and social development. This statistical survey is needed because very many of the decisions that have to be taken are of a quantitative nature and also because a development policy always has to be based on verifiable figures. Any proposed development will to a very great extent be concerned with production, investments, educational processes, imports and exports and budgetary items, and all of these are expressed in figures. But there are always, of course, many qualitative aspects, distinctions which have to be made according to the kinds of commodity, the types of school, the level of the pupils and so on, and these form a background to the quantitative aspect of planning. This means that it is virtually impossible to deal exclusively with the quantitative aspect of this subject in the chapters that follow – even if a rigid distinction between the quantitative and qualitative aspects could be made.

I have already indicated that development planning has become sufficiently complicated for it to be divided into several stages. The precise division of the plan into stages will depend on the size and diversity of the national economy in question, on the training of the staff available to the planning organisation and on the personal preferences of the leading members of this staff. The choice of method will be determined not only by the capabilities of the staff but also by the possibilities of making clear to outsiders what decisions have to be taken. The 'outsiders' here are those who are more directly concerned with the economic development of the country – members of the government, high ranking officials, leaders of industry, party leaders, workers' representatives, employees, farmers, and educationists in the widest sense of the word.

In this book I propose to deal with the three main stages in planning, to which I shall refer by the names macrophase, middle phase and microphase. Subdivision of the country into sectors, or industries in the widest sense, and into geographical regions is introduced in the middle phase of planning. Both these subdivisions are considered in greater detail in the microphase. The whole picture is thus refined in two dimensions. It is, moreover, a feature of planning in stages that the results of a later stage may well lead to a revision of an earlier stage, and that the number of steps in the planning process is consequently often greater than the number of stages envisaged in the first place. The macrophase has to show the most desirable development in macro-economic terms, without subdivision into regions or industries. In this phase, then, only such overall figures are used as the national product and capital, the total investments, imports and exports and state expenditure. In the middle phase, the picture resulting from the macrophase is made clearer by distinguishing a number of sectors or industries and a number of regions. Finally, in the microphase, an even clearer and more detailed picture is obtained by dealing with separate projects and even smaller geographical regions, perhaps even separate rural and urban districts.

2 The macrophase: the theoretical approach

The problem of non-homogeneity in production is disregarded in the macrophase. This allows the planners to give their full attention to what may well be called the most fundamental aspects of the whole development process. The most essential features of this process are the expansion of production, the increase and improvement of capital goods, including land, and the education and training of men as producers, both of which are necessary if production is to be expanded. Both the extension and increase of the quantity of capital stock and the education and training of personnel are investments. In terms of financial effort, an extension of capital goods is a more important sacrifice than the training of men. That is why we have used the word investment in this wider sense. It is, moreover, a feature of all investments, including that of the training of personnel, that they take a certain time to mature. This time is usually referred to as the gestation period. The fundamental question may now be expressed in the following way. Given 1 the laws of production, 2 the scale of preferences within the population for various levels of consumption and for postponement of consumption, 3 the growth of the population and 4 the initial capital stock, how much must be invested annually in order to obtain maximum satisfaction (or value) from all future consumption? Put in simpler language, the problem is this. The more there is invested at any given moment, the less consumption and consequently the less satisfaction there is at that moment, but the more there will be in the future.

A great deal of attention has been given to this problem in recent years. What has emerged above all is that it cannot be solved in all circumstances. Study of the problem has also revealed that it is in general so difficult that a solution in explicit form can only be found if a number of simplifying assumptions are made. If these assumptions are to be of any practical value, they must be realistic. But this brings us face to face with the further difficulty that our knowledge of the laws of production is very limited and subject to constant change. We know even less about the human scales of values and preferences.

Among the simplifications that have so far been scientifically applied with some success can be counted a series of assumptions which may be termed the assumptions of a long-existing development. They include, for example, a constant growth of population, a constant investment quota (in other words, a constant relationship between investment and national product), a constant discount for the deferment of consumption, a constant technical development and the existence of a certain kind of simple law of production, the so-called Cobb-Douglas function. There are also other possible assumptions of a rather more general nature. [15] If these conditions obtain, it can be proved that the proportion of national income to be invested should be less than the proportion of national income paid to the holders of capital. Various econometricians have calculated this at approximately one-quarter. The higher the discount for the deferment of consumption, the lower the proportion of the national income that has to be invested.

The chief objection to these assumptions is that they cannot be applied so well to national economies which are only just beginning to develop. There is considerable variation in the results obtained from the more general assumptions, dependent on the nature of the assumption made. For this reason, it is at present still difficult to find a growth-rate with a theoretical basis.

