INVESTMENT POLICIES AND "DUALISM" IN UNDERDEVELOPED COUNTRIES

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Economists have not shown much interest in the tensions and conflicts that accompany economic development. Not unlike the Marxist who shrugs off revolutions as "birthpangs" of a new society, the economist has tended to consider social and cultural disruptions in underdeveloped countries as the inevitable by-product of growth. But just as the nature and course of a revolution profoundly affects the society that it brings forth, so is the course of a country's development intimately conditioned by the manifold tensions which it experiences during its struggle to break away from economic stagnation. Failure to include these conflicts in the empirical basis of our analytic structures may mean the loss of important insights. For instance, we persist in attempts to view the developmental process as a self-generating and self-sufficient activity moving along a smooth exponential path, when any observer of the reality of underdeveloped countries is fully aware of the ever-present dangers of abortive development and of the important ways in which progress and backwardness clash and interact.

This article is an attempt to build some of these interactions into the analysis of development. Its first two sections deal with the conflicting claims and uneven growth of different regions within an underdeveloped, but developing economy. After describing the principal methods of governments in coping with situations of this kind, we pass to consider economic problems of a country that has become split into a developed and an underdeveloped region. The last two sections deal with some structural consequences of the close cohabitation of progress and backwardness within the same country, first for the type of industrialization and then for the kind of industrial organization that are promoted and are likely to prove most effective in this particular environment.

I. *The Regional Distribution of Public Investment*

The regional distribution of public investment is the resultant of powerful forces acting on the policy-makers of underdeveloped

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countries.[1] Three principal patterns may be distinguished: dispersal, concentration on growing areas, and attempts to promote the development of backward areas.

In contrast to widespread impressions, the most pervasive tendency of governments of underdeveloped countries in making their investment decisions is not so much the obsession with one dam or one steel mill, as the dispersal of funds among a large number of small projects scattered widely over the national territory.

While this pattern is *dominant* only in countries where dynamic economic growth has not yet taken hold,[2] it can be said to exert a steady pull in practically all underdeveloped countries. The most obvious reason is that public investment decisions are easily the most political ones among the economic policy decisions taken by governments. Whether to build a road here rather than there, whether to construct a power plant that is to supply towns A, B, and C, rather than D, E, and F, these are questions that have decisive local political impact.

Thus, as all governments regardless of their democratic character desire and need support from all sections of the country, the temptation is strong to scatter the investment effort far and wide. Disconnected roads are built at many points, small Diesel power plants and aqueducts are installed in many towns without adequate provision for their maintenance; even low-cost housing programs which should obviously concentrate on relieving critical shortages and on slum clearance in the big cities, are often similarly dispersed.

More fundamentally, the tendency toward wide dispersal of investment funds may be due to the fact that some traditional societies can conceive economic progress only as a force that ought to affect equally all members and sections of the community. Such societies are therefore unprepared and unwilling to make the choices about priorities that are the essence of development programs. Experience with community development projects has shown that the belief or suspicion, however mistaken, that a project will lead to individual enrichment, may easily spell its failure.[3] Similarly, within the setting of a country, the feeling may be widespread that there is something wrong with even temporarily preferred treatment for some regions, a feeling that it might be politically dangerous not to take into account.

[1] For an attempt to account for economic policies of underdeveloped countries in other fields, see my "Economic Policy of Underdeveloped Countries," to be published in *Econ. Develop. and Cult. Change*, July 1957.

[2] See Benjamin Higgins, "Development Planning and the Economic Calculus," *Soc. Research*, Spring 1956, XXXII, 35-56.

[3] For a good example, see A. R. Holmberg, "The Wells That Failed: An Attempt to Establish a Stable Water Supply in Viru Valley, Peru," in *Human Problems and Technological Change*, E. H. Spicer, ed. (New York, 1952), pp. 113-23; also P. S. Taylor, "Can We Export the 'New Rural Society'?", *Rural Soc.*, Mar. 1954, XIX, 13-20.

Finally, the dispersal pattern can be explained by certain shortages usually affecting underdeveloped countries. The elaboration of the many small projects into which public investment is typically split up when this pattern is dominant, requires comparatively little engineering and planning talent, whereas the larger projects in electric power, transportation or basic industry require far more such talent than is usually available to the government. This is why entirely too much has been made of the argument that development is held back, not by the scarcity of funds, but by a scarcity of "bankable," *i.e.*, well-conceived and engineered, projects. The question which should come first, the project or the funds, is really of the chicken-egg variety. Obviously funds can be spent only on clearly defined projects. But without definite expectations that funds—from domestic or foreign sources—will be forthcoming, the considerable cost of engineering and economic studies and the administrative effort required to gather the necessary staff and to obtain the assistance of foreign consultants will most likely not be undertaken. The promise of foreign funds—provided the studies prove the project feasible and worth while—is particularly important if this effort is to be made, as a large project usually results in one region obtaining for the time being a substantial advantage over all others. This is an investment decision which the local government may find it difficult and imprudent to make unless it has the feeling—and the excuse vis-à-vis the other regions—that international development capital is not to be had at all on other terms.

Moreover, the study and preparation of a large-scale project implies in itself—especially in countries where there is the rhetorical tradition of confusing the word with the deed, and the announcement of plans with their realization—a commitment to the region which is going to be principally benefited. Governments are therefore reluctant to start such studies unless they feel reasonably sure that they will be able to "deliver." Unless they have assurances in this regard, they would be politically much better off to let sleeping projects lie.

