1 Management in a Model of Economic Development

In considering the question of the relative speed of economic development of different nations, a concept frequently used is that of the "advantage of backwardness."[1] This is the common-sense notion that a country which lags behind the most advanced levels of technology and organization which are known and proved workable can make great strides in productivity by adopting these available techniques. Such a country can be regarded as functioning inside its transformation curve rather than on its border;[2] the greater the degree to which it is operating inside its transformation curve, the larger is its potential for achieving productivity growth. This leads to the expectation that, ceteris paribus, less-developed countries should grow at a faster rate per capita than do the more-developed countries.

It should be noted that this expectation has nothing in common with the view that countries should be expected to grow more rapidly when they are poorly developed than when they are highly developed—relative to some absolute standard—because of the respective levels of their development at different times. When one contrasts the annual rate of growth in gross domestic product per member of the labor force in the United States and western Europe between 1900-1966 and 1950-1966 (see Table 1.2), the growth rate in the postwar years in both geographic areas is so much higher that the difference cannot be reasonably accounted for simply by the effect of the two world wars. There is neither logic nor evidence for the view that it becomes more difficult per se for countries to maintain a high rate of growth as their per capita income level mounts. It is only backwardness relative to those levels of technology and organization which are currently known which would seem to matter.

It is true that a worldwide comparison of rates of growth provides no clear evidence for the view that even relative backwardness is an advantage.[3] But the absence of a higher rate of growth in the less-developed countries can be readily reconciled with the doctrine of the "advantages of backwardness" by pointing to two major peculiarities of many currently less-developed nations:

[1]This was developed by Alexander Gerschenkron. See his *Economic Backwardness in Historical Perspective* (Harvard University Press, Cambridge, Mass., 1962).

[2]A technique is considered more advanced than another only when the first yields a greater output per unit of mix of factor inputs regardless of whether the individual input factors are priced at the shadow prices of the more- or of the less-developed country.

[3]It should be remembered that national income statistics of growth rates are inherently biased upwards for countries emerging into a market-economy stage, due to the fact that no deduction is made for the increased transport, merchandising, and other costs of operating such an economy.

Table 1.1 Annual Rate of Growth in Gross Domestic Product 1950-1966 (Percentages)

	Total G.D.P.	Per Capita G.D.P.
More-developed countries[a]	4.4	3.2
Less-developed countries[b]	4.5	2.2

Source: *Yearbook of National Account Statistics 1967* (United Nations, New York, 1968), Table 6b, pp. 819-823.
[a]Countries of Europe (excluding the USSR and Eastern Europe), North America, Oceania and Japan, and the Union of South Africa.
[b]Countries in Africa (excluding the Union of South Africa), the Caribbean and Latin America, East and Southeast Asia (excluding Japan, mainland China, Mongolia, North Korea, and North Vietnam), and the Middle East (excluding Cyprus and Turkey).

the failure to have reached a point of "takeoff",[4] and the existence of an exceptionally high rate of population growth.

It is thus more interesting to turn to a comparison that avoids these peculiarities. Such a comparison can be made by restricting our universe of countries to those which are relatively developed, and comparing the world leader (the United States) with the major groupings from the rest of the field.

Table 1.2 indicates that the rate of growth of the output/labor ratio over a long period has been no greater in the backward region (western Europe) than in the advanced country. A comparison restricted to the post-Second World War period shows some "catching up," but it still seems slight—at least for western Europe and the Soviet Union—relative to the large degree of backwardness involved.

How can we explain the fact that, within the universe of countries which are all considered developed by international standards, the equalization of income levels has proceeded so slowly? All are fully capable of absorbing the latest technologies. None of the countries has suffered from peculiarly great population pressures. While it is true that the ratio of investment to national income was lower in western Europe than in the United States until after the Second World War, this was compensated for by a much smaller rate of growth in the labor force. Certainly the United States may profit from certain advantages which have not been diminished, such as superior natural resources and the possibilities of greater economies of scale; but it is difficult to believe that these account for a very large portion of the continuing discrepancy.