3 The macrophase: the practical approach from the capital-output ratio

Any attempt to solve the main problem raised in the macrophase has therefore to be made in a rather rougher and more intuitive way. The usual starting-point is a given capital-output ratio, in other words, a given relationship between the investments that are to be made and the annual income resulting from these investments. This income will be for the entire population and will therefore include not only profits and interest but also wages and salaries paid. The size of the ratio for the whole of a country is often in the region of four, although quite important variations do sometimes occur. Strictly speaking, the figure four represents a period of time, namely, a period of four years. If, on the other hand, the year is not taken as the unit of time for the determination of the income expected from investments, but a period of, for example, five years, then the ratio will not be given by the figure four, but by the figure 0·8. This is because in five years, an income that is five times as big will be obtained, and the ratio between investment and income will be one-fifth the size. For this reason, the capital-output ratio is said to have a time dimension. This is expressed better in the term used in the communist countries for what is practically the same concept – recoupment period.

This ratio is not very stable, but it is sufficiently stable for it to be used as a first approximation. The variations that have been noted in various countries are illustrated in several of the data that follow. These data also show that the level depends on the way in which the investments and the income resulting from these investments are measured. This can be calculated either gross or net (after deducting depreciation). A distinction can also be made between the income (or the investment) that are formed or which take place (known as national) in the country, or which are enjoyed or financed (known as domestic) by the inhabitants of the country itself. This can make a considerable difference in the case of countries that receive important amounts of foreign investment. Finally, a distinction is also made between the average and the marginal capital-output ratio. The average capital-output ratio refers to everything that has been invested in the past and to the whole income. The marginal ratio refers to all that has been added in a recent period to the capital or income. Marginal ratios are shown in table 4 (page 80) (see also appendix D). Table 5 shows the development in time of the capital-output ratio for certain countries.

The most important reason why the capital-output ratio is fairly stable is that the relative shares in the total national product of industries showing very high or very low ratios do not vary much. I shall deal more fully with this in chapter 7, section 2.

4 The macrophase: the practical approach and alternative growth-rates

An attempt is made in the macrophase to deal with the problem of the optimum growth-rate in the following way. Various alternative growth-rates are put forward, together with the necessary investment, so that the government can choose the most attractive of these alternatives. It is obvious that the advantage of quicker growth in the future is balanced by the disadvantage of more investment and less consumption in the present and the immediate future. The possibility of obtaining foreign aid or foreign investment will also play a part in this choice. A concrete example should make this clear. Let the percentage of the national income saved in the current year preceding the period covered by the plan equal 8,

Table 4. Marginal capital-output ratios for certain countries.

Country	Period	GDI/GDP	GNI/GNP	NDI/NDP	NNI/NNP
United Kingdom	1952–8	6·2	6·6	3·2	3·6
West Germany	1952–8	3·4	3·9	2·3	2·9
Denmark	1952–8	6·4	6·7	4·6	4·9
Sweden	1952–8	6·1	6·1	4·0	3·9
Australia	1952–8	7·3	7·0	6·0	5·7
Japan	1952–8	4·2	4·3	3·6	3·7
Norway	1949–56	8·5	7·8	6·5	5·8
Italy	1949–56	3·2	2·8	2·1	1·6
Canada	1946–55	6·0	5·9	3·5	3·3
United States	1939/48–48/57	5·1	5·2	2·0	2·1
Argentine	1930/9–1955	7·6	7·2	2·7	2·3
Union of South Africa	1944/8–1954/8	5·3	4·3	4·5	3·3

GDI = gross domestic investment
GNI = gross national investment
NDI = net domestic investment
NNI = net national investment

GDP = gross domestic product
GNP = gross national product
NDP = net domestic product
NNP = net national product

Source: S. Kuznets, 'Quantitative Aspect of the Economic Growth of Nations', *Economic Development and Cultural Change*, Chicago, Vol. IX, No. 4 (July 1961).

Table 5. Development in time of the capital-output ratio for certain countries.

	1903	1915	1929	1947	1956	Authors
United States	3·0	3·1	3·1	2·4	2·7	Garland and Goldsmith
Australia	4·4	4·1	4·0	3·0	3·3	
		1913	1929	1948	1955	
West Germany		3·5	3·9	3·1	2·2	Grünig
	1905		1924	1935		
Japan	3·1		4·0	3·7		
		1918		1937	1955	
Union of South Africa		3·5		3·0	2·6	Franzsen & Willers

Source: Reports made by the relevant authors at the 5th Conference of the International Association for Research in Income and Wealth, 1957.

and the amount of foreign aid (and investment) come to 4 per cent of the national income. At a capital-output ratio of four years, these investments, amounting to 12 per cent of the national income, result in an increase of 3 per cent in national product. If there is no change in the amount of foreign aid and investment, every increase in domestic savings by 4 per cent of the national income will lead to a further increase of 1 per cent in the growth-rate of the national product. This will result in the alternatives shown in table 6 on page 82.