The International Bank for Reconstruction and Development has often defended itself against charges of insufficient lending by the argument that there were not enough "bankable" projects available.[4] But in fact the Bank frequently has acted in accordance with the point of view just outlined, *i.e.*, it has helped in the preparation of such

[4] Statements to this effect can be found in several of the Bank's annual reports; *e.g.*: "Perhaps the most striking single lesson which the Bank has learned in the course of its operations is how limited is the capacity of the underdeveloped countries to absorb capital quickly for really productive purposes. . . . The Bank's experience to date indicates that the Bank now has or can readily acquire sufficient resources to help finance all the sound productive projects in its member countries that will be ready for financing in the next few years, that can appropriately be financed through repayable foreign loans and that cannot attract private capital." *Fourth Annual Report, 1948/49*, pp. 8, 13.

projects by virtually committing itself in advance to the financing of their foreign exchange costs, including even the cost of the preliminary engineering surveys.

In this way the availability of international development capital may make for a shift from dispersal of public investment toward concentration on a few key projects. The "demonstration effect" of similar projects undertaken in other countries also works in this direction.[5] But the most important force opposing the tendency toward excessive dispersal of public investment is the growth pattern characteristic of rapidly developing countries. Development often begins with the sudden, vigorous and nearly spontaneous growth of one or a few regions or urban centers resulting in serious shortages of electric power and water supply, as well as in housing and transportation bottlenecks. Thus, urgent demands for several types of capital-intensive public investments appear and must be given the highest priority whether or not they correspond to the government's sense of distributive justice and to its pattern of regional political preference. The public investment in overhead capital in turn makes possible further growth in industry and trade of the favored areas and this growth requires further large allocations of public investment to them.

Determined as it is by the volume of private investment and the general rise in income in the developing areas, public investment clearly plays here an "induced" role, and investment choices are often remarkably and unexpectedly obvious.[6] It is not always easy, however, to have these obvious choices adopted, partly because of the continuing desire of governments to revert to the policy of scatter, and partly because a new pressure soon makes itself felt, namely to accelerate development in the areas that have fallen behind.

A situation in which the bulk of public investment is continuously being sucked into the comparatively developed portions of the national territory cannot in the long run be considered satisfactory by governments, because of compelling equity considerations. In fact, the attempt to change drastically the distribution of public investment in favor of the country's poorer sections generally comes at a point that seems premature to the foreign observer or adviser for the simple reason that the more rapidly advancing sections do not strike *him* as so outstandingly prosperous. It is, however, quite understandable that the attempt should be made long before these sections have come anywhere near

[5] The demonstration effect is perhaps more important in raising the propensity to invest of public authorities than in increasing the propensity to consume of the public. The latter relation is stressed by R. Nurkse, *Problems of Capital Formation in Underdeveloped Countries* (Oxford, 1953), pp. 57f.

[6] *Cf.* my "Economics and Investment Planning—Reflections Based on Experience in Colombia" in *Investment Criteria and Economic Growth,* M. F. Millikan, ed., Mass. Inst. Tech. (Cambridge, 1955), pp. 35-54.

fully developing their potential. Moreover, the poorer sections of the country, where careers in industry and trade are not promising, often produce, for this very reason, a majority of the country's successful politicians and thereby acquire weighty spokesmen in the councils of government.

Whatever the correct timing, the channeling of large-scale capital expenditures toward the underprivileged areas of the country contains the danger of misguided and excessive investment—a danger which is always more present in a region that has not yet experienced real development than where spontaneous growth has already staked out fairly well the areas in which public investments are urgently required.

It is possible that the transition from the second pattern—concentration of public investment on spontaneously growing areas—to the third—attempt to ignite development in the heretofore stagnant areas through "autonomous" public investment—is facilitated by certain peculiar properties of public investment. Usually the second phase results not in a mere shift from scatter to concentration of a given investment total, but in a considerable enlargement of the total amount of funds required for public investment. These funds are secured through the introduction of new and higher taxes or through other *permanent* revenue-raising devices.

On the other hand, it is probably reasonable to assume that the need for the investment of public funds in the country's spontaneously growing areas is particularly heavy in the initial stages of development, as basic utilities are created and rapidly expanded. After development has proceeded for some time, the need for public investment in relation to private investment tends to decline and in any event an increased portion of public investment can be financed out of earnings of previous investments. This kind of change in the mix of public investment with private investment is implicit in the term "social *overhead* capital" often used to designate the kind of investments which are primarily financed by public funds.

As the taxation and other measures which have financed the original spurt in public investment continue to yield revenue, some funds may thus become, if not unemployed, at least less compellingly employed than previously. This is likely to be immediately sensed by the officials responsible for apportioning public investment and provides an excellent opportunity to those among them who would want to change its geographic composition in favor of the less developed sections.

II. *Divergent Development of Different Regions*

On probability grounds alone, economic growth is unlikely to start everywhere at the same time and to proceed everywhere at the same

speed within an economy. Once some areas and sectors have pulled ahead of others, they assert a powerful attraction not only for the simple reason that nothing succeeds like success, but also because external economies are coming into being at these "growing points." There can be little doubt that an economy, in the process of lifting itself to higher income levels, must first develop within itself some such regional centers of economic strength. Interregional inequality of growth is therefore an inevitable concomitant of growth itself.

To simplify our exposition, we shall call "North" the region or regions of the country which are experiencing growth and "South" those that have fallen behind. This terminology is suggested by the fact that a large number of backward areas appear to be located in the South of the countries to which they belong. The term "South" as used here does not include *un*developed—*i.e.*, largely unsettled—areas.

After the first spurts of growth in the North, it is no longer obvious what course development will take. Normally one might expect that little by little the higher incomes in the North will trickle down to the Southerners, either as a result of purchases and investments by the North in the South, or because of migration of Southerners to the North. But there are important instances of countries where the initial advance of a region has resulted in a North-South split which has shown considerable durability. Under what conditions is such a lasting split likely to emerge?

