

# Jan Tinbergen

NOBEL LAUREATE JAN TINBERGEN was born in 1903 in The Hague, the Netherlands. He received his doctorate in physics from the University of Leiden in 1929, and since then has been honored with twenty other degrees in economics and the social sciences. He received the Erasmus Prize of the European Cultural Foundation in 1967, and he shared the first Nobel Memorial Prize in Economic Science in 1969.

He was Professor of Development Planning, Erasmus University, Rotterdam (previously Netherlands School of Economics), part time in 1933–55, and full time in 1955–73; Director of the Central Planning Bureau, The Hague, 1945–55; and Professor of International Economic Cooperation, University of Leiden, 1973–75.

Utilizing his early contributions to econometrics, he laid the foundations for modern short-term economic policies and emphasized empirical macroeconomics while Director of the Central Planning Bureau. Since the mid-1950s, Tinbergen has concentrated on the methods and practice of planning for long-term development. His early work on development was published as *The Design of Development* (Baltimore, Md.: Johns Hopkins University Press, 1958).

Some of his other books, originally published or translated into English, include *An Econometric Approach to Business Cycle Problems* (Paris: Hermann, 1937); *Statistical Testing of Business Cycle Theories*, 2 vols. (Geneva: League of Nations, 1939); *International Economic Cooperation* (Amsterdam: Elsevier Economische Bibliotheek, 1945); *Business Cycles in the United Kingdom, 1870–1914* (Amsterdam: North-Holland, 1951); *On the Theory of Economic Policy* (Amsterdam: North-Holland, 1952); *Centralization and Decentralization in Economic Policy* (Amsterdam: North-Holland, 1954); *Economic Policy: Principles and Design* (Amsterdam: North-Holland, 1956); *Selected Papers*, L. H. Klaassen, ed. (Amsterdam: North-Holland, 1959); as coauthor, *Programming Techniques for Economic Development* (Bangkok: U.N. Economic Commission for Asia and the Far East, 1960); with H. C. Bos, *Mathematical Models of Economic Growth* (New York: McGraw-Hill, 1962); with others, *Shaping the World Economy* (New York: Twentieth Century Fund, 1962); *Essays*

in *Regional and World Planning* (New Delhi: National Council of Applied Economic Research, 1964); *Central Planning* (New Haven, Conn.: Yale University Press, 1964); with others, *The Case for an International Commodity Reserve Currency* (Geneva: UNCTAD, 1964); *Development Planning* (New York: McGraw-Hill, 1967); *Income Distribution: Analysis and Policies* (Amsterdam: North-Holland, 1975); and, with others, *Reshaping the International Order* (New York: Dutton, 1976).

Some of his articles on economic development and economic planning are: "Capital Formation and the Five-Year Plan," *Indian Economic Journal*, January 1953; "Problems Concerning India's Second Five-Year Plan," *Public Finance*, February 1956; "The Optimum Choice of Technology," *Pakistan Economic Journal*, February 1957; "The Use of a Short-Term Econometric Model for Indian Economic Policy," *Sankhya: The Indian Journal of Statistics*, April 1957; "International Coordination of Stabilization and Development Policies," *Kyklos*, March 1959; "Problems of Planning Economic Policy," *UNESCO International Social Science Journal*, March 1959; "The Appraisal of Investment Projects: The Semi-Input-Output Method," *Industrial India*, 1961; "Planning in Stages," *Statsokonomisk Tidskrift*, January 1962; and "Wanted: A World Development Plan," *International Organization*, January 1968.

# Development Cooperation as a Learning Process

My understanding is that this book deals with a twofold learning process: the one through which, in the last half-century, all who participate in the process of cooperation have gone and the one that goes on inside each of us. The former could not have existed without the latter: in order to change one's mind one has to be honestly convinced of the necessity for accepting the change.

Like a number of others in the field of economics I deserted the subject of my education, physics, under the influence of the phenomena of poverty—to begin with, in my own country. I made this switch in 1929, the very year the Great Depression started. The latter created still more poverty, even in the industrialized world. Intellectually, it was the cyclical component in economic movements that first caught our minds. I had the privilege to work, first, at the Netherlands Central Bureau of Statistics on business cycle research, and from 1936 to 1938 at the League of Nations secretariat at Geneva (so my first experience abroad was not exactly in a poor country).

Soon after my family's return to the Netherlands, the country was invaded by the German army and cut off from the remainder of the world. This gave me plenty of time to think over a number of problems left open by the work so far on economic movements. Two of the resultant issues of concentration seem to fit the present essay. One is that in addition to understanding cyclical movements we need understanding of the trends around which these cycles are supposed to fluctuate. The other is the desperate need for international cooperation instead of cruel conflicts. Both issues found their expression in written form. *International Economic Cooperation* was the title of an amateurish book I published after the war.<sup>1</sup> The first subject was dealt with in a theory of trend movements, published in German in 1942 and translated into English in 1959.<sup>2</sup> This

1. Amsterdam: Elsevier, 1945.

2. First published as "Zur Theorie der langfristigen Wirtschaftsentwicklung," *Weltwirtschaftliches Archiv*, vol. 55 (1942), pp. 511–49. As a check on the non-Nazi attitude of the journal editors, I had quoted a considerable number of Jewish authors.

trend theory in fact was a theory of development in an embryonic state, though narrowly economic and not inspired by personal experience in the Third World. At most, therefore, it can be seen as a prelude.

