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The Impact of Agricultural Migration on the Rate of
Improvement in the Living Conditions of the Population

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1. The Problem

Migration from agriculture is an indispensable condition for a better utilization of the available resources of manpower, for a faster growth of the whole national economy and for improving the living conditions of millions of people. It should be remembered, however, that migration also puts in motion a number of processes which, to some extent, counteract the acceleration of economic growth. Hence it seems necessary to take a comprehensive approach to the problem of migration and to investigate the conditions of its optimization from the point of view of its influence on the rate of improvement in the living conditions of the population.

2. The Assumptions

Let us consider a closed economy characterized by a substantial share of agriculture in total employment and in formation of the national income. Let us divide this economy into two sectors: the urban non-agricultural one and the rural agricultural one.†

We shall assume that the urban sector is characterized by a full employment of manpower while the rural sector we shall consider alternatively as being in the state of "full employment", or in the state of disguised unemployment. We shall assume further that the non-agricultural sector will absorb the whole labour force originating from natural increase and, over and above, that it will absorb the labour force migrating from agriculture. Accordingly, in the total increase in the labour force for the non-Agricultural sector L we can single out the following components:

$$L = L_n + L_e \quad (1.1.)$$

where

L_n - an increase in the labour force from natural sources

L_e - an increase in the labour force migrating from agriculture.

Let us imagine now that for an economic system described above a long-term economic programme is to be designed (covering, for example, the period of 10 or 15 years) in which the amount of means J is earmarked for investment purposes, including replacement. Let us assume further that the distribution of J between the particular years of the period under consideration is given, and the total increase in employment L is distributed over the particular years of this period in proportion to the annual values of investment outlays.

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† For the sake of simplicity we assume that migration to the non-agricultural sector is tantamount to a translocation of the population to the urban areas.

In total gross investments J , we can single out the following components:

$$J = J_i + J_a + J_n \quad (1.2.)$$

where

J_i - non-agricultural investments

J_a - Agricultural investments

J_n - the remaining "non-productive" investments with respect to which we assume that they are to provide services not included in the gross national income.

The investment programme described in (1.2.) must create the material premises for the employment of the total increase in the labour force L described by (1.1.). Let us assume that migration has no influence on the value of modernization and replacement investments financed from J_i .

Hence we can introduce

$$r = \frac{J_i}{L} \quad (1.3.)$$

where r - the degree of mechanization.

It is known from the practice of planning that comparing at a given point of time different variants of the degree of mechanization r we find the relationship according to which every further percentage increase in r results in a correspondingly smaller percentage increase in the productivity of labour p . In accordance with this we write

$$p = F(r) \quad (1.4.)$$

where F satisfies the above relationship.

Our object is to consider the influence of different variants of migration on the total increase in consumption in the long-term period under consideration, assuming that the policy of maximization of increase in consumption is subject to the following limitations:

1. Migration cannot result in unemployment in the non-agricultural sector.
2. A decrease in the labour force in agriculture cannot affect the value of the increase in final production in agriculture assumed in the long-term programme.
3. An increase in consumption cannot be accompanied by a deterioration in the living conditions of the urban population.
4. Migration cannot increase the total investments J which means that the advantages resulting from migration do not increase profits and accumulation but raise consumption.

3. Migration and Increase in Production in the Non-Agricultural Sector

3.1. Migration and the Production Function

In accordance with the assumptions mentioned above, a certain part of total investment J has been devoted for agriculture in order to assure an increase in agricultural production fixed in the long-run programme. Then, an appropriate amount of means has been earmarked for "non-productive" investments J_n , among others for the preservation of environment and for urbanization.

The remaining part of J , namely

$$J_i = J - (J_a + J_n) \quad (2.1.)$$

constitutes the investment fund available, after satisfying the needs of replacement and modernization of the existing production apparatus, for the creation of new jobs in the non-agricultural sector.

After absorbing the whole natural increase in the labour force L and nothing more than that, the incremental degree of mechanization would be

$$r_n = \frac{J_i}{L_n} \quad (2.2.)$$

which, according to (1.4.), would give

$$\Delta Y_i = F(r_n) L_n \quad (2.3.)$$

where ΔY_i - an increase in final production in the non-agricultural sector, equal to the increase in gross product in this sector.

Let us consider now what influence on the value of ΔY_i an additional increase in employment in the non-agricultural sector stemming from migration movements L_e will have.