In the first place, it must be noted that the initial advance of the North, instead of spilling over to the South, may affect it adversely. If the North industrializes, some Southern handicraft industries may become depressed as a result of competition, and real incomes in the South may also fall as Northern manufactures, produced behind newly erected tariff walls, replace similar goods previously imported from abroad at lower prices. Moreover, the economic expansion of the North may attract only the more enterprising young men from the South as well as whatever capital is generated there.

Nevertheless, if the North specializes in manufactures and relies on the South for primary products, this sequence cannot continue for long. In view of the low supply-elasticity characteristic of the South, the increasing demand for foodstuffs and materials in the developing North will turn the terms of trade sharply against the latter.[7] In this way, either the advance of the North is going to be halted by rising labor and material costs, or the South is eventually going to be spurred

[7] This situation has been fully analyzed by H. G. Johnson for the case in which a developing industrial country trades with a stagnant agricultural country; see his "Economic Expansion and International Trade," *Manchester School Econ. Soc. Stud.*, May 1955, XXIII, 96-101. *Cf.* also W. A. Lewis, "Economic Development with Unlimited Supplies of Labour," *Manchester School,* May 1954, XXII, 173.

into becoming an efficient producer—in both cases, the gap between the two regions is likely to be narrowed or closed.

But what if the North possesses within itself a large and productive agricultural area or is able, as a result of expanding exports, to supply its needs in primary products from abroad? Under such circumstances, it is easy to see that the South could indeed remain in the backwater of subsistence agriculture, almost entirely cut off from any beneficial effects of economic progress in the North while it would remain exposed to the already noted adverse effect of factor mobility on its own manpower and capital resources.

Under these conditions—which are or were fairly typical of such backward regions as Brazil's Nordeste, Colombia's Oriente, and Italy's Mezzogiorno—the split of the country into a progressive and a depressed area could persist for a long time. Economic, as distinct from the already noted political, pressures to remedy the situation will arise only at a relatively late stage, usually when the expansion of Northern industries begins to be seriously hampered by the insufficient size of the home market or when balance-of-payments difficulties make the country realize that it would save foreign exchange by an improved use of Southern resources. Whenever such economic arguments can be combined with the already noted political forces working in the same direction, a determined effort to pull the South out of its stagnation is likely to be made.

The preceding analysis gives us a hint as to the kind of investment which is likely to yield the best results in the South. With the considerable advance of the North in manufacturing, the best chance for the South to break into the pattern of self-sufficient growth of the North lies probably in a major effort to improve its agriculture so as to become a supplier of agricultural raw materials and foodstuffs for the North. Agricultural resettlement, irrigation and drainage schemes, and the establishment of extension services are likely to be of particular importance in this endeavor to move away from subsistence agriculture. Other investments in North-South integration, *e.g.*, in education and in essential transportation links, are also likely to be highly beneficial.

On the other hand, large-scale investment in social overhead capital such as electric-power facilities, modern highway networks, and urban redevelopment may be ineffective in promoting economic growth in the South. Such investments should by all means be undertaken when there exists a reasonable degree of confidence that entrepreneurial initiative will manifest itself as soon as the resulting facilities become available. But in view of the long stagnation of the South, such confidence can hardly be justified. When development is not actually underway large-scale investments in overhead facilities are essentially equivalent to the

use of monetary policy in a depression: the availability of power and transportation facilities is of a purely permissive nature but it cannot by itself set development in motion, just as the availability of excess reserves at low interest rates to prospective borrowers does not of itself insure economic expansion at the bottom of a depression. The nature of public works spending in a stagnating underdeveloped area is thus fundamentally different from its role during a depression in an industrial country. The equivalent of the latter in an underdeveloped country is agricultural development or the outright establishment of state-owned industries, provided of course that their technical and economic feasibility has been studied and provision is made to administer them with some competence. In this sense, the Paz de Rio steel mill in Colombia's backward Oriente will probably turn out to be, in spite of initial difficulties and setbacks, an effective development move compared with any program to provide such an area with plentiful public utilities whose capacity might go begging for years.

III. *Economic Consequences of "Dualism" for Industrial Development*

The North-South split is nothing but a special aspect of the often noted "dual" character of underdeveloped countries where the hypermodern exists side by side with the traditional, not only in techniques of production and distribution, but also in attitudes and in ways of living and of doing business.

Probably one of the principal economic characteristics of these countries and more generally of any country where industrial development is incipient and spotty, is the existence of two distinct wage levels, one applicable to the industrial sector and the other to the non-industrial and preindustrial sectors which comprise most of trade and other services (except banks and insurance companies) as well as handicraft and small-scale industry.

With mobility far from perfect, the dual wage level reflects different marginal productivities of labor in the modern and preindustrial sectors of the economy, but it is also explained by social security and minimum wage legislation which is usually enforced and enforceable only in the larger industrial units, by the high cost of living (particularly of housing) in the growing industrial cities, and by persistent preferences for the traditional and more independent pursuits in agriculture, small trade and small industry.

While labor is cheaper in the underdeveloped sector of the economy, capital is typically more expensive, also for a variety of reasons: access to the banks is difficult and interest charges are much higher, machinery, equipment and tools are bought at retail rather than imported directly from the foreign manufacturer at important savings, etc.

To illustrate what happens to industrial development in countries

under these conditions, a familiar diagrammatic technique may be employed.[8] The terms "North" and "South" will now not necessarily refer to geographically distinct areas, but to the industrial and preindustrial sectors of the economy which may be, and in fact often are, closely intermingled.