Its (shaky) empirical basis was a collection of heterogeneous data on France, Germany, the United Kingdom, and the United States, 1870–1914. The theoretical frame was at the level one could expect for the early 1940s. A first distinction was made between periods in which production is determined by the supply side and those in which it is determined by demand. For long-term movements the supply side was considered more relevant. Production, and hence real income, was assumed to depend on the supply of labor and of capital. The relationship determining production was assumed to be a Cobb-Douglas function with disembodied exponential technological development; the exponents of labor and capital were three-fourths and one-fourth respectively. The supply elasticity of capital with regard to its price (interest) was assumed to be zero; labor supply was given values ranging from  $-1$  to infinity. The supply of labor was also assumed to depend proportionally on population, itself growing exponentially. Capital formation was taken to be a fixed proportion of real income. Other assumptions with regard to the supply elasticity of capital and the development of population over time were considered. For the central case described in the preceding sentences two main results were offered: (1) the time shape of production and (2) the growth rates, for the middle of the period considered, of capital, labor, and product for four different values of labor supply elasticity.

The whole exercise was meant as a supplement to business cycle theory and was typically inspired by the situation in developed countries and by the absence of massive unemployment in the phase of prosperity. Hence my qualification that it was a prelude, and a theoretical one at that, to the sort of development theories we need for developing countries.

### First Confrontation with Developing Countries

During the first postwar decade I was mainly assigned the task of heading the Central Planning Bureau of my own country, the Netherlands, but I did visit a Third World country, India. In 1951 I was a guest at the International Statistical Institute, at the initiative of its prominent member, P. C. Mahalanobis. As the institute's secretary, I went to New Delhi as well as to Calcutta. Although in Holland we had been hungry during 1944–45, the last winter of the occupation by Hitler's army, the poverty

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The editors accepted my text without changing it. The paper was translated as "On the Theory of Trend Movements," in L. H. Klaassen, L. M. Koyck, and H. J. Witteveen, eds., *Jan Tinbergen: Selected Papers* (Amsterdam: North-Holland, 1959), pp. 182–221.

prevailing in India—as a normal situation—was such a contrast that it redirected my thinking and main activities.

In 1955 I left the Dutch planning office and accepted a full-time professorship, with research possibilities, at the Netherlands School of Economics (now the Economics Faculty of Erasmus University), Rotterdam, combined with a similar task in the Netherlands Economic Institute, which operated on a contract basis and to a large extent paid its own way. This brought me to at least a dozen other countries in the three underdeveloped continents. Most intensively I was involved in Turkey and Egypt. In order to contribute to what seemed to me to be the highest priority from a humanitarian standpoint, it was necessary to use my “comparative advantages,” which I assumed to reside in my (self-made) economic thinking. One of the clearest characteristics of underdevelopment is, of course, capital scarcity. This shows up in the most diverse observations even a superficial visitor can make: not only the quality of dwellings, but also the overcrowded trains, trams, and buses and, typically, the small size of the average shop, not to speak of the number of trades practiced in the open air.

Simultaneously, the contrasts between poor and rich, which are definitely much greater than in Western Europe, reflect at least two features: differences in and scarcity of *human* capital and other differences in power. I use the word “other,” since differences in human capital constitute differences in economic power, but the word “power” is less used by economists than by sociologists.<sup>3</sup> Upon closer observation, errors in economic decisionmaking are seen as another possible cause of underdevelopment. This at least was my conclusion when in 1957 I was shown a highly automated textile factory in Egypt, with a capital intensity far out of gear with the country’s endowment of capital and labor.

### Some of My Teachers

The twofold learning process referred to in the introductory section cannot be discussed without mentioning some personalities who have strongly influenced my thinking. If important contributors to development

3. Often this difference in terminology creates the misunderstanding that economists altogether disregard the phenomenon of power. They deal with at least two types of power whose reduction requires different instruments: the power of scarcity, just mentioned, and the power of monopoly. Scarcity can be reduced by production; that is, scarcity of human capital can be reduced by increased education, which is production of skill. Monopoly can be reduced by competition. The economist does suggest some means to reduce undesirable power. But the sociologist is able to add more possibilities—for instance, the reduction of discrimination because of caste or sex, which in many developing countries is very striking.

theory are lacking in my list, it may be because of my bad luck in not meeting them or the mistake I made in not reading them.

In my learning process Paul Rosenstein-Rodan was the pioneer, partly because of his very early research on how to develop Southeastern Europe, but especially his famous MIT study.<sup>4</sup> Probably this is the most careful basis for the “1 percent target,” which has been the most characteristic unifying thought of all who have participated in the campaign for development cooperation—from Hans Singer via the Pearson Commission and the United Nations Development Planning Committee to the Independent Commission on International Development issues (Brandt Commission).<sup>5</sup> Singer was the main author and proponent of a program for “the” U.N. Development Decade, 1961–70. In Latin America’s Comisión Económica para América Latina (CEPAL) and later at the world level (UNCTAD), it was Raúl Prebisch whose persistence I have always admired. My first steps in technical assistance missions were guided by Manuel Pérez Guero in Cairo, where he was resident representative of the United Nations Development Programme. Later, in his own country, Venezuela, his courage would show me some of the nonintellectual ingredients needed for a development policy worth the name. Several of my younger colleagues, among them Leida van Oven and Jan Breman, made similar contributions. An impressive guide in the slums of Dakar was my French colleague, Jacques Burnicourt. The practical American approach was symbolized by Edward S. Mason, with his pupils in every region of the world.