Let us note that under the conditions of increasing L_e the value of ΔY_i is influenced by two opposing tendencies. On the one hand migration increases employment in the non-agricultural sector which affects positively the value of ΔY_i . On the other hand, with a non-increasing investment fund J_i , which corresponds to our assumptions, migration decreases the degree mechanization of all newly employed. This in turn results in a decline in the productivity of labour which has a negative influence on the value of increase in production. Hence the basic task now must consist in an appropriate formulation of both these opposing tendencies.

If, in the conditions of increasing L_e the productivity of the labour force constituting the total increase in employment ($L = L_n + L_e$) could be maintained at a constant original level determined for $L_e = 0$ by (2.3.) then the increment in the value of ΔY_i would increase in proportion to the increment in variable L_e , i.e. according to the linear function

$$\Delta Y_i = F(r_n) L_n + F(r_n) L_e \quad (2.4.)$$

where $F(r_n)$ is the constant and $F(r_n)$ is the constant coefficient of

Proportionality equal to the productivity of labour at point $L_e = 0$. The graph of this function representing the total hypothetical increase in production achieved owing to increased employment is the straight line ΔY_i in Fig. 1, sloping at a sharp angle to the horizontal axis L_e .

We know, however, that the constant productivity of labour $F(r_n)$ in equation (2.4.) corresponds to the degree of mechanization r_n which is achieved by employing only the labour force from the natural increase [see (2.2.)]. But the inflow of the additional labour force from migration, encountering a non-growing investment fund J_i , reduces the degree of mechanization in accordance with a certain decreasing function

$$\begin{aligned} r &= G(L_e) \\ G(L_e) &< 0 \end{aligned} \quad (2.5)$$

substituting in (1.4) the value r from (2.5.) we obtain

$$p = F[G(L_e)] \quad (2.6)$$

Hence, denoting by ΔY_i a loss in the hypothetical increase in final product which results from a decreasing level of productivity of all newly employed workers we have

$$\Delta Y_i = [L_n + L_e] [F(r_n) - F(G)(L_e)] \quad (2.7)$$

Let us now subtract equation (2.7.) from equation (2.4.). We find that the real increase in the final product in the non-agricultural sector changes according to function

$$\Delta Y_i = F(r_n)L_n + F(r_n)L_e - [L_n + L_e][F(r_n) - F(G)(L_e)] \quad (2.8.)$$

Since the total hypothetical increase in production obtained owing to increased employment is here uniquely determined, the value of ΔY_i depends upon a diminution in the product caused by a decreasing productivity of labour $F[G(L_e)]$, the behaviour of which, with F characterized before, is decisively influenced by the shape of relationship symbolized by G .

We know for sure that r declines when L_e increases; this follows from non-increasing J_i which corresponds to the condition of constant J . Now, however, let us concentrate our attention on all those circumstances accompanying migration which can be expected to reduce the value of the investment fund J_i .

3.2. "Disguised Unemployment" in the Agricultural Sector

Let us assume, first, that in the agricultural sector there is disguised unemployment by which we understand the situation characterized by the fact that the marginal productivity of the labour force migrating to towns equals zero. Let us now look more closely at equation (2.1.). The total investment fund J is given, and its component J_a is also constant because no additional outlays for investments in agriculture will be needed now for the substitution of a decline in the labour force. There remains, however, the component J_n which we should investigate more closely.

* The above description of "disguised unemployment" differs from that accepted by other authors.

In J_n we can distinguish the following elements

$$J_n = J_s + J_u + J_e \quad (3.1.)$$

where

- J_s - investments totally independent of the rate of growth of the urban population. (Investments on the development of science, culture, etc.)
- J_u - urbanization investments whose portion depends exclusively on the rate of growth of the urban population. (Investment on the additional urban infrastructure, communal facilities, urban transportation means, recreation centres, etc.)
- J_e - investments for the protection of the natural environment. A certain part of these investments, similarly as is the case of J_u , depends exclusively on the rate of growth on the urban population.

It follows from the above review that only some of the components of the investment fund J_n remain neutral with respect to changes in employment caused by migration to towns. Others, however, such as urbanization investments J_u and investments for the preservation of the natural environment J_e , will increase together with an increase in L_e .^{**}

This means that migration to the non-agricultural sector not only increases employment, that the investment fund J_i must absorb but also reduces the value of this fund by the above mentioned outlays related to the additional increase in the urban population. In this situation the degree of mechanization of the increase in employment in the non-agricultural sector declines in accordance with the function

$$G(L_e) = \frac{J_i - Q(L_e)}{L_n + L_e} \quad (3.2.)$$

where $Q(L_e)$ expresses the additional investment outlays caused by migration and where, of course,

$$Q(L_e) > 0.$$

Substituting (3.2.) in (2.8.) we obtain the production function that is not monotonically increasing but reaches maximum for a certain value of L_e .

