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AGRICULTURE AND ECONOMIC DEVELOPMENT: THE RELEVANCE OF THE JAPANESE EXPERIENCE*

Economically speaking, Japan has arrived. Its postwar rate of growth of real national output, averaging 10 per cent annually for the period 1955 to 1964, is probably the most impressive economic achievement of the postwar years, even though the period has also been characterized by unprecedentedly high growth rates in western Europe.¹ The fact that Japan has passed a critical turning point is epitomized by a comment in Japan's *Statistical Handbook for 1965*. After reporting that 26 per cent of the nation's labor force was engaged in agriculture, it is noted, a bit apologetically, that "such a high percentage in her agricultural population in spite of her highly developed economy is a peculiar aspect of the Japanese industrial structure" (38, p. 101).

To the student of Japan's economic history the striking fact is that the farm labor force accounted for *only* 26 per cent of the total—and that the absolute size of the farm labor force is currently declining at an annual rate of close to 4 per cent. For more than half a century the agricultural labor force had remained nearly constant at a level of 14 to 15 million persons. In the long span between 1880 and 1940 agriculture's share in the labor force declined from a little over 75 per cent to 42 per cent of the total labor force (Appendix Table III). Under the conditions of extreme economic disorganization and hardship existing in the aftermath of World War II, Japanese agriculture demonstrated its special character as the "self-employment sector" of the economy, absorbing millions of returning servicemen and the homeless or hungry from the war-damaged cities. After reaching a peak in 1949, agriculture's share in the total labor force began to

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¹ In focusing on an attempt to explain the reasons why Japan's leaders pursued an efficient strategy of agricultural development that contributed importantly to overall economic growth and on an analysis of the relevance of this experience to contemporary developing countries, the quantitative details of growth in Japan have been held to a minimum. A few of the key statistics are summarized in Appendix I.

decline and in 1951 was again 42 per cent of the total. The decline from 15.4 million in 1951 to a farm labor force of 12.4 million, or 25.6 per cent of the total, in 1964 represents a breathtaking rate of structural transformation.

I. SIGNIFICANCE OF JAPAN'S EXPERIENCE

As the only non-Western country that has entered the ranks of the industrialized nations, it would be surprising if Japan's development experience had not been the object of much study and analysis. A considerable consensus seems to have emerged concerning the strategic role of agricultural development in the economic growth of Japan. Three features of agriculture's role have been specially emphasized. First is the fact that agricultural output has been increased with remarkably small demands on the critically scarce resources of capital and foreign exchange. This was possible because of increases in the productivity of the existing on-farm resources of labor and land; and it was done within the framework of the existing small-scale agriculture.² Even with the recent reduction in the farm labor force, the cultivated land per farm household still averages only about two and a half acres. Secondly, agricultural and industrial development went forward together in a process of "simultaneous growth" (67). Expansion of the nonagricultural sectors has, of course, proceeded a good deal more rapidly than agriculture so that the overwhelmingly agrarian character of the economy has been transformed. But throughout the period of modern economic growth there have been important interactions between agriculture and the rest of the economy with profound implications for growth in both sectors. Thirdly, the gains in agricultural productivity were of strategic importance in making possible the increase in savings and investment that were a necessary condition for industrial expansion.³

The consensus is not complete, and two of the dissenting voices should be mentioned. James Nakamura has argued that the impressive increases in agri-

² Gross farm output in Japan during the years 1955-59 was about 2.8 times the average output in 1880-84, and net output increased nearly 2.2 times. Over the same period (1880-84 to 1955-59) the use of conventional inputs increased by only about 35 per cent. The rates of increase in output and factor productivity were especially noteworthy between 1880-84 and 1915-19 and again between 1945-49 and 1955-59. Gross output increased at a record rate of 4.5 per cent during the recent period, but use of physical inputs also increased rapidly. During the earlier period an average annual increase of gross output of about 1.8 per cent was associated with an annual increase in the use of conventional inputs of only 0.28 per cent (95). There is inevitably uncertainty with respect to the increase of output in this early period, but Yamada's careful revision of the official estimates which gives the 1.8 per cent rate just cited seems more plausible than the 2.7 per cent figure presented by Ohkawa and others (69) or the drastic downward revision to about 1.0 per cent by Nakamura (61, p. 312). Although the rate of increase in farm output in the early period was not very high as compared to rates achieved in recent years, given the "moderate" rate of growth of population it was sufficient to permit an improvement in per capita food consumption (with very little reliance on food imports until after World War I) and also a significant expansion of exports of silk and tea.

³ Discussions of agriculture's role in Japan's economic development available in English include the well-known article by Kazushi Ohkawa and Henry Rosovsky (70); articles by the present author published in 1951 and 1962 (40 and 41); a 1964 article by Ohkawa (67); and the book edited by Takekazu Ogura and published by the Japan FAO Association (65). This volume contains a detailed description and analysis of many aspects of agricultural development in Japan prepared by a number of Japanese specialists and a summary section (Part IV) prepared by a group of international experts assembled in Tokyo in early 1963. Mention should also be made of the articles by Tang (88) and Yamada (95) which document the fact that the increase in farm output in Japan has been much greater than the increase in the use of physical inputs, and examine the role of research, education, and other nonconventional inputs in facilitating the technical change that has accounted for so much of the increase in agricultural output.

cultural productivity in the decades between 1880 and 1920 were largely a statistical illusion reflecting gross underestimation of output in the early part of the period. That official figures give an upward bias has never been in doubt, but Nakamura's attempt to substitute an alternate set of production estimates is not convincing. The income elasticity of demand for food was almost certainly not as high as 0.6—Noda's estimate for the period 1878–1921 based on the official production statistics (64). But Nakamura's revised estimates of the rate of change in farm output implies a coefficient of income elasticity so close to zero as to be quite implausible, considering the low levels of income that prevailed and the qualitative improvement in the diet that was taking place (61, pp. 296–303). In any event, whether "impressive" or not, the rate of expansion of agricultural output was "sufficient." Apart from the rice riots of 1918, there seems to be no evidence to suggest that food shortages hampered industrial expansion; and the considerable dependence on cheap imports of rice and sugar from the Japanese colonies of Taiwan and Korea in the 1920's and 1930's did not pose a foreign exchange problem for Japan. Moreover, agriculture-based exports of tea and silk were a highly significant source of foreign exchange; as late as 1930 raw silk exports accounted for nearly 25 per cent of the total value of exports despite the collapse of silk prices (40, p. 227).

Dissent has also been voiced by Harry Oshima. He does not take issue with the results obtained, but he does contend that Japan's approach entailed excessive hardship for the nation's farmers because the Meiji leaders squeezed agriculture too hard in their heavy reliance on proceeds from the land tax in the early decades of the Meiji period (1868–1912). Oshima concedes that there was no alternative to relying on agriculture for a