A useful way of explaining this retardation is by the hypothesis that the

[4]This can be thought of as reflecting both the failure to achieve a viable ratio of net investment to national income and of the inability to overcome many social and psychological obstacles to growth.

other developed countries show a slower speed of adjustment to changing conditions than does the United States. Modern industrial economies are faced with a constantly changing world transformation curve both with regard to new technologies (including organizational methods) and new products.[5] A country that lags in its rate of adjustment will steadily fall behind the leader in its ability to utilize these new possibilities; on the other hand, to the extent that it enjoys the "advantage of backwardness," its exploitation of this resource will provide a compensation in its growth rate. There is no general reason to expect one or the other factor to dominate.

The hypothesis can be described in the model
where

$$\frac{dz}{dt} = ax\frac{db}{dt} - (1-x)\frac{dc}{dt} - (1-x)\frac{de}{dt},$$

with

z = observed difference between the rates of growth in gross national product per member of the labor force in the lagging country and in the leading country;

a = the degree of backwardness (defined as the intercountry relationship between gross national product per member of the labor force) relative to the leading country other than that accounted for by long-term disadvantages such as inferior national resources and lesser possibilities for achieving economies of scale;

x = the speed of adjustment of the lagging country as a percentage of that of the leading country;

db/dt = the annual rate at which the country would make good its backwardness if its speed of adjustment were the same as that of the leading country;

dc/dt = the rate of expansion of the international transformation curve, assuming both the speed of adjustment of the leading country and sufficient investment to embody the necessary changes;

de/dt = the rate of change in national income due to change in other noninput factors in the leading country—in particular, structural change between sectors and economies of scale; and

[5]See H. Aujac, "Le Passage de l'invention à la production," Congrès des économistes de langue française, May 1966. McGraw-Hill surveys of 1960-1965 showed that new products constitute 10 to 14 percent of the sales of American manufacturing as a whole. (New products are defined as those which meet the twin criteria of not having existed five years earlier and of being considered new by experts in the industry concerned.)

Table 1.2 Comparisons of Production per Member of the Labor Force Among Developed Countries

Measure of Comparison	United States	Western Europe					Soviet Union
		Including United Kingdom	Excluding United Kingdom	France	United Kingdom	Japan	
1. Gross national product per member of the labor force, 1966 (U.S.=100)							
U.S. weights	100	58	61	67	49	28	31
Own country weights, non-U.S.	100	43	43	49	41	...	...
2. Industrial production per member of the industrial labor force, 1966 (U.S.=100)							
U.S. weights	100	47	50	55	36	25	...
Own country weights, non-U.S.	100	35	36	40	30	...	...
3. Gross domestic product per member of the labor force, annual rate of growth, 1900-1966 (percentage)							
U.S. weights	1.8	1.7	1.8	...	...	...	...
Own country weights, non-U.S.	1.8	1.7	1.8	1.8	1.2	...	...
4. Gross national product per member of the labor force, annual rate of growth 1950-1966 (percentage)							
U.S. weights	2.6	4.1	4.6	...	...	...	...
Own country weights, non-U.S.	2.6	4.0	4.5	4.5	2.2	7.9	5.0

Table 1.2 (continued)

Measure of Comparison	United States	Western Europe					
		Including United Kingdom	Excluding United Kingdom	France	United Kingdom	Japan	Soviet Union
5. Industrial production per member of the industrial labor force, annual rate of growth 1950-1966 (percentage)							
U.S. weights	3.1	4.4	5.0		...	...	
Own country weights, non-U.S.	3.1	4.3	4.9	4.8	2.2	9.5	7.5

Notes: Western Europe is taken as the weighted average of Belgium, Denmark, France, Germany, Italy, Netherlands, Norway, Sweden, and the United Kingdom–the choice of countries being partly determined by the availability of data. Purchasing power equivalents between currencies are given for 1955 for all west European countries except Sweden in Milton Gilbert & Associates, *Comparative National Products and Price Levels: a Study of Western Europe and the United States* (O.E.E.C., Paris, 1958); for 1960 for Sweden and Japan in Irving B. Kravis and Michael W. S. Davenport, "The Political Arithmetic of International Burden-Sharing," *Journal of Political Economy*, August 1963. The 1966 comparisons between countries as to the levels of gross national product and of industrial production are made by extrapolating the 1955 and 1960 purchasing power equivalents to 1966 by dividing the United States G.N.P. price deflator by each foreign country's G.N.P. price deflator. The summation procedure for western Europe as a whole in foreign country weights rests upon the crude assumption that the price structures of the various west European countries are similar. Basic output and labor-force data are generally taken either from OECD or national economic statistics. Labor force is defined to include the armed forces. However, the source used for the 1900-1966 comparisons is Angus Maddison, *Economic Growth in the West* (Twentieth Century Fund, New York, 1964). Soviet data are taken from the articles by Stanley H. Cohn and James H. Noren for the Joint Economic Committee of the United States Congress, *New Directions in the Soviet Economy* (U.S. Government Printing Office, Washington, D.C., 1966), and from the Joint Economic Committee's *Soviet Economic Performance: 1966-67* (U.S. Government Printing Office, Washington, D.C., 1968).
Postwar annual rates of growth in labor productivity cover, in general, the period 1950-1966. However, the dates vary somewhat by country for three reasons: to eliminate recovery to the prewar level; to allow for business cycle variations; to take advantage of the best statistical sources. Countries for which the period covered is other than 1950-1966 are: Denmark (1951-1966), Germany (1954-1966), Norway (1951-1966), United Kingdom (1951-1966), and Japan (1955-1966). For industrial production only, the Soviet Union is analyzed for the period 1950-1965.