The graph of this function in Fig. 1 is the curve denoted by ΔY_i (whilst the curve ΔY_i represents the losses in hypothetical product due to a decline in productivity corresponding to 3.2.). The maximum value of ΔY_i is reached at point $L_e = L_e^*$.

^{**} Perhaps in some developing countries poverty caused by disguised unemployment and the lack of possibility of increasing productive employment in agriculture will prompt giving preference, as a lesser of two evils, to accelerated migration without developing the urban infrastructure and a hopeless situation of a significant portion of the agricultural population will be a source of spontaneous movements not lending themselves to control and planning.

After passing through this critical value of employment from migration sources a further increase in L_e may cause a decline in the value of ΔY_i . It is easy to imagine a situation in which employment due to migration L_e is so substantial that it eliminates altogether all the production advantages obtained through migration. (This happens when the total loss in production, due to a decline in the productivity of labour, equals the total hypothetical increase in this product due to increased employment L_e .) This kind of situation arises in point $L_e = L_e^{**}$ in Fig. 1. For values higher than L_e^{**} migration would result in production losses in comparison with the state in which employment is secured only for the natural population increase.

3.3 "Full Employment" in the Agricultural Sector

Let us note now that in fact even in countries with disguised unemployment those migrating from agriculture do not always have a marginal productivity of labour equal to zero.

In this situation there arises a conflict between the two objective tendencies of development. The migration processes increase the demand for agricultural products, which is related to rising incomes that usually accompany changes in employment. But, at the same time, they may substantially limit the potential rate of growth of agricultural production. Only in highly developed countries can this contradiction be solved by an appropriate increase in the imports of agricultural products or means of production for agriculture. In developing countries, including also the countries at a medium level of development, in order to maintain the increase in production assumed in the long-term programme, growing migration must be accompanied by appropriate outlays to substitute capital for labour.

These outlays assume primarily the form of additional direct investments in the capital stock of the agricultural sector - variable J_a in equation (2.1).†

Experience shows, however, that not only an increase in the capital-output ratio, but also a substantial increase in material inputs accompanies everywhere the processes of transformation from labour-using to labour-saving forms of Agricultural Production†† This increase in the flow of materials to agriculture necessitates the development of a number of industries which pollute considerably the natural environment with a very effective "help" from the "industrialized" process of agricultural production itself.

† One should take account that the direct investments do not exhaust the problem of all necessary investment outlays related to the development of agriculture. The indirect investments - incurred at all consecutive stages of producing basic and other materials for agriculture - should also be taken into consideration. For example, in Poland the share of direct investments and of indirect investments related to the development of agricultural production (outside the sector of purchases and food processing) constituted, according to the most recent estimates, about 40% of "productive investments" in the whole national economy (the years 1966-1970).

†† For instance, in Poland the sector of state farms which employs 10 persons per one hundred hectares of agricultural area, is characterized by a 56% share of industrial input in the final product (without depreciation) while the peasant sector which employs 30 persons per 100 hectares is characterized by a 25% share of industrial input.

In consequence, the migration to the non-agricultural sector necessitates additional investment outlays for the preservation of the natural environment which together with additional outlays for substitution discussed above, increase the rate of increase in $Q(L_e)$ in equation (3.2.).

This means, however, that - in the absence of disguised unemployment - migration reduces much faster the degree of mechanization and the productivity of labour causing a faster increase of the losses in non-agricultural production which in the case under consideration are represented by the curve ΔY in Fig. 1. Hence, optimum employment from migration is here much lower than in the case of disguised unemployment in the agricultural sector. Also the national economy obtains less advantage from migration. The curve of increase in non-agricultural production in the conditions of "full employment" in agriculture is denoted in Fig. 1 by ΔY_i and optimal employment in these conditions - by $L_e \text{ opt.}$

4. Migration and increase in Consumption

4.1. Consumption and the Final Product

Now let us recollect that the objective we have set here does not consist in maximizing the increase in the final product of the non-agricultural sector, but in maximizing increase in consumption in the whole national economy. With some simplifying assumptions the total value of the increase in final product of agriculture can be treated as a component of the increase in consumption in the national economy and therefore:

$$\Delta C = \Delta Y_a + \Delta C_i \quad (4.1.)$$

where ΔC - Total increase in consumption

ΔY_a - the agricultural part of the value of ΔC

ΔC_i - the non-agricultural part of the value of ΔC

With ΔY_a maintained at a constant level as assumed in advance, the value of the total increase in consumption depends exclusively upon the behaviour of its component of non-agricultural origin ΔC_i . This in turn can be obtained by subtracting from ΔY_i its non-consumption components

$$\Delta C_i = \Delta Y_i - (\Delta N + \Delta J) \quad (4.2.)$$

where ΔN - an increase in industrial raw materials for agriculture

ΔJ - an increase in investments J for the whole national economy.