### The Need for a General Framework

By a happy coincidence, one of my first tasks in the field of development policy was set by an invitation from the World Bank to compose a general guide to civil servants in both developing and developed countries confronted with responsibilities in the field of development policy. In their heavy day-to-day decisionmaking they have to consider so many concrete details that they cannot “see the woods for the trees.” This invitation, which I gladly accepted, forced me to adapt my experience with the Dutch approach to planning, and what I had learned in discussions with Western

4. “International Aid for Underdeveloped Countries,” *Review of Economics and Statistics*, vol. 43 (1961), pp. 107–38.

5. See Lester Pearson and others, *Partners in Development* (New York and London: Praeger, 1969). For the work of the U.N. Development Planning Committee, see *Towards Accelerated Development*, no. E.70.II.A.2 (New York: United Nations, 1970); *Renewing the Development Priority*, no. E.73.II.A.7 (New York: United Nations, 1973); *Continuity and Change: Development at Mid-Decade*, New York, no. E.75.II.A.6 (New York: United Nations, 1975); and *Launching a Third Decade of Development*, no. E.79.II.A.7 (New York: United Nations, 1979). The report of the so-called Brandt Commission is *North-South: A Program for Survival* (London and Sydney: Pan Books; Cambridge, Mass.: MIT Press, 1980).

and Eastern European politicians about many variants of it, to the situation in developing countries as far as I knew it. The book that resulted was *The Design of Development*.<sup>6</sup>

Among the difficulties the underdeveloped countries had to face, some were well known: the tendency toward too ambitious goals and projects, the failure to avoid inflationary tendencies, the waste of resources in various sorts of bottlenecks or by inexperienced national politicians, together with the widespread disease of corruption—often simply as consequences of poverty and underdevelopment, but also in part a response to colonial relationships or local culture.

One necessary ingredient for a more efficient and somewhat less inequitable development was a better understanding of the main economic interrelations and of the orders of magnitude of the phenomena at stake—and hence of the limits to what a nation with modest endowments could attain. Also essential were minimum standards of law and order, a minimum of financial and monetary policies, and social stability. Previously, these had been provided, up to a point, by colonial rulers, although then they had been biased by colonial interests rather than by those of the colonized country. Another basic need, that of a minimum of schooling, was recognized but not dealt with.

The general orientation needed could, to a considerable extent, be provided by statistics. Only ten years or so earlier, in the 1940s, developed countries had integrated into their national accounts a bookkeeping system for the nation as a whole. Even if only rudimentary, an idea of the orders of magnitude involved could help stimulate a sense of proportion—something many politicians lacked, even in developed economies, during the Great Depression. These sets of figures, and attempts to set future goals for them, serve as a basis not only for government decisions and negotiations, but also for market analyses of private firms.

In *The Design of Development* I discussed some of the techniques available and used for setting realistic targets and deriving appropriate policy instruments, including estimates of future production, consumption, and investment; evaluation of public investment projects; the choice of appropriate industries; and the means to stimulate private initiatives. The text also deals with some technical instruments to support evaluation, including what we now call shadow prices. Some central problems will be dealt with below in more detail.

## The Early Approach: Physical Capital and Project Appraisal

With physical capital so visibly in short supply in underdeveloped countries, it is understandable that early theories gave a central place to

6. Baltimore, Md.: Johns Hopkins University Press, 1958.

the need to expand these countries' stock of capital goods, whether infrastructure or superstructure. Two main problems immediately arise: how much capital would be needed and on what should it be spent?

Rosenstein-Rodan had made his path-breaking contribution to the question of the total amount and its distribution over countries. Its hard core was the Harrod-Domar model and its central concept the capital-output ratio, meaning that the portion of national product to be available for investment should be several times the annual rate of growth of national product desired.<sup>7</sup> Self-sustained growth of a country would be attained when its savings equal the necessary investment. Development cooperation was seen as providing the temporary supplement to what could reasonably be expected to be saved by the better-off in countries where the average income meant a very low level of well-being.

Choosing concrete figures for each of the concepts implied a lot of arbitrariness, and striving for an "optimal" policy needed a number of heroic guesses. A logical start was, of course, to observe the recent past and then opt for a somewhat higher figure. In practice, the narrowest of all the bottlenecks often determined its actual dimension. In many of the least developed countries this was the absorptive capacity (that is, the number of sufficiently concrete blueprints for projects); for many of the more developed countries the bottleneck was the donor's willingness to supply capital. But all sorts of other bottlenecks turn up during the execution of a given project: material supplies, certain types of skilled workers (from manual to managerial), and various bureaucratic shortcomings.

The second main question—on what objects should the capital be spent?—has given rise to a new industry: project appraisal. Essentially the answer is that the project promising the highest present value of all future yield should be preferred. Estimating the yields to be expected in each consecutive year requires a detailed knowledge of the project's construction time and costs, as well as the income for the nation concerned (if not for the world at large!). Engineers will usually know the volume figures involved much better than economists,<sup>8</sup> who can make their contribution when it comes to the pricing component. The idea of shadow prices, or, in earlier terminology, opportunity prices, comes in for markets not in equilibrium; in particular, factor markets often show structural disequilibria. The most difficult question, of course, is the time discount: intuitive answers or political compromises usually have to come in here.

7. Otherwise well-trained development economists often ignore the time dimension that the capital-output ratio has; this may be about three years. A correct definition of the capital-output ratio is "the time period for which output equals capital invested." The word "ratio" is somewhat misleading.