In Figure 1 the ordinate measures capital and the abscissa physical units of labor input. We assume two distinct wage and capital cost-levels and therefore the expenditures corresponding to identical labor and capital inputs differ from North to South. For the purpose of the argument, it is supposed that one homogenous good is to be produced and that two processes are available, the industrial one which is com-

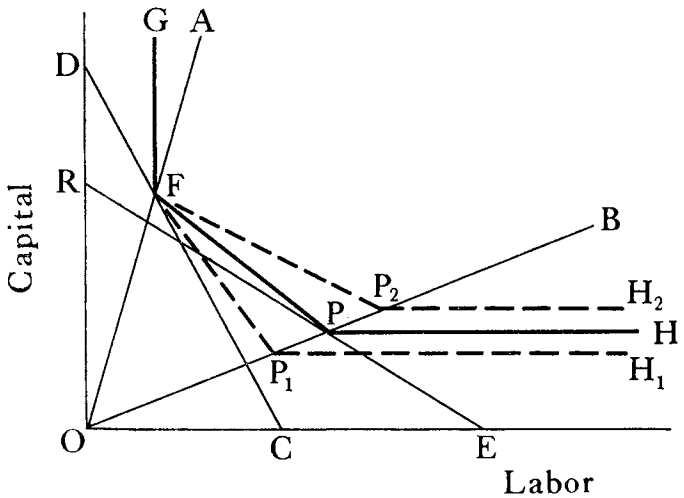

FIGURE 1

paratively capital-intensive and necessarily uses "expensive" labor and "cheap" capital, with the expansion path *OA*, and the labor-intensive preindustrial process which uses "cheap" labor and "expensive" capital and is shown by the expansion path *OB*. We shall now draw a constant-expenditure line for different combinations of labor and capital reflecting the dualistic situation we are describing. Let *DC* be such a line for the industrial process used in the North, and let labor in the North be twice as expensive as its Southern counterpart, while capital costs are, say, two-thirds of what they are in the South. Then we derive a corresponding constant-expenditure line *FE* for the preindustrial

[8] For recent applications to related problems, *cf.* R. S. Eckaus, "Factor Proportions in Underdeveloped Areas," *Am. Econ. Rev.*, Sept. 1955, XLV, 539-65, and Yale Brozen, "Entrepreneurship and Technological Change," in *Economic Development—Principles and Patterns*, H. F. Williamson and J. A. Buttrick, ed. (Englewood Cliffs, N.J., 1954), pp. 236-41.

process by making CE equal to OC and OR equal to twice the length of RD.

On these assumptions, any combination of labor and capital shown by points on lines DC and RE require the same expenditure, it being understood that line DC refers to Northern and line RE to Southern conditions. If the industrial process is used, it is possible to produce with this expenditure the quantity of output corresponding to OF and the same expenditure yields the output corresponding to OP in case the preindustrial process is used. Now, if production OF happens to be equal to production OP, in other words if the constant-product line is represented by $GFPH$, it is a matter of indifference whether the commodity in question is produced by the one or the other process. If on the other hand, the constant-product line going through F is correctly shown by GFP_1H_1, the preindustrial process is less expensive and will be adopted. On the other hand, if the constant product line is GFP_2H_2, then the labor-intensive process is more expensive for the same output than the industrial process and the latter will be used.

Of course, the neatness with which the diagram shows under what conditions the industrial process can or cannot compete with the preindustrial one, is blurred in the real world. As the Southern wage is ordinarily implicit and as Southerners will take considerable squeezing of their earnings before they actually stop production, the potential investor in modern industrial processes is not confronted with a point such as P against which he must successfully compete, but with a range of such points along the OB line. He must therefore be sure that he can out-compete the South not only on the basis of present prices, but even on the basis of prices that may be considerably lower.

Under such conditions, the industrial processes that have least to fear from the competition of the South are those which are entirely outside the technological and capital capabilities of the local handicraft and small workshop industries. These are the processes characteristic, for instance, of chemicals, petroleum refining, basic iron and steel, cement, pulp and paper, but also of many "modern" consumer goods, from radios and light bulbs to toothpaste and aspirin.

There is a second type of manufacturing that is liable to be introduced in countries characterized by dualism in the cost structure, namely industries turning out products similar to those of the preindustrial sector, but producing them with such superior efficiency and productivity that they are able to crush any competition from the old industries. The classical example here is, of course, the textile industry, particularly spinning.

Finally, we come to the industries where dualism is vindicated. Here the appearance of modern industrial methods is seriously handicapped

by the possibility of competition from independent, small-scale producers. Examples that come to mind are the manufacture of furniture, shoes, apparel, bricks, ceramics, cigars (as opposed to cigarettes), baskets (holding back the development of modern forms of wrapping, bagging and packaging), as well as large parts of the food-processing and construction industries. Most services, in particular retailing, also are in this category. In truck and bus transportation, the dual wage situation and the relatively small size of the needed capital investment make for organization along traditional small-business lines in preference to modern large-scale operations, and consequently the service provided has a distinctly preindustrial flavor in spite of the modern equipment used.

In all these sectors which jointly form a fairly substantial part of any economy, the advantages of modern industrial methods apparently are not decisive enough to overcome the traditional or small-scale way of doing things. The use of machinery is unable to offset the advantages of using Southern labor or would do so only at levels of output that are beyond the capacity of absorption of the economy.

