

Physical Planning

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INDIVISIBILITY OF THE PRODUCTION PROCESS
AND "ECONOMIES OF SCALE"

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"The indivisibility of production processes means that in practice, below a certain volume of output, it is impossible to carry out certain types of production or to follow certain production techniques. From the point of view which we are considering, this impossibility is extremely important. In fact if this impossibility did not exist, the problem of the effect of population settlement on development would be posed in very different terms, and probably the increase in the population of a territory would even appear to have mainly adverse consequences on the possibilities of increasing (in the long term and in the short term) the level of living of the population of that territory. This point merits consideration for a moment.

Assuming no indivisibility of production processes and no "economies of scale" resulting from the increasing population, the pattern of development of a given territory is roughly as follows:

At any given time, this territory is occupied by a certain population, which has available for production a stock of capital, which enables it to achieve a given level of technology, and to develop certain

natural resources ⁽¹⁾. On that basis, this population has a certain aggregate national income and a certain per capita national income and, bearing in mind its social structure and its needs, it produces a certain surplus, part of which is available for investment.

If we assume that this population is stationary, the surplus available for investment during each period will be placed exclusively at the disposal of the existing working population, and will consequently increase the amount of capital per worker in the proportion, for example, of 10 percent per year, which will be reflected in a given growth of the labour productivity of this population, and, hence, of its level of living.

On the other hand, if the population is increasing at a certain rate, a portion of the accumulation no longer goes towards increasing productivity, but is used to provide the additional working population with means of production similar to those available to the already existing population. Consequently, there is a certain ratio between the rate of growth of the population and the rate of accumulation at which productivity can no longer increase, and beyond which there would be a reduction in the average level of living as compared to the level which would obtain if there had been no increase in population.

In other words, on this assumption, the increase in the population of a territory would have adverse effects on the growth in the level of living.

If this does not in fact occur, it is mainly because there is an indivisibility in certain production processes and there are "economies of scale".

(1) When we speak of the volume of investment made possible by a certain size of population, we must always specify that this volume of investment is related not only to a certain population size, but also to a given level of productivity which may be achieved by that population.

It is practically impossible to develop certain natural resources (mines, hydro-electric resources, or to open up inland territory in an underpopulated country which requires for its development a vast effort of clearance, etc.) and consequently, to raise the average labour productivity, unless the population is sufficiently large to be able to dominate these resources physically, and to enable them to be used under economic conditions, bearing in mind the requirements of technology.

What we must bear in mind, is that although, owing to the indivisibility of production processes, the increase in the population of a given territory can, under certain conditions, enable a larger population to live better in that territory than a smaller population, it remains true that the raising of the level of living which an increase in population allows, only becomes apparent after a certain time. On the other hand, in an interim period, the fact that the population of a territory is increasing, has immediate negative consequences on the raising of the average level of living of the population, for the reasons indicated above; that is to say that, on the average, each individual making up a working population which is more numerous than it would be in the absence of an increase in population, has less equipment available, and hence, less efficient equipment, than in the assumption of no increase in population.

The problem which arises here is similar to that which arises with regard to an investment effort. Just as an increase in the investment effort reduces for some-time the immediate possibilities of increasing the level of living, but affords on the other hand greater possibilities of raising the level of living later on, so the increase in the population of a given territory, while ultimately enabling the level of living to be greater than it would have been if the population had not increased, requires, in the interim period, the acceptance of a lower level of living than if there had been no increase in population. Hence, in all the long-term models concerning the effect of population on development, we ought to bear in mind the phenomenon which has just been pointed out, and in fact the analyst ought to concentrate his attention on it.

To go back to the problems of the indivisibility of production processes, and to highlight their nature more effectively, we should also note the following point :

The indivisible nature of production processes means, on the one hand, that some types of production cannot be undertaken below a minimum size of production unit, this size being itself dependent on the presence of a minimum number of workers. Indivisibility has yet another aspect, which is that the minimum size for a production unit itself depends on a minimum volume of investment. In a given country (if we leave aside for the moment the possibility of a foreign loan), a particular volume of investment can only come, under given social and technical preconditions, from a given size of population. In other words, from the point of view of investment, certain possibilities are excluded so long as the population has not reached a certain size.

It may be objected that the above observations, concerning the possible effect of an increase in the population of a territory on the level of living which the population of that territory might attain at the end of a more or less long period of time, do not take into account the possibility of resorting to the international division of labour.

It may be said that it is always possible for a given population to concentrate its labour on those activities which, in the given population conditions, are the most productive ones, and to procure the products of other activities through international trade. By so doing, that territory would be benefiting, without any immigration, from the "economies of scale" while at the same time ensuring a larger amount of capital equipment per worker.

For example, if the population of a territory is insufficient for it to be able to develop mining deposits and waterfalls, and if it has to concentrate its activity on agriculture, it may be said that this population can export agricultural produce, and that it will be able gradually to raise the technical level of its agriculture by importing capital equipment,

fertilizers and power supplies (all these being products, which it is assumed, the population cannot provide on the spot because it is too small). It may also be imagined that, little by little, when the level of productivity of agriculture has grown sufficiently (through the accumulation achieved and through the resulting rise in the technological level), it would ultimately be possible for the agricultural population to be reduced, and thus for enough people to be released to carry out an industrial activity (but this does not at first sight seem to be necessarily advantageous).

The substance of the preceding objection consists therefore in saying that, even when there is an indivisibility of the production processes, it does not necessarily follow that a given territory needs to increase its population, since that territory can always obtain from abroad the commodities which it is unable (owing to its small population) to supply economically itself. Underlying this objection we find one of the two following assumptions:

Either: 1) with a given amount of capital equipment (i. e. representing a certain sum of capital or a certain number of crystallized labour-hours) a man supplies in one hour or in one year an equal value of output (or roughly equal) whatever his field of activity.

Or : 2) Even if the value supplied per worker in the activities available to a territory with a certain population size and a certain quantity of capital equipment is small, it will nevertheless - provided that the relatively more advantageous activities have been chosen - always be greater than would have been obtained if a larger population had been forced to direct its labour partly to other (hence in our assumption less advantageous) activities, whereas each worker will have a smaller supply of capital equipment.

Actually, in the present state of the world economy, the assumptions underlying this objection are not valid.

In fact, for technical and economic reasons, the sparsely populated countries are destined mainly to engage in agricultural activity.

But, owing to the relative over-population in agriculture (which, for quite specific historical reasons is a feature of under-developed countries with a high density of population), agricultural activity is characterized in the present-day world economy, by low productivity in value.

In other words, in one hour or in one year of work, a man produces a lower value (this value being measured on the basis of world prices) in agriculture than in industry. From this stems the advantage of industrialization and the delusion given present world conditions) of resorting to the international division of labour in order to obtain industrial products in a given country **instead** of producing them on the spot.

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("Planification et croissance accélérée",
Paris 1964, p. 147 to 150).