8. For a related experience, see T. C. Koopmans, "The Transition from Exhaustible, Renewable or Inexhaustible Resources: Economic Growth and Resources," Cowles Foundation Paper no. 533 (New Haven, Conn., Yale University, 1981), p. 6.



important point there is less room for compromise—a proper weighing of all competing projects has to be taken into account. This reminded me when President Sukarno of Indonesia was trying to get the approval for a nonsense project into which he had been talked by the representative of an European firm specializing in rotating restaurants on the islands. The minister of finance, the president of the Central Bank, were unable to postpone the decision on the strength of our statement. In the end, a decision could be made only after all other projects had been discussed. The tower was not built.

### A Philosophical Interlude: The Role of Environment in Its Widest Sense<sup>9</sup>

On the occasion of a publication to honor the well-known Swedish economist Johan Åkerman in 1961, seven authors were asked to present papers on the “theory of growth.”<sup>10</sup> Characteristically for that time, economists of the Third World were scarcely of concern to Western economists. Except Albert Hirschman,<sup>11</sup> they all concentrated on the development of industrialized countries, taking up the well-known approaches by Karl Polanyi and Joseph Schumpeter. Having been asked to give my contribution, I attempted to list some parameters which are needed if we are to understand the differences between developed and underdeveloped economies, and the very existence of the latter. (This was a typical rich-country economist’s way of posing the problem. But historians and sociologists were already aware—long before their views were known to me—that “developing countries have been the exceptions in human history.”)

In my contribution I attempted to sum up some extra-economic phenomena that presumably help determine the level of development. My list was incomplete and consisted of climate, social institutions, state of technology, and race. Two possible theories were mentioned, elements of which might be found relevant to a general theory of differences in level of development. One was Toynbee’s theory of “too strong challenges,” from which an explanation of underdevelopment may be derived (as in the case of the Eskimo society). Race may play a role, since we know there are differences. Objective scientific treatment of this subject is obstructed, however, by the emotions aroused by two extremist views: one

<sup>9</sup> I am calling this section a philosophical interlude because I do not think that these questions have a high priority.

<sup>10</sup> Bengt Ohlsson, ed., *Money, Growth and Methodology: Essays in Honor of Johan Åkerman* (Lund, Sweden: Gleerup, 1961).

<sup>11</sup> A. O. Hirschman, *The Strategy of Economic Development* (New Haven: Yale University Press, 1958).

assumes a priori that the subject is taboo; the other, that whites—and even more particularly, German-defined “Aryan” peoples—are superior in all respects. The underestimation of Japanese capabilities is one very clear error made by a number of whites.

Other elements of a theory of underdevelopment must be looked for in the differences between the individuals of a homogeneous racial group. Thus, the Europeans who populated the United States of America are not a representative sample. Presumably they are a selection of more active and enterprising individuals. In many countries we find similar groups selected from the Chinese and the Indians. In all three cases—Europe, China, and India—those who stayed home may have been less active and enterprising than those who moved. This suggests that the poorest nations may be found in the areas of oldest settlement.

### The International Division of Labor and Technology

Given the goal of increasing the prosperity of the Third World, the natural means is to raise productivity. This immediately leads to the next question: which activities—or productive sectors—should be chosen? In view of the rapid growth of population, which is expected to continue for some time, increased productivity in agriculture should be one target. More generally, we may follow Eli Heckscher and Bertil Ohlin and the theory of international trade which point out that the activities developed should be those that require inputs of the factors of production in abundant supply. For many developing countries this means some types of natural resources and, as a rule, unskilled labor. Capital, on the other hand, is scarce—both physical and human capital. According to the Heckscher-Ohlin principle, developing countries will maximize their national product if they concentrate on natural-resource-intensive and labor-intensive activities. In other words, processing of their own natural resources is the sort of activity to recommend, especially if labor-intensive processes are known.

In this respect, some underdeveloped countries have better prospects than others. Since textile and garment industries are labor-intensive, countries producing natural fibers—cotton or jute—are in a favorable position. The same applies to leather and leather products and timber products. Countries with iron ore deposits are in a less favorable situation since steelmaking is capital-intensive. Often the dilemma is that the processing starts with capital-intensive phases and only the later phases, such as toolmaking and production of machines, are more labor-intensive. Similarly, processing of bauxite requires much capital and energy to begin with, whereas the final phases—production of aluminum utensils—are more labor-intensive. One may even argue that these technological consid-

erations make the process of import substitution an attractive industrialization strategy because it implies a start at the final phases of the production of finished goods. Both strategies—processing of natural resources and import substitution—require that trade impediments be avoided. To attain maximum efficiency, the first strategy requires the absence of import barriers in developed countries; the second strategy, the absence of protection by the developing country itself.

Another aspect of the recommendations formulated is the range of choices between different technologies for a given industry. For some industries this range is wide, whereas others hardly have any choice. In textile industries, for example, the range is fairly wide; one example is that the number of spindles or looms supervised by one worker may be varied. Empirical studies show that, obviously, the balance should be chosen so as to occupy as fully as possible the more expensive of the two factors: where labor is cheap the machines should be kept busy, and where it is expensive the workers should be used as fully as possible.