The phenomenon which we have described may be an aspect of the factor proportions problem that has been overlooked. Much attention has been given by economists—though not much yet by engineers—to the question of adapting modern technology to countries where labor is cheap and plentiful and where the introduction of certain labor-saving (as opposed to capital-saving or product-improving) innovations may not be justified. While the search for evidence of such adaptation apparently has been somewhat disappointing, it would be wrong to conclude that differences in factor endowments and costs relative to those of industrial countries are not exerting profound effects on the pattern of development in underdeveloped countries. But these differences are perhaps more importantly reflected in the outright *absence* of modern methods from a number of branches of commerce and industry, than in the always difficult transformation of technical processes in those branches into which modern industry is moving.[9]

The absence of something is always a little hard to notice and this may explain why the one stressed here has not received the attention it deserves. Nevertheless, it is the partial character of industrial penetration into underdeveloped countries which is behind the pervasive impression of "dualism," *i.e.*, the feeling that the economic structure is a rather incongruous mixture of the new and the old—airplane and

[9] See, however, David Granick, "Economic Development and Productivity Analysis: The Case of Soviet Metalworking," *Quart. Jour. Econ.*, May 1957, LXXI, 205-33, for interesting evidence on the use of labor-intensive methods, principally in auxiliary operations such as materials handling, inspection and repair.

mule, oil refinery and basket weaving, gleaming modern office buildings and unsanitary food markets, etc. Whether or not they are geographically separate, these two sectors simply appear to coexist, each with its own standards of workmanship, efficiency, bargaining and human relations in general.

It has recently been contended that underdeveloped countries should give priority in their investment programs to capital-intensive industries with a highly advanced and complicated technology. By drawing on historical evidence, Gerschenkron has eloquently argued that only by establishing such industries will a country be able to generate the momentum it needs to break the fetters of the past,[10] while Galenson and Leibenstein have advocated this course on the ground that capital-intensive industries make for high profits and therefore for high reinvestible savings.[11]

Whatever the intrinsic merits of these somewhat paradoxical views, they are perhaps not needed to explain and defend the preference for capital-intensive lines of production which many industrializing countries have exhibited. Viewed in the light of our analysis, this preference can be justified on quite orthodox grounds even for a capital-poor and labor-rich economy. It would probably be wasteful for such an economy to invest its scarce capital resources in duplicating lines of production that are already being carried on, even though inefficiently. A better use for capital would almost certainly be in the establishment of new-product industries. But in such industries capital-output ratios are likely to be typically high whereas they tend to be comparatively low in industries that would produce goods and services similar to those turned out by existing small-scale operators.

In other words, the most efficient use of capital in underdeveloped countries is not in capital-intensive industries *qua* capital-intensive; it is in industries that open new product horizons for the economy and these industries are likely to be more capital-intensive than others with which the country can dispense for the time being because the needs served by them are satisfied by existing handicraft and cottage industries. Therefore, what looks like a puzzling preference for capital intensity on the part of capital-poor countries in effect turns out to be the incidental result of a perfectly commonsense way of *husbanding* capital.

With respect to this pattern of industrialization, today's underdevel-

[11] This is their principal thesis as exposed in "Investment Criteria, Productivity, and Economic Development," *Quart. Jour. Econ.*, Aug. 1955, LXIX, 343-70.

[10] Alexander Gerschenkron, "Economic Backwardness in Historical Perspective," in *The Progress of Underdeveloped Areas*, B. F. Hoselitz, ed. (Chicago, 1952), pp. 3-29.

oped countries enjoy a definite advantage over nations where modern manufacturing first developed. In the latter nations, as is well known, the industrial revolution introduced fundamental technological innovations into iron, textile and pottery manufacturing, with immediate adverse impacts on the well-diversified handicraft and small-scale industries that had previously supplied these products.[12] In today's underdeveloped countries, on the other hand, industrial progress can concentrate on a wide range of useful and desirable products that are entirely new to the economy. As a result, the traditional handicraft and cottage industries are given a valuable respite which can be utilized to improve the efficiency of their operations and the quality of their output.

It must be understood that if this opportunity is not taken advantage of, industrial methods will eventually infringe upon the handicraft sector. As the economy grows in size, industrial methods will reveal themselves superior to the preindustrial ones in more and more areas in spite of the dual-wage situation. But the absence of sharp competition by modern industry during the first stages of development should make it possible to save a strong handicraft and small workshop tradition where it exists. It is well known that small and inexpensive additions of capital equipment, made available at easy credit terms, and combined with technical education and cooperative marketing, may considerably improve the performance of these industries.[13] By providing them with a new margin of protection against encroachment by big industry, successful efforts in this direction would also make it possible progressively to reduce the wage gap. Clearly, this is a more promising approach than the always futile attempt to freeze existing situations through legislative action. For many countries, this approach also seems wiser, and may be even more efficient in setting the stage for unified development than a policy of letting "nature take its course," *i.e.*, passive resignation to the squeeze of many old trades and skills which so unreasonably refuse to die.

In conclusion: Dualism brings with it no doubt many social and psychological stresses, but it has some compensating advantages and represents in a way an attempt by the economy of an underdeveloped country to make the best of its resources during a transitional phase. While countries may be anxious to put this phase behind them, they ought to realize that in doing so they must not necessarily follow the path of those nations that industrialized in an earlier period.

[12] Cf., e.g., J. L. and B. Hammond, *The Rise of Modern Industry* (London, 1937), Pt. II.

[13] *Cf.* H. G. Aubrey, "Small Industry in Economic Development," *Soc. Research,* Sept. 1951, XVIII, 269-12. For encouraging evidence from Indonesia, see K. Nagaraja Rao, "Small Scale Industry and Economic Development in Indonesia," *Econ. Develop. and Cult. Change,* Jan. 1956, IV, 159-70.