Table 6. Alternative growth rates and the percentage of savings in the national income necessary for this growth-rate at a given foreign aid of 4 per cent of the national income and a capital output ratio of four years.

Growth-rate	Total investment	Domestic savings
3	12	8
4	16	12
5	20	16
6	24	20

As I have already indicated, the government will have to bear in mind, in choosing between these alternatives, the fact that a higher rate of growth in the more distant future will place the country in a much more favourable economic position, but that this will demand greater sacrifices initially in the form of greater savings and consequently less consumption. The choice will be made intuitively.

These alternatives can be made clearer if the growth-rates obtaining at each period are used to calculate the trend during the period of the most important variables – the national income, investment and consumption. If this course is followed, it is advisable also to take into account the fact that a certain gestation period will have to elapse before higher investment can lead to higher national product.

Let us assume that this period amounts to two years. This means that, despite an increase in savings, the national income will continue to increase at the old rate (of 3 per cent) for the first two years, and only after the first two years at the new rate. Table 7 shows how the national income, investment, savings and consumption can increase in this way over the first five years.

Table 7. National income (Y), investment (I), savings (S) and consumption (C) for the years 0–5, with investment at 12 per cent in the base year 0 and at 12 per cent and 20 per cent in the planning years 1–5 (foreign aid being 4 per cent of national income).

	Y	I	S	C
Year	Investment at 12 per cent during the planning period			
0	100	12	8	92
1	103·0	12·4	8·3	94·8
2	106·1	12·7	8·5	97·6
3	109·2	13·1	8·7	100·5
4	112·5	13·5	9·0	103·5
5	115·9	13·9	9·2	106·7
	Investment at 20 per cent during the planning period			
0	100	12	8	92
1	103·0	20·6	16·5	86·5
2	106·1	21·2	17·0	89·1
3	111·3	22·3	17·9	93·5
4	116·9	23·4	18·7	98·2
5	122·7	24·5	19·6	103·1

It is clear from the last table that by year 5 consumption has still not reached the level that it should have reached if the existing quota of investment were continued, but that it does increase by 5 per cent per year and will thus, shortly after year 5, exceed the level that would otherwise have been attained. The production figure from year 3 onwards is certainly higher, but, of this higher figure, a smaller percentage, namely 84 per cent, is consumed, as against 92 per cent in the earlier years.

The picture will be more favourable to higher growth-rates if the capital-output ratio is lower, the investment period shorter or the amount of foreign aid higher, dependent on the rate of growth that is chosen. In any concrete case, of course, the model that is chosen must be as realistic as possible. The value of the capital-output ratio will not have to deviate too much from the value found in the past, but it will be influenced by the choice of those industries which are to be developed most. This question will be considered in greater detail in the following chapter.

It should also be borne in mind that, in addition to capital, there will also be a need for trained and well qualified personnel. This will mean a corresponding expansion in various types of education (see chapter 8). Initially, this too will have to be regarded as an investment. The financial sacrifices required to provide for this educational expansion may be included in the investment, and the capital-output ratio will be correspondingly higher. The total expenditure on education in a number of countries amounts to about 20 to 30 per cent of their investment in the narrower sense the word. Not all educational costs, however, need to be increased in proportion to investment. An increase of approximately 0·5 to 1 in the capital-output ratio may, however, be necessary. My choice of the figure 4 was partly based on this.

The level of this ratio is also influenced, as I have already observed, by the financial form of the foreign aid. If this financial aid from abroad is in the form of loans, then the interest payments are deducted from the national income.

In the present state of economics, a choice of the rate of development will mark the end of the macrophase of planning. This means that a table of the same type as of table 7 is chosen as the macro-economic framework within which further items are set out in detail. The lower half of table 7 may serve as an example of this. In some cases, a higher rate of development may be advisable, depending on the circumstances and the prospects. In the United Arab Republic, Turkey and Venezuela, for example, a rate of 7 per cent or more has in fact been chosen.

Among the most important considerations in deciding the rate of development are those of providing opportunities for employment and of narrowing the gap in prosperity between the country concerned and the developed countries. The anticipated growth of the population plays a very important part in the provision of employment and in reducing the gap in prosperity. In a number of developing countries, the population is increasing by 3 per cent per year and, even in those countries where every attempt is being made to encourage family planning, the effects of this policy will not be noticeable for some time. What is more, the sector of the population available for employment is that of about twelve years of age or more, and changes in birth rates can only influence this sector after twelve years.