Economists agree that the technology chosen should be “appropriate” or “adapted” to the conditions under which it is used. G. K. Boon even uses the term “geotechnology” to remind the reader of this adaptation.<sup>12</sup> Among transnational enterprises few have given systematic thought to the optimal choice of technology. One is Philips Lamps, the well-known Dutch multinational. Other characteristics of the production process determine the prices of products, and hence competitiveness on the world market. With the help of many concrete examples Boon has also shown the importance of lot size, that is, the quantity of one brand manufactured in one run. Clearly this depends on the size of the market served: the world market permits long runs.

Empirical work by Chenery and collaborators has shown that in cross-section as well as historical comparisons there is a clear link between level of development and capital intensity of industrial production.<sup>13</sup> Japan, the country which showed the quickest development, displays the phenomenon quite clearly. In the 1930s it frightened the Western world by its export offensive in cheap textiles; later it became the world’s shipbuilder, motor car producer, and optical instruments supplier; now it is leading in electronics, automation, and robots.

A well-known objection against the main recommendation—to start with labor-intensive activities—is that these are low-income industries and

12. See G. K. Boon, *Technology and Sector Choice in Economic Development* (Alphen aan den Rijn, The Netherlands, and Rockville, Md.: Sijthoff and Noordhoff, 1978) and, from the same publisher, his *Technology and Employment in Postwar Manufacturing* (1980) and *Technology Transfer in Fibres, Textile and Apparel* (1981).

13. Hollis B. Chenery and others, *Structural Change and Development Policy* (New York: Oxford University Press, 1979).

hence not attractive. This objection overlooks the difference between income per producer and income per potential producer (or employable worker). If high-income (capital-intensive) industries are chosen, the number of employables who actually become employed producers will fall far short of the total employable population. It can be shown that total national product is maximized if employment is maximized, which happens if relatively labor-intensive industries and technologies are selected.<sup>14</sup> Out of a maximum national product, more can be used for investment and hence for growth; so the future national product will then be maximized too.

Another aspect of the international division of labor should not be lost sight of either: the well-known existence of nontradables. In this category, although the number of material products is limited—mainly buildings and some building materials—the number of services and their total value are considerable. For an average-size economy about half of the national product consists of nontradables. This fact has far-reaching consequences, especially for countries where the balance of payments is in deficit. To eliminate such a deficit the usual advice is to reduce national expenditures (consumption and investment outlay) so as not to surpass national income. What has not always been understood is that this advice implies a considerable reduction in the national product itself—something difficult for developing countries to accept. Hence this is, in its unqualified form, not the best advice. Reduction of spending in order to equilibrate the balance of payments is relevant only for tradables. Reduction of the production of services such as education, for instance, or health care, not only fails to make sense; it does harm to the country's development.<sup>15</sup>

The existence of nontradables also affects the application of the well-known input-output method of planning. If one aim is a given increase in the final demand of some tradable product, this does not necessarily require increases in the output of other tradables which are inputs into its production. It may be better to import such inputs. Only the increased inputs of nontradables have to be produced in the country itself. The traditional input-output method may be adapted to these arguments; at the Centre for Development Planning in Rotterdam the amended method has been baptized "semi-input-output method" and has been set out in detail by A. Kuyvenhoven with an elaborate application to Nigeria.<sup>16</sup> This study had been preceded by the work of L. B. M. Mennes and others, who

14. Jan Tinbergen, "Maximizing National Product by the Choice of Industries," Discussion Paper no. 60, Centre for Development Planning, Erasmus University, Rotterdam, 1981.

15. Jan Tinbergen, "Spardefizit und Handelsdefizit," *Weltwirtschaftliches Archiv*, vol. 96 (1965), pp. 89–101.

16. *Planning with the Semi-Input-Output Method* (Leiden and Boston: Martinus Nijhoff, 1978).

dealt with the distinction between geographical areas of different size, combined in a hierarchical system.<sup>17</sup> The basis for this spatial dimension of planning had been laid by H. C. Bos, who studied the optimal dispersion of economic activities in centers of various size and composition.<sup>18</sup>

### The Necessity of a Public Sector

An interesting evolution of views has taken place on the question of where to draw the frontier between the private and the public sector. In the United States many politicians and some economists have a strong preference for the private sector. The World Bank has been influenced by its American surroundings more than has the United Nations:<sup>19</sup> in its work the frontier was drawn between the infrastructure and the superstructure. For quite some time it was assumed that the latter, which consisted of all material production (primary and secondary sectors), would automatically come into existence once the transportation system and public utilities had been created by public authorities. So in the beginning World Bank loans were primarily for infrastructural projects. Only much later was the need felt for a specialized agency dealing with industrialization, mainly under the pressure of developing countries, and the United Nations Industrial Development Organization (UNIDO) was created.

It would be tempting to deal with the problem in a theoretical way, especially with the aid of welfare economics and management science, and against the background of a discussion of socialist views. I shall resist that temptation and choose an empirical approach—one too rare in the discussion of alternative social systems—taking the history of two countries which at the time to be considered were not under socialist rule.

Around 1900 in the Netherlands the Dutch State Mines were created. The government had to take this initiative because neither private capital of sufficient volume nor private initiative was available to exploit the national coal deposits to the extent needed for the country's development. A few decades later state farms were established on land newly recovered from the sea. This state ownership was only temporary, in order to prevent

17. *The Elements of Space in Development Planning* (Amsterdam and London: North-Holland, 1969).

18. *Spatial Dispersion of Economic Activity* (Rotterdam: Rotterdam University Press, 1964).