IV. *Technology as an Aid to Management in the Modern Sector*

The preceding section has shown that the type of industrial development which takes place under conditions of dualism in today's underdeveloped countries holds out special opportunities of survival for small-scale industry. At the same time this survival and staying-power of the older, labor-intensive production and distribution methods are likely to influence the organization of the modern sector in several ways.

In a society where dualism prevails, operators in the modern sector will feel that they are manning an outpost where they are always in danger of being contaminated by the old and in many respects so much more pleasant ways of working and doing business. Examples of such contamination are frequent: the pasteurizing plant whose milk one is strongly recommended to boil thoroughly before drinking; the first-class hotel that three months after a triumphant opening, has become third-rate; the "supermarket" which slowly takes on again the familiar aspects of the much decried open-air affairs. To avoid such deterioration, modern industry will often feel that it has to maintain a fighting position and is likely to consider any modification of advanced technology in the labor-intensive direction as infiltration of the enemy.

This attitude may spring from a correct instinct. The advisability of adopting more labor-intensive processes is usually evaluated on the assumption that work and quality standards will not deteriorate. But for a number of reasons, the validity of this assumption is highly doubtful in underdeveloped countries.

The impact on labor efficiency of machine-paced as opposed to operator-paced operations first comes to mind here. It is certainly true that an untrained labor force is likely to perform incomparably better in machine-paced operations, not so much because of a tendency toward slacking when the machine does not compel the work, as because machine-paced operations provide for steadiness of pace and regular brief rest periods which the inexperienced self-paced worker has difficulty in observing.[14]

In addition, modern machinery and equipment have a more subtle influence in *inducing* efficiency at all levels of labor and management. With better and more modern machinery, all personnel experience a feeling of obligation to live up to the performance of the equipment just as better highways induce improved driving habits and modern

[14] *Cf.* U. S. Department of Labor, *Hours of Work and Output*, Bull. No. 917 (Washington, 1947). This bulletin reports on the differential effect on workers' productivity of increases in daily work-hours during wartime. One of its conclusions is (p. 11): "Where the workpace is controlled by the machine, thus affording the operator some brief rest periods while waiting for the machine to perform its operation, the increase in output is more nearly proportional to the increase in hours [than in operator-paced operations]."

sanitary facilities better habits of personal cleanliness and hygiene.

A closely related point is that the most modern, *i.e.*, the most capital-intensive, plants are at a considerable advantage in competing for that scarce article, namely the trained engineer and the skilled workman. The poor workman always complains about his tools, as the saying goes; but, conversely, the poorly equipped factories are always the ones that complain about their workers, and probably with good reason.

But the most important function of modern technology is as an aid to management in the performance of new, unfamiliar and perhaps somewhat uncongenial tasks. Cooperation in large organizations meets with special difficulties in underdeveloped countries.[15] By predetermining to a considerable extent what is to be done, where and at what point of time, the machines and the mechanical or chemical processes they perform reduce these difficulties immeasurably in comparison with a situation where work schedules depend exclusively on the convergence and coordination of many human wills and actions. The latter situation is characteristic of most administrative processes and this circumstance helps to explain why the performance of the political and administrative process is so defective in most underdeveloped countries, while achievements in large-scale manufacturing are often quite creditable. That industrial technology can be considered as an aid to management is also confirmed by the observation, frequently made in these countries, that efficiency is far higher in the plant- than in the office-operations of industrial firms.[16]

The productivity effects of technology have been so spectacular that this efficiency-enhancing property has gone largely unnoticed. Ever since Adam Smith, it has been realized that the division of labor induces mechanical inventions. But the inverse relationship also deserves to be stressed. The technical processes carried out by machinery provide factory operations with a basic structure and rhythm which in effect deal out functions and determine sequences. If it is correct, as Chester Barnard has said, that "processes of decision . . . are largely techniques for narrowing choice,"[17] then the use of modern technology

[15] The nature of these difficulties will be discussed in a paper now in preparation.

[16] United Nations, *Labor Productivity of the Cotton Textile Industry in Five Latin American Countries* (New York, 1951), *passim*.

[17] C. I. Barnard, *The Functions of the Executive* (Cambridge, 1938), p. 14. Note also the following description of assembly problems in M. E. Salveson, "On a Quantitative Method in Production Planning and Scheduling," *Econometrica*, Oct. 1952, XX, 562: "In an assembled commodity, if there are n component parts there will be theoretically $n!$ different sequences in which the parts can be assembled together. . . . In any real situation, it would be prohibitive to enumerate all of these different sequences and select the one which is optimum. . . . Instead an engineering type of analysis is used to select some one sequence of assembly according to which the assembly methods and tooling are laid out."

in manufacturing is one of the most powerful of such techniques.

The degree to which modern technology facilitates coordination, varies from one industry to another. In some industries, the technology consists of a basic process around which work falls into place almost naturally; examples are smelting, petroleum refining, cement, brewing and many others. In other industries, such as construction and much of metal working, as well as in most service industries, not only is individual work largely operator- rather than machine-paced, but work in general is not patterned around one or several key technical processes. As a result, sequences are far less rigidly compelled, it is impossible to identify any one process as central, and tasks are typically defined in terms of their *direct* contribution to the achievement of the goal—the final product—rather than in terms of the roles performed in different phases of the production process. In these "product-centered" industries technology makes therefore much less of a contribution to the coordination of efforts unless it succeeds, by organizing "flow," in imitating the conditions prevailing in the "process-centered" industries. Thus, the efficiency-enhancing and coordination-promoting property of modern technology tends to be much more pronounced in process-centered than in product-centered industries.[18]