The component J in (4.2.) is, in accordance with the conditions of our analysis, constant and independent of the value of migration. Instead the behaviour of ΔN depends exclusively on the nature of the labour force migrating from agriculture. If this labour force had been employed only in a formal way (disguised unemployment in the agricultural sector) then ΔN does not react to the value of migration and remains constant. Similar to ΔJ . But in the conditions of "full employment" in agriculture it is necessary to have additional outlays for basic and other materials of industrial origin to counteract the negative influence of a decline in employment on the assumed increase in agricultural production. The

non-consumption deductions from ΔY_i consist in this case of two components: constant ΔJ and component ΔN , growing with migration. This is illustrated in Fig. 2.

In point $L_e = L_{e \text{ opt}}$ maximum is simultaneously reached by ΔY_i and ΔC_i , with disguised unemployment in the agricultural sector. (The behaviour of non-consumption components ΔY_i with respect to L_e is then depicted by a straight line parallel to $L_{e \text{ opt}}$.) However, in the conditions of "full employment" in the agricultural sector the total value of non-consumption components ΔY_i increases with migration and therefore ΔC_i^* reaches its maximum when $L_e = L_{e \text{ opt}}^*$, at a much lower employment from migration sources.

4.2 Formal and Real Consumption

A study of the conditions of maximizing consumption provokes, however, certain thoughts on the phenomenon which we statistically record as "increase in consumption". This increase - represented by ΔC_i in equation (4.2.) - expresses, in fact, only an increase in the real consumption expenditure. However, in the conditions of a rapidly developing industrial - urban civilization, an increase in the real consumption expenditure is not always accompanied by actual improvement in the living conditions.

A certain part of what is necessitated by migration - additional outlays for processing and distribution of agricultural products; the expenditure for some services, e.g. city transportation, water in growing urban centres, etc., are examples of an apparent, but not real, growth in consumption.

Thus we come to the conclusion that under the conditions of a rapid growth of urban-industrial agglomerations we should distinguish two components in the statistically recorded increase in consumption: an increase in real consumption and an increase in apparent consumption expressing such a growth in consumption expenditure as is not accompanied by a real rise in the quality of life. In accordance with this

$$\Delta C_{ir} = \Delta Y_i - (\Delta J + \Delta N + \Delta C_{is}) \quad (4.3.)$$

where

ΔC_{ir} - a real increase in consumption (of goods and services of industrial origin)

ΔC_{is} - a formal or apparent increase in consumption^①

It suffices now to assume with a good justification that ΔC_{is} grows with migration to show that the real increase in consumption reaches its maximum value for a value of L_e lower than that corresponding to the maximization of the statistically recorded increase in consumption. The above is marked in Fig. 2 where the curve ΔC_{ir} , representing the real increase in consumption, reaches its highest value in $L_e = L_{e \text{ opt}}^*$.

① The increase of ΔC_{is} (similarly, additional outlays reducing "productive" investments) - compare p.5 - can be counteracted by the employment of the population released from the agricultural sector in various kinds of minor industries and services located in the countryside, e.g. tourism services.

5. Technical and Social Limitations

Let us now consider the problem of limitations which, with even a basically full control over the accumulation fund of the non-agricultural sector, the central authority may encounter in creating new jobs. Increasing employment with a given - or, as we have seen, a declining - investment fund implies the possibility of putting into motion production processes characterized by lower and lower capital-output ratios. But the production functions available in reality are, by no means, "continuous and differentiable at every point". The development of many modern branches of production requires techniques which are highly capital using and at the same time, variable only in relatively narrow intervals determined by the technological properties of the respective production processes.

Finally, it is worth while to consider also the degree of freedom of the central authority in choosing such labour-using techniques in agriculture, as under given conditions, may correspond to optimal solutions. The application here of techniques of this kind may encounter limitations of a sociological type. For the attitude of contemporary man may prevent him from accepting many hard jobs which for centuries have been performed in agriculture manually or with the help of horse power - with particularly intensive efforts in peak periods of agricultural work.