19. *The Design of Development*, published in 1958, had actually been written for the World Bank in 1955. At their request, I dealt with an additional example of state financing, in the Dutch steel industry. The report was accepted but not published then; I am afraid the president of the Bank at that time did not agree with the opinion I expressed. Three years later it was published: the director of the Economic Development Institute, created by the Bank for teaching purposes, considered it a useful text.

the first generation of settlers from becoming bankrupt. On previous occasions—the reclamation of the Haarlemmermeer—unexpected difficulties in the early years had ruined the first generation of settlers, notwithstanding their qualities as farmers. In both cases, public and private enterprises existed and their relative performance could be compared: in neither were cost differences large—state mines were slightly more efficient than private mines, whereas state farms were slightly less efficient than comparable private farms.

The other case is Turkey, where in 1923 the great modernizer Atatürk established “state economic enterprises” in various modern industries, again because private initiative was unable to raise the necessary capital.

As an outcome of many discussions and on the basis of experience with various alternative management structures, many European economists and politicians have concluded that the type of ownership of the means of production is much less important for an enterprise’s efficiency than the quality of its management. Among other features, the tendency toward bureaucracy should be minimized. So efficiency considerations need not be a stumbling block if public enterprise is chosen as a means for furthering a country’s development. Rather, the nonavailability of sufficiently large private capital is the decisive point.

### Education—The Longest Production Process

The study of economic cycles, started in the 1920s, has drawn attention to the significance of the time needed for a number of productive processes. In the German Institute for Business Cycle Research (Institut für Konjunkturforschung, headed by Ernst Wagemann), Arthur Hanau was the first to analyze the so-called hog cycle, in which a considerable role was played by the length of the production process, including the time the farmer needed to react to hog prices.<sup>20</sup> Periods about twice as long are shown by the adaptation process of the market for pork. In the Anglo-Saxon literature, this became known as the cobweb theorem, since the graphical presentation of the successive steps in the adaptation process looks like a cobweb. Similar, but somewhat more complicated, mechanisms can help explain the intensive swings in coffee and rubber prices, where again the duration of the production process is the main explanatory factor (for example, the time needed before a coffee tree first bears beans). It is also well known that investments in mining or oil exploration require time periods of the order of magnitude of a decade, not to speak of the time needed to recover investment.

20. Arthur Hanau, “Die Prognose der schweinepreise,” *Vierteljahrshäfte zur Konjunkturforschung*, Sonderheft 18 (1930).

Perhaps the longest production process of considerable relevance to the development process is the investment in human capital, as we now like to say (Jacob Mincer was perhaps the first to use that expression<sup>21</sup>). Schooling is the best-known element in training, preceded by informal training in the family between birth and the age of about six and followed by another informal process of training on the job. Schematically, the schooling process can be seen as three consecutive six-year periods (at least in my own country), known as primary, secondary, and third-level schooling. The subdivision is different in different countries and subject to change, but for a considerable portion of the labor force it takes two decades to produce an experienced worker. Recently Russell W. Rumberger made the most elaborate estimates of schooling required for the main occupational groups of the American labor force.<sup>22</sup> They range from 7.5 years for the laborers to 15.6 years for the professional and kindred workers. Gradually the importance of human skills for the development process was discovered, and this contributed to a change of emphasis from physical to human capital.

Because of the length of the education process, it is very probable that at the time a person completes his schooling the situation in the labor market differs considerably from that prevailing when he made his final decision about the process. Of course this last decision need not coincide with the initial choice. At the moment of graduating from high school, it is still possible to choose a college or university education different from that originally intended.<sup>23</sup> So in fact a duration of only four to six years is typically at stake. Longer periods are involved for teachers in particular, since a change in the labor market will affect the demand for various kinds of teacher indirectly, through the number of students. And what about the teachers of the teachers?

A number of studies have been made dealing with how best to redirect the schooling system if, for instance, an acceleration of development is desired.<sup>24</sup> Transitional structures have to be designed, based on the length of the processes mentioned. If need be, temporary or second-best solutions are available, of course. Thus, jobs may be entrusted to persons not fully schooled for them. Also, quick courses may be organized to produce the most urgent skills needed.

An educational policy that is at first sight surprising arises if a newly independent nation wants to get rid of expatriate teachers as soon as

21. "Investment in Human Capital and Personal Distribution of Income," *Journal of Political Economy*, vol. 66 (1958), pp. 281–302.

22. *Overeducation in the U.S. Labor Market* (New York: Praeger, 1981).

23. This is not always true, since some types of secondary schools do not give access to all university studies.

24. Hector Correa and Jan Tinbergen, "Quantitative Adaptation of Education to Accelerated Growth," *Kyklos*, vol. 15 (1962), pp. 776–86.

possible. It turns out that the quickest way to achieve that goal is to attract more expatriates temporarily in order to raise the number of nationals among the teachers. (This does not apply to subjects such as the national language or history taught in that language.)

### Not All Cultural Features are Sacrosanct

From the very beginning, those in favor of development cooperation have been warned not to impose their own cultures on those assisted. These warnings spring from a view often held by cultural anthropologists that all cultures should be respected in every detail. The answer of “development assistants” usually could be that they were concerned about something that no culture whatsoever disagreed with: the prevention of starvation. Unfortunately, for quite some time to come the question of cultural imposition is hardly relevant, as starvation will be with us longer than we once hoped.

The issue is not completely irrelevant, however. Long before development cooperation became a branch of political activity, Christian missionaries worked in developing countries that were most frequently still colonies. Simultaneously Muslims succeeded in spreading their religion; so did communists.