It is possible to classify a plant (or industry) into one or the other category by asking the question whether it has a definite capacity.[19] If a positive answer can be given, as is the case with a blast furnace, a refinery, or a brewery, we have a process-centered situation: with a certain equipment, it ought to be possible to produce so many tons or gallons per day. In the product-centered industries, on the other hand, it is not possible to make this kind of statement: there is no such thing as a set capacity of a construction firm or of a repair shop. This test illuminates another aspect of the manner in which technology in process-centered industries acts as an aid to management: the rated capacity of the plant provides managers with a performance goal and an objective criterion of failure or success, provided demand is adequate. This is a very valuable mechanism in underdeveloped countries where competition is often not a sufficiently strong spur to good performance.[20]

[18] In the product-centered industries, the well-known human drive to complete a task once it has been started, helps to some extent in stimulating work performances; but this effect is clearly much weaker than that deriving from technology in process-centered industries.

[19] This test was suggested to me by Alan S. Manne.

[20] In the paper cited in footnote 6, I pointed out that underdeveloped countries experience particular difficulties in insuring effective maintenance of equipment and machinery and that they therefore are likely to do comparatively well in industries or technologies where maintenance is virtually compelled by technical characteristics, as is the case when non-maintenance carries extremely stiff penalties. For example, the descending order of per-

We conclude that there are various ways in which capital enhances the efficiency of management and therefore of labor[21] and that this *stimulating* function of capital is of particular importance in underdeveloped countries where modern manufacturing is surrounded on all sides by a preindustrial society with its own work habits and without experience in coordinating and directing large-scale organization.

That there exists a strong social need for this stimulating function is suggested by the fact that, in the absence of modern technology, it is frequently performed in cooperative work by other devices, such as singing.[22] A particularly striking example of the elaborate way in which the function is performed in a primitive society is given by Raymond Firth in his description of the role of ritual in canoe-building and net-making in Tikopia.[23] He shows in minute detail how "certain types of ritual make for conformity of the work to a time-schedule and so help to safeguard the task from miscalculation and inertia." The ritual acts not only as a "unifying factor for the assembly of labor" and as a "general stimulus to the productive process," but also as a specific guide in the course of this process since "the traditional sequence of rites of necessity involves a corresponding sequence of technical operations."[24]

Finally, Firth shows that "with similar environmental, technical and social conditions, work of this kind [*i.e.*, work involving cooperation in large-scale activities] is performed with less regularity, secures a smaller labor force and is integrated less effectively where it is not accompanied by such ritual." His conclusion is that the extra degree of capital intensity implicit in the time-consuming performance of ritual is fully justified since without it output would substantially decrease and deteriorate.[25]

The parallel is complete with the special stimulating role which

formance of air lines, railroads and highways in these countries seemed to be explainable by the decreasing degree of compulsion to maintain them that is characteristic of these three modes of transportation in the order cited. This point can now be seen to be a special illustration of the interaction between techniques and work performance which must be kept in mind in development planning.

[21] The close relationship between organizational and managerial skills on the one hand, and labor productivity on the other, has been shown by Frederick Harbison, "Entrepreneurial Organization as a Factor in Economic Development," *Quart. Jour. Econ.*, Aug. 1956, LXX, 364-79.

[22] Georges Friedmann, *Industrial Society* (Glencoe, 1955), pp. 157-59, and sources there cited. *Cf.* also C. J. Erasmus, "Cultural Structure and Process: The Occurrence and Disappearance of Reciprocal Farm Labor," *Southwestern Jour. of Anthropology*, Winter 1956, XII, 452.

[23] Raymond Firth, *Primitive Polynesian Economy* (London, 1939).

[24] *Ibid.*, pp. 183, 179, 125 and 181.

[25] *Ibid.*, pp. 182-84.

modern technology performs and which because of difficulties in cooperation and the inexperience in management is particularly needed in underdeveloped countries. Here also some additional capital intensity may sometimes be well worth while if it "safeguards the task from miscalculation and inertia" and prevents decay.

It may well be therefore that production functions are not the same for developed and underdeveloped countries even though the underlying technological possibilities are identical. The marginal rate of

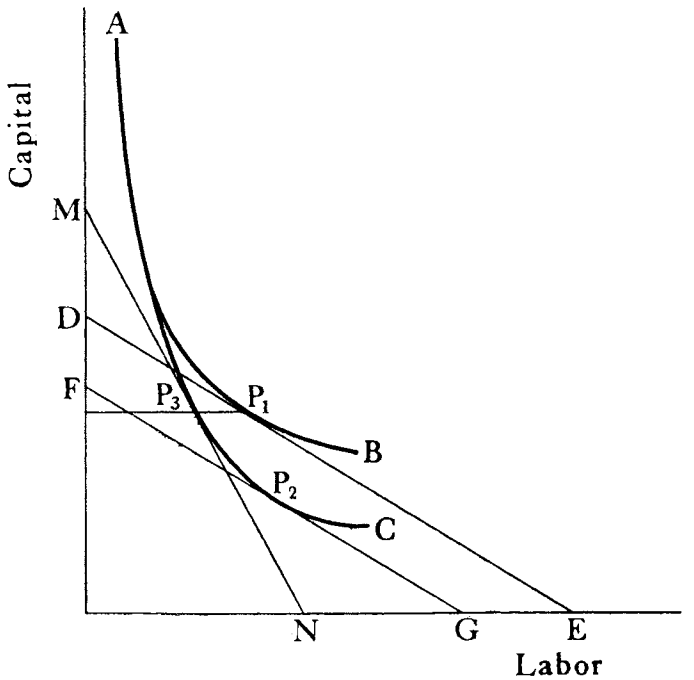

FIGURE 2

substitution of labor for capital is larger in underdeveloped countries as, with the loss in managerial and labor efficiency consequent upon the adoption of less capital-intensive methods, more labor is needed than in developed countries to make up for a given decrease in capital.