6. Comments on Other Theoretical Models Dealing with the Influence of Migration

The point of view presented here differs essentially from the approach to similar problems in the report by the OECD[†] - in the models by G. Weinschenck and W. Henrichsmeyer[‡] and in works of E. F. Denison.[§] The point is not only that the subject of the above-mentioned studies is mainly the economy of highly developed countries - and for this reason it is assumed there that an increase in migration lowers the rate of growth of agricultural production - but that there are, primarily, essential differences in the approach to the problem.

The brevity of this paper makes it impossible to discuss more fully this problem; so let us concentrate on one aspect only. In the models by Weinschenck and Henrichsmeyer particular attention is paid to the question of the impact of the rate of migration on changes in the mutual relations of remuneration for labour in agriculture and in the non-agricultural sector.

We approach the latter problem in a different way. Considering the problem from the point of view of planning, we analyze, first of all, what should be done in order to maximize the net effects that migration brings to the whole national economy. The problem of mutual relations between

[†] See Bibliography - 3 OECD
4 E. F. Denison
6 G. Weinschenck and W. Henrichsmeyer

remuneration for labour in the agricultural and non-agricultural sectors, very important indeed, we treat here as a separate and, in a sense, secondary one. This is a problem pertaining to the distribution of the national income, while the question of prime importance seems, first of all, an analysis of production conditions for maximization of the income that is subsequently divided and may be distributed in different ways. The relations of the rate of growth of the productivity of labour in the agricultural and non-agricultural sectors should be such as to ensure the fastest possible increase in the part of the national income that is earmarked for an improvement in the living conditions of the population. The relations of the rate of growth of remuneration for labour in both sectors, on the other hand, do not have to correspond, by any means, to the relations of the rate of growth of the productivity of labour. The maximized production effect should be divided in accordance with the principles of social justice and a contemporary state, under the conditions prevailing in a planned economy, has at its disposal a number of economic instruments - for instance, price policy, credit and taxation policy - which enable it to make the rate of changes in the consumed incomes of the particular groups of population at least partially independent of the rate of changes in the productivity of their labour. This very approach is satisfied by the postulate of maximization of consumption, and not of profit, over a defined time horizon, the stability of investment burdens independent of changes in the size of migration, and other general assumptions accepted for the construction of the model presented here.

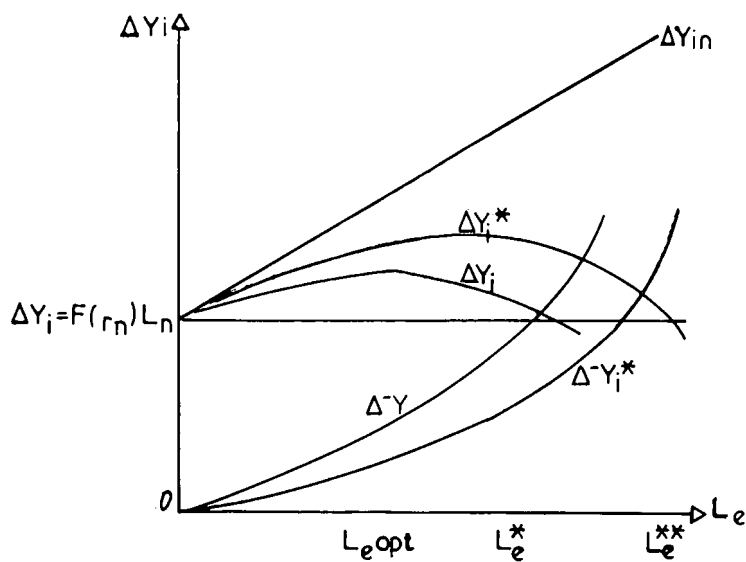
It is worth noting in conclusion that if we take into consideration the higher social costs of the upkeep of a man within the framework of urban-industrial civilization we obtain a picture, different from the generally accepted one, of burdens that the society must carry by subsidising relatively more labour-using forms of agriculture.

A delay in development, manifesting itself in a high percentage of agricultural population must, of course, be a subject of concern for many societies. It should be noted, however, that such a delay provides certain specific chances, for there is hope that many countries will shape the future development of their towns and villages in such a way as to prevent these negative effects of the development of industrial civilization which we observe now in many regions of rapidly progressing industrialization.

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