$dc/dt + de/dt$ = the rate of growth in gross national product per member of the labor force in the leading country.

For purely expository purposes, we might assume the following values:

$$\frac{dz}{dt} = 2 \text{ percent per annum}$$

$$a = 0.5$$

$$\frac{db}{dt} = 10 \text{ percent per annum}$$

$$\frac{dc}{dt} + \frac{de}{dt} = 2.6 \text{ percent per annum}$$

Given these values, then x would equal 0.60. If x had equaled unity, and the other values had been the same, then dz/dt would have been 5 percent per annum and the lagging country would have approached the level of the leading country at two and one-half times the assumed rate of speed.

While the above example is only expository, it is not completely arbitrary, being based upon a comparison of the United States and continental western Europe. Employing what are essentially historical data for 1950-1966, and making a quite arbitrary assumption only for the value of db/dt (10 percent per annum), we derive the values of x shown in Table 1.3.

The relative values of x for these five different portions of the world seem quite reasonable. Note that, of the lagging countries, it is only Japan whose value of x is close to unity.[6]

Table 1.3 Values of the Speed of Adjustment

	x
United States	1.0
Japan	0.91
Continental western Europe	0.60
Soviet Union	0.56
United Kingdom	0.31

Note: The data for the various entries is for the following years: United States, 1950-1966; Japan, 1955-1966; continental western Europe, 1950-1966, with 1954-1966 for Germany; Soviet Union, 1950-1966; and United Kingdom, 1951-1966.

[6]In determining the degree of backwardness of the other countries with respect to the United States, own-country weights are used for Japan, the Soviet Union, and the United Kingdom, and the geometric weights of the results obtained from using United States and continental western European weights for this last region. In deriving the value of a for each country, the assumption is made that one-fifth of the backwardness was due to long-term disadvantages.

The above model—which is intended only for secular and not for cyclical analysis—includes a vital assumption as to the degree to which a lagging country can utilize its "advantage of backwardness": namely, that it cannot profitably concentrate all of its technical and organizational effort and its investment resources into improving the areas of existing backwardness at the expense of failing to utilize expansions in world technical knowledge as the international transformation curve moves outward. The justification for this assumption is twofold. On the one hand, the mass of organizational effort available nationally is diversified throughout the economy in the form of the labor force and managerial talent present in each enterprise; it cannot be concentrated. Second, and more important, "catching up" is a sequential process: both because improvements in one enterprise depend on prior improvements in materials, services, and market acceptance by other enterprises and because, within the same enterprise, organizational and technical changes often require prior success in different innovations.

The model also treats gross domestic investment as an implicit dependent variable, being provided in sufficient amounts to support the growth in gross national product which derives from improvements in technology and organization as well as from increases in the size of the national labor force. This implies not only that the level of investment is not a restriction upon a country's increase in labor productivity but also that no gains can be hoped for from the substitution of capital for labor as a result of changes in relative factor costs. The capital/labor ratio is treated as varying purely as a function of the rate of adoption of particular innovations, which happen to be more or less capital intensive. This follows from the omission of capital from my model.