Looking at the present situation I am inclined to defend two theses. First, Western culture is not something to be very proud of in all aspects. It now shows several features of degeneration, it has been outspokenly materialist in the sense of being greedy, and it has suffered from serious inconsistencies. There is a wide gap between Christian preaching and acts by so-called Christian nations or politicians: the few who have really lived up to Christian principles, among them many missionaries, are exceptions.

My second thesis is that most cultures are not static, and that cultural exchange is something to aim for. Most cultures show some attractive qualities alongside unattractive, even repulsive, features. In many cultures, the way women are treated leaves much to be desired. Also the way animals are treated is sometimes repulsive and cruel. It seems better to have an open mind with regard to other cultures, to be tolerant about many issues, even willing to learn, but also prepared to defend alternatives. In the light of today’s energy and food problems much is to be learned from authors such as Téoédjè or Elgin, to mention only two out of a long list.<sup>25</sup>

25. Albert Téoédjè, *La Pauvreté: Richesse des peuples* (Paris: Les éditions ouvrières, 1978); and Duane Elgin, *Voluntary Simplicity* (New York: William Morrow, 1981).



## The DD II Circus and the RIO Circle—Gratifying Experiences

Around 1965 it became clear that the first Development Decade had not inspired the large and middle-size industrial countries to change their policies in the direction suggested by the U.N. designation of the decade as one in which special efforts should be made. This contributed to the creation of the U.N. Committee for Development Planning in Resolution 1079 (xxxix), July 23, 1965, by the Economic and Social Council. Until 1972 I had the privilege of being the chairman of this committee. The product of our deliberations is a booklet of forty-six pages entitled “Towards Accelerated Development—Proposals for the Second United Nations Development Decade,” brought out early in 1970.

The committee had eighteen members. This modest size was outnumbered considerably by the number of observers who attended the meetings and took an intensive part in the discussions. All members of the United Nations family of institutions—from the International Monetary Fund and the World Bank to the Universal Postal Union—and a number of nonmember international agencies such as the Organisation for Economic Co-operation and Development and its counterpart the Council for Mutual Economic Assistance (Comecon), as well as the European Economic Community, were represented. I think the word “Circus”—with due respect, of course—reflects the nature of the deliberations rather faithfully.<sup>26</sup> Certainly for the chairman there was never a dull moment, and it gave me great satisfaction to have been entrusted with this post for some time. I don’t venture an estimate of the yield of our efforts.

It was a rather different experience, but also a very stimulating one, to act as the coordinator of what I shall call the RIO Circle. The group whose meetings I had to “coordinate” (in fact, to chair) had been composed in consultation with Dr. Aurelio Peccei, president of the Club of Rome, in 1974, to report on the New International Economic Order, as defined and adopted as an aim by the United Nations General Assembly. It is no exaggeration to say that this was a circle of friends, and that the more informal and profound discussions held there were of a totally different

26. The observers surely provided the committee with useful information and suggestions, but their behavior was hardly distinguishable from that of the members. I remember that on one occasion I requested the observers to refrain from asking the floor until the committee’s members had made their interventions. Immediately one of the observers asked the floor for a matter of order: he voiced a protest against my request. Even so, the atmosphere of the meetings was pleasant throughout. And thanks are due to those who, in succession, acted as rapporteur, often Josef Pajestka, and to the U.N. secretariat staff who assisted our work. Scientifically, a major step forward was Jacob Mosaks’s world model from which some of the key figures in our report were derived.

character. Many attempts were made to go beyond accepted scientific views and produce a number of innovations—reflecting the Club of Rome's feelings of urgency toward mankind's problematical future. Thus, the optimal level of decisionmaking for problems with different areas of impact throughout the world was one of our innovations. Another was sovereignty as a functional concept instead of a concept of property. A third concept of a novel character was package deals, composed so as to contain elements attractive to all negotiating parties.

It is regrettable that, partly as a consequence of today's stagflation, and partly as a consequence of a general shortsightedness, the Foundation RIO had to stop its activities in 1982—let us hope temporarily.

### Shifts in Priorities

As illustrated by the preceding sections, during its short history the development strategy for underdeveloped countries has been subject to an intensive learning process. This may be characterized as an attempt to shift to other activities so as to avoid repeating previous mistakes and to fight negative forces blocking the road toward higher prosperity, in this case the well-being of the poor masses in the Third World.

Some of the clearly negative forces we are facing are ignorance in many forms, shortsightedness (one type is narrow nationalism), polarization (which often implies waste of energy), and cynicism (which discourages action).

In the preceding sections I discussed a number of the shifts from less to more satisfactory approaches: for example, from the creation and transfer of physical capital to that of human capital; from foreign, capital-intensive technologies to appropriate, or adapted, less capital-intensive technologies, which in many cases implies a shift from large to smaller projects; and from employment creation in cities to its creation in villages or small towns. I also discussed a shift from external (intergovernmental) to internal policies and, somewhat related, from paternalism to self-reliance.

Polarization in ideas, which implies reinforcement of extremist political forces, both within and between nations, is useful sometimes in order to demonstrate the existence of a problem, but it is an incomplete process which must be supplemented by a synthesis. This thesis (the well-known dialectic philosophy dealing with the consecutive phases of thesis-antithesis-synthesis) may be illustrated by an almost simplistic example. Some politicians hold that markets are self-regulatory and can solve many problems without intervention by public authorities. Others are in favor of regulation of markets with the aid of buffer stocks, minimum and maximum prices, and quotas. So far this is a polarized situation. The synthesis can be created from the moment we understand that there are essentially two types of markets, stable and unstable. Stable markets can indeed be

left to themselves, but unstable markets need regulation, as noted above where I mentioned a few unstable markets: those of pork, coffee, and rubber.