A swift rise in the rate of production will have a direct effect on the provision of employment. Prosperity can best be measured by the income per head of the population. If a rapid increase is desired in incomes per head, production will also have to be increased even more rapidly in the case of a country with a high population growth, even though this increase in production is in the early stages partly absorbed in higher investment.

5 An extension of the macro-economic picture

The macro-economic picture shown in table 7 can be extended in various ways. It will, for example, be clear from what has been said in the preceding section that it is important to add the population figures and the consumption per head of population to this picture.

The population figures are provided by demographic forecasting, which can generally speaking be regarded as an activity that is not dependent on economic planning and is carried out by specialists in the demographic field. If so desired, such details can be provided as the difference in growth-rate between the total population and that part of it capable of working though this will not normally be required. There are, however, certain situations in which it may be necessary.

The macro-economic picture can be further extended by showing foreign trade and the balance of payments. The most reliable figures are based on estimates of anticipated imports in the absence of important structural changes. It is often sufficient here to divide imports into several broad categories, such as consumer goods, capital goods and raw materials (including semi-finished articles). For a first approximation, it may be assumed that the imports of finished consumer goods are dependent on total consumption, those of capital goods on total investment, and those of raw materials and semi-finished articles on total production. An attempt can be made to assess each of these relationships by using statistical material from the past. The simplest method is to prepare a graph, with the variable to be explained shown on the vertical axis and the explanatory variable on the horizontal. If, on a graph of this kind, a number of points are obtained which can be joined by a line or curve, this can be used to estimate future values of the explanatory variable in the category of imports dealt with.

It is more difficult to estimate future exports. In the case of traditional exports, it may be assumed that future development in the exports of such products will be parallel to the world demand for them. This will depend mainly on the development in income in the principal countries importing these goods. It is sometimes possible to obtain plans or forecasts for these countries, from which an estimate can be made of their development in income.

As for those goods which have not been previously exported by the country in question, it is the development of the productive capacity of these goods, in other words, the supply, that will give the lead. This means, however, that a study will have to be made of this development in separate sectors. This will be discussed more fully later. It will, however, be clear that it is for this reason difficult to make a macro-economic valuation of exports in the very long term.

The estimates of the balance of payments will be completed by making an estimate of the balance of invisibles and of the capital items. Circumstances will, to a very great extent, determine what can be done here. It can sometimes be assumed that possible payments of freight charges run parallel to imports and exports. In addition, there will be certain interest payments to be made in connection with foreign liabilities and repayments of similar debts under the capital items. These two items are of great importance in the case of certain developing countries.

Finally the macro-economic picture can be extended still further by the inclusion of estimates of the public finances. At this stage, it will of course be necessary to make a number of fairly general assumptions. As far as expenditure is concerned, it is possible to distinguish between expenditure on investment, including education, transfers of income, such as social expenditure, and the current expenses of the government machinery. In the case of the latter, expenditure in connection with the armed forces can be considered separately. Even if no structural changes are contemplated in the function of the state machinery, expenditure on investment should develop at a parallel rate to total investment, and the current expenses of the government should develop at a rate parallel to the total national income. 'Parallel' in this context does not, however, have to mean 'proportionate'. It is possible to find, from graphs showing the explanatory variables and the variables to be explained, a relationship in the past that does not necessarily have to be a proportionate relationship or ratio. The development of social expenditure in particular and also of the government's expenses will, moreover, also be dependent on possible changes in economic and social policy, and will therefore have to be scrutinised more closely at a later stage (see chapter 8).

It is possible to assume a connection between social expenditure and the national income in order to obtain a provisional survey of the situation, but it will be obvious that this can be only a very rough approximation.

As for revenue, taxes and other sources of revenue can be subdivided according to various types, and in each of these categories it is possible to establish which macro-economic variable will determine the return and to what extent. Taxes on consumer goods will be regarded as being connected with consumption. If so desired, various categories of rates can also be distinguished, but if this is done, it will also be necessary to subdivide consumption. This question will be discussed in chapter 7. Income tax and profits tax often have a progressive character, and it will be necessary here to make certain general assumptions about the distribution of incomes. The simplest of these assumptions is that the ratio between the higher and the lower incomes per head does not change and that all incomes consequently rise proportionately. As a result of this progressive rate, the ratio of taxation to income will rise automatically.

Finally, the national debt will have to be paid off with interest, and the exact amounts of these payments will be known in the case of loans effected in the past. It is possible to make a general assumption about the future, namely that the debt will probably continue to rise in proportion to the investments.