The justification for ignoring the bottleneck aspect of gross domestic investment is that, particularly in economies such as those of western Europe which are reasonably linked to the international capital market, investment will presumably respond to expected profit margins; these, in turn, should be a function of the opportunities confronting the economy and of its ability to take advantage of them. The effect on expected profit margins of different national patterns of income distribution as between wages and profit is ignored. Furthermore, the significance of changing relative factor costs for the combination of factors of production, and thus for labor productivity, is left outside the model on the ground that its quantitative importance is probably secondary among the developed countries that we shall be examining.

The foregoing hypothesis, put in terms of speed of adjustment to change, is primarily a supply analysis. However, as was already pointed out, it also explains the demand for investment resources. Now we can extend the demand analysis to an examination of the balance of trade problem.

In post-Second World War western Europe, it seems reasonable to posit that demand has been secularly restricted below the level needed to ensure full utilization of resources only by the need to protect the balance of payments positions of the nations concerned. If we assume that the prices of export and import goods produced in a country are a function of that country's average unit wage costs, then the evolution of the balance of trade of a country must be a joint function of the changes in the wage level and productivity of that country relative to that of its trading partners.

These assumptions mean that the evolution of a country i's balance of trade is a joint function of db/dt, dc/dt, de/dt, and of the country's values of a_i, x_i, and dy_i/dt relative to its trading partners, where dy_i/dt expresses country i's change in the money wage level. The higher a country's values of a and x relative to its trading partners, the higher the value of dy_i/dt which it can permit itself without the government being forced to depress the country's demand level below that of full utilization of resources. A nation with a relatively low combination of a and x can afford to maintain demand only if it can develop adaptive procedures to restrain appropriately its dy_i/dt growth. Britain is the prime example of a country with a relatively low combination of a and x which has failed to limit its dy_i/dt below that of its trading partners, and which thus has been forced to restrict demand. Demand restriction, in turn, has held down Britain's value of x. The resulting vicious circle can be thus interpreted as a failure in adaptation.

If we compare the present-day problem of "catching-up" to the similar problem facing continental western Europe in relation to Britain or the United States during the pre-First World War era, current difficulties appear substantially greater. This is the case for two reasons.

First, $dc/dt + de/dt$ (the rate of growth in gross domestic production per member of the labor force in the leading country) is substantially greater today[7] and is likely to remain so. The critical reason for this is that dc/dt, the

[7]During the period 1870 to 1913, gross domestic product per person of working age increased by an average compound rate of 1.2 percent in the United Kingdom and by 1.9 percent in the United States. (Angus Maddison, *Economic Growth in the West*, Twentieth Century Fund, New York, 1964, pp. 199-209.) Between 1950 and 1966, United States gross national product per member of the labor force increased by an average compound rate of 2.6 percent.

rate of expansion of the international transformation curve, seems to be considerably more rapid today than earlier. For, with the stepping-up both of higher education and of the proportion of research and development expenditures to national income, the pace of technological and organizational advance has accelerated.

With dc/dt higher today, only a compensatingly higher value of x_i (the speed of adjustment of the lagging country as a percentage of that of the leader) could make possible the equalization of the rate at which the continental countries once caught up with Britain. The lagging countries must perform much better in adapting to change than was ever previously necessary in order to equal the historical performance of the half century preceding the First World War.

Adjustment to Change

Adjustment to change can be readily divided into four components, with a fifth component representing all the residual factors. Let these components each be represented by x_j, and comparable components of backwardness by a_j. Then

$$\sum_j a_j x_j \frac{db}{dt} = ax \frac{db}{dt}.$$

The component x_1 is the speed of adjustment of the economy as a whole in the lagging country, relative to that in the leader, in changing sectoral structure in the direction of greater employment in those sectors with higher value added per member of the labor force. Also, x_1 represents adjustment to changing present and forecast demand schedules as well as to international trade possibilities; it requires not only sectoral mobility of labor force and investment, but also business organization and regional mobility as well.

The movement out of agriculture has historically been the prime case of the x_1 type of adjustment. In recent years, $a_1 x_1$ has been of major significance in the continental west European countries and in Japan.[8] But while there remain considerable reserves of a_1 in these nations, the sharp reduction that has already occurred in continental western Europe in the proportion of the labor force engaged in agriculture makes it unlikely that the $a_1 x_1$ component of growth in gross national product in these countries can be maintained.

[8]For continental western Europe, see E. F. Denison, *Why Growth Rates Differ* (The Brookings Institution, Washington, D.C., 1967), p. 215.