One more lesson should be learned from the past. The corresponding shift might be said to be from idealism to long-term common interest. Around the 1950s, development cooperation was seen as an act of idealism required by the few among the developed world's citizens who propagated it. Those who formulated the Brandt report point out that development cooperation is a policy in the long-term self-interest of developed countries. The tragedy is that even that down-to-earth view is not shared by the shortsighted politicians whom we have elected. The world is in desperate need of statesmen as Churchill defined them—politicians who think of the next generation and not only of the next election—people of the stature of, for instance, the founding fathers of the European Community and their American counterparts who launched the New Deal and, later, the Marshall Plan.

# Comment

Michael Bruno

IN THE FOLLOWING COMMENTS I shall not discuss Tinbergen's seminal contributions to general economic science.<sup>1</sup> Tinbergen was a cofounder of econometrics (and the Econometric Society) and his contributions to the statistical study of business cycles and other dynamic processes (such as the cobweb process) would in themselves have earned him a major place in the modern revolution of economics as a quantitative science. I shall also resist the temptation of commenting in detail on the various development issues brought up in Tinbergen's paper for this volume. Tinbergen has thought and worked on many aspects that development economists have been and still are occupied with, such as the choice of "proper" technology, the role of international competitiveness in investment allocation, the design of educational planning, and the interplay of economic and social factors in development. His thoughts and contributions in all of these were always of considerable relevance and importance, but they were not unique. His unique contribution, to my mind, lies in the adaptation of his own pioneering thoughts on the *Theory of Economic Policy*, developed at the Dutch planning office in the postwar years, to the subsequent *Design of Development*. I shall confine my comments to that phase of his work, perhaps in part because many of my own generation of development economists often started their thinking and analysis under the deep imprint of Tinbergen's planning methodology.

The most important lesson that Tinbergen and the postwar Dutch planning school taught us is that economic planning and economic policy could be expressed in a form that combines sound economic theory with applied empirical content. The main body of a plan should be based on a theoretical construct or "model," be it a simple Harrod-Domar model with a rudimentary consumption function or a more complex input-output framework. It should involve quantitative targets and quantitative

Michael Bruno is Professor of Economics at the Hebrew University.

1. For an excellent survey and overall evaluation of Tinbergen's work, see Bent Hansen, "Jan Tinbergen: An Appraisal of His Contribution to Economics," *Swedish Journal of Economics*, vol. 71 (1969), pp. 325-36.

policy instruments, and it should be based on a set of equations or constraints of a technical, behavioral, or institutional nature which link the important variables into a systematic conceptual framework.

Tinbergen did not lose sight of the fact that there may be an inconsistency between a "top-down" macro approach and a "bottom-up" micro project approach to planning. He realized early on that there is need to fill a macro plan with detailed project planning, making use of accounting prices and allowing for both public investment planning and private investment promotion. A macro plan should later be revised in the light of project information. Subsequent writers (Henri Theil probably being the first) pointed out the limitations of Tinbergen's formal fixed-target approach (with sensitivity analysis on the chosen parameters) and the advantage of combining modern welfare economics (that is, social optimization) with the underlying Tinbergen structure. Much was said and written on the difference between "consistency" planning and planning for "optimality."

The evolution of formal development planning in the late 1950s and 1960s dealt with economy-wide application of linear, nonlinear, and dynamic programming techniques. These more sophisticated techniques were greatly helped by the rapid advance of electronic computers, which did not exist in the early planning days. Such models have certainly helped in the process of thinking about trade and development policy issues, about the link between macro planning and the actual derivation of shadow prices for micro-investment decisions. But in one basic sense the more advanced techniques have not helped us progress much beyond the stage already developed by Tinbergen. Data limitations and uncertainty about the response of public and private agents still make the relatively simple consistency frameworks, such as the semi-input-output method developed by Tinbergen, the most useful ones when it comes to the actual design of a formal development plan in a developing country.

We all know that the formal planning techniques designed by Tinbergen and his followers have serious limitations. The best-designed set of simultaneous equations is no substitute for a good development strategy, which very often has important qualitative, and unquantifiable, dimensions. Issues of centralization and decentralization in development planning, the problem of assessing the area of effective government control, as well as social and political questions often escape the structured planning model format. I am sure Tinbergen himself would want to disown some of the naiveté with which formal programming techniques have often been implemented. Even as early as twenty-five years ago, he stated an eclectic view: "It must first be made clear that programming is not an alternative to common sense; it cannot replace common sense and it should not. It does supplement it, particularly with regard to the orders of magnitude of the phenomena involved. In the design of development all information and all methods available should be put to use. This seems the more desirable

since information of the traditional type, the usual statistics, is often insufficient and inconsistent.”<sup>2</sup>

Finally, one must stress the fact that Tinbergen has set a very important example by his own personal involvement in actual development policy, first in his own country and later on the international scene. Everywhere he has always been led by very deep humanitarian convictions. These clearly transpire again in Tinbergen’s present paper. It is for this reason that his great impact on development economics and practitioners transcends the important legacy of introducing formal programming techniques.

2. *The Design of Development* (Baltimore, Md.: Johns Hopkins University Press, 1958), pp. 9–10.