Using again the usual diagram, with labor and capital measured respectively along the abscissa and the ordinate, the constant-product curves for a given output of any good may be expected to coincide for industrial and underdeveloped countries only along their most capital-intensive segments. Thereafter the curves will follow different paths, with the isoquant of the underdeveloped country—curve AB in Figure 2—lying somewhat to the right of the isoquant AC that applies in the

industrial country. Only the latter is a genuine technical possibilities curve.

With this situation, it becomes immediately evident that identical relative factor prices in both countries should result in the adoption of more capital-intensive processes in the underdeveloped country than in the industrial one.[26] This is shown by comparing the points of tangency P_1 and P_2 of the two parallel lines DE and FG. Conversely and more realistically, if we assume that relative factor prices are less favorable to labor in the underdeveloped country, this does not necessarily mean that it should adopt less capital-intensive techniques than the industrial country. For instance, line MN reflects a higher ratio of labor costs to capital costs than line DE and yet, at their points of tangency P_3 and P_1 with the isoquants to which they belong, both ratios result in the same capital requirements.

Care should be taken not to read more into the preceding argument than it can bear. As stated at the outset, it applies only to the problem of appropriate factor proportions *within* the industrialized sector of the economy, not to the division between the industrial and preindustrial sectors, which was considered in Section III.

Secondly, with the low wage rates prevailing in some underdeveloped countries there remains the possibility that the limited choices which modern technology has to offer, are *all* too capital-intensive, even after taking into account the factors here discussed.

Thirdly, the argument has stressed above all the role of modern technology in determining the key production processes and in providing management with a guide to the basic breakdown of functions and sequences. There remains much room for labor-intensive operations on the periphery once they are fitted into the requirements of the central process. This applies, for instance, to materials-handling and internal transportation where, according to most observers, the variability in capital intensity from one country to another is greatest.[27]

Thus, our findings strengthen only moderately the case of the "capital-intensivists" in the current controversy about appropriate factor proportions in underdeveloped countries. Any practical usefulness our analysis can claim may rather lie in the investment criterion it contains. For if it is correct, then industrial planners in underdeveloped countries should see to it that the industries and techniques that are introduced are preferably those that induce minimum standards of performance on the part of labor and management. To disregard this

[26] Capital intensity is here understood to be measured by the capital-output, rather than by the capital-labor, ratio.

[27] *Cf.* Granick, *op. cit.*, and Seymour Melman, *Dynamic Factors in Industrial Productivity* (New York, 1956), Ch. III.

criterion might not result so much in additional labor requirements to make up for the loss of efficiency (this might rather be considered an advantage by the planner concerned with underemployment) as in speedy deterioration in the quality of output. Such deterioration could have a seriously demoralizing influence on the whole industrialization program.

There will of course be industries which do not rate highly from the point of view of our criterion, but whose establishment is nevertheless necessary or desirable on balance for a number of other reasons; repair facilities for machinery and vehicles are an example. It will nevertheless be useful to be aware of the special handicaps under which firms engaging in such activities are likely to operate, so that their management, personnel, and techniques may be selected with the appropriate safeguards.

Naturally, before any such practical applications, an empirical verification of our hypothesis should be undertaken. This might not be too difficult. If we are correct, labor productivity differentials between an underdeveloped and an industrial country should be much larger in certain industries (*e.g.*, metal fabricating) than in certain others (*e.g.*, cement) even when essentially similar techniques are used in both countries.[28]

Concluding Comments

This article has focused on a phenomenon that occurs constantly in the process of economic growth, namely the uneven course of progress of different industries and geographical areas within a country. It has been shown that the resulting split of a developing nation into advanced and traditional sectors may be of considerable width and duration and that this split may in turn affect the nature and direction of subsequent development. Tentative suggestions have been derived from the analysis for economic development policy in such matters as public

[28] It occurs to me that Leontief's celebrated findings about the comparatively high labor content of U. S. exports could be considered corroborative evidence (see his "Factor Proportions and the Structure of American Trade: Further Theoretical and Empirical Analysis," *Rev. Econ. Stat.*, Nov. 1956, XXXVIII, 386-407, and literature there cited). Conversely, Section IV of this paper provides an explanation of Leontief's statistics, related to the one he has proposed himself. I have suggested that it may be easier for underdeveloped countries to approach the efficiency standards of the advanced industrial nations in capital-intensive, process-centered, than in labor-intensive, product-centered industries. Therefore, as worldwide industrialization progresses, the comparative advantage of the advanced industrial countries may come to lie increasingly with certain types of labor-intensive goods and services. This can best be illustrated by a fanciful hypothesis. Let us imagine that certain labor-intensive services such as maintenance of roads, buildings and machinery, or the issuing of official permits, or the handling of personnel relations, could become objects of international trade at moderate transport costs. I have no doubt that in this eventuality the older industrial nations would specialize in the export of these services, quite possibly importing steel and cement in exchange.

investment in an underdeveloped country's own backward area, the role of small industry, and the type of technology appropriate for the modern sector of the economy.

Only passing mention was made of the social and political consequences of uneven development. However, serious dangers for a country's peaceful and democratic evolution are implicit in the numerous conflicts that are certain to arise from the cleavage between "North" and "South" and from the prolonged coexistence of modern industry with many traditional forms of production and distribution. On this score also, some value may attach to a more intimate understanding of the nature of these conflicts, of their probable course and possible resolution.