The component x_2 is the speed of adjustment of the economy as a whole in eliminating diseconomies of scale that arise from excessively tiny enterprises. The rate of elimination of nonfarm enterprises with no paid employees might be taken as a proxy for this. Here, too, the potential for improvement is rapidly diminishing.

The component x_3 constitutes the macroadjustments by the government to ensure the full use of economic resources. All the countries in our universe have done much better in this regard since the Second World War than was ever the case before. But there seems no obvious reason to believe either that the European countries have done better than the United States in this regard,[9] or on the contrary, that this represents an area of lag on their part. As the situation stands today and in the likely future, x_3 is a neutral force with regard to relative growth rates among the countries in which we are interested.

The component a_4 represents the area of backwardness in technology and organization, aside from those diseconomies of tiny enterprises which are treated under a_2. The relevant x values are labeled as x_{4a} and x_{4b}.

The component x_{4a} represents the relative willingness and ability of nonmanagerial labor to adjust to changing conditions. Willingness and ability to learn new skills, to raise productivity in individual enterprises in line with the potentials of new technologies, to accept employment in different industries and geographic locations and to accede to the working of shifts: all these are involved. The existence of low values for x_{4a} appears to be a major area of weakness of European countries relative to the United States. This is due in part to housing shortages that penalize geographic mobility. It is due in part to lower general educational levels, which make the learning of new skills more difficult. To a marked degree, it is due to working class traditions. But also, to a considerable extent, it is due to the failure of enterprise managements to offer the kind of industrial leadership that motivates and makes technically feasible these adjustments of the labor force.

The component x_{4b} is the willingness and ability of enterprise managements to adjust to changing conditions. This is the component with which I shall be concerned in this book.[10]

[9]The lower rates of unemployment do not of themselves indicate superiority, for they often represent no more than underemployed manpower—whether this be spread throughout the economy (as has too often been the British experience), or whether it be concentrated in particular sectors such as agriculture (as in France).

[10]The factors x_{4a} and x_{4b} are obviously closely related to Professor Liebenstein's concept of X-efficiency. His and my approaches share the common features of reflecting

It is x_{4a} and x_{4b}—the micro as contrasted with the macro elements of adjustment—that represent the prime deficiencies in the x factor of the lagging countries. It is their values in particular that will have to be raised significantly if the process of catching up is not to be reduced sharply as the possibilities represented by a_1 and a_2 decline.

The approach of this book is that managements are constantly faced with possibilities, advantageous or disadvantageous, for change; and that the quality of a management's contribution to increases in productivity rests in its ability to respond to these opportunities. The response includes both the specific decisions related to change which are made by management, and the actions which are taken to carry out these decisions.

The managerial function in a modern industrial society is viewed as primarily consisting of adapting the enterprise to changes of all sorts. If demand and supply conditions and the state of knowledge were stable over time, even the poorest management might be expected eventually to stumble into a reasonably satisfactory adaptation to its situation. The differences in quality of management between individual firms that had survived for a long period would not be likely to be great.

From this perspective, management as a factor in the production process differs fundamentally from those of labor and capital as these are traditionally treated in production functions. The usual production-function approach considers that available factors have their full effects either on current production or on production which is a specific number of periods in the future. A country with a lower input of factors than another nation will have lower production; but there is no reason to assume that its rate of growth will be affected. Management, however—like any other factor affecting the x variables—is involved in the adaptation process and thus in the rate of change. It is true that the quality of management can properly be treated as a conventional input into the production function for currently-produced goods; as such, it affects only the production level. But to the extent that it is correct to consider it as primarily consisting of a capacity for adaptation to change, it

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a concern with adaptability to change, and with holding to the importance of the fact "that firms and economies do not operate on an outer-bound production possibility surface consistent with their resources." While our analyses are quite different, they are complementary rather than competitive. My interest is the differences between what might be called X-efficiency in different industrial cultures, while Leibenstein has not concerned himself with cultural factors. (See H. Leibenstein, "Allocative Efficiency vs. 'X-Efficiency'," *American Economic Review*, June 1966, pp. 392-415 and "Organizational or Frictional Equilibria, X-Efficiency, and the Rate of Innovation," *Quarterly Journal of Economics*, November 1969, pp. 600-623.)

is an argument in a function which yields the rate of change of production (such as my model above) rather than in a function which provides the absolute level of production in a given period.

The purpose of this book is to study management as a factor of production, viewing the relevant production function as dynamic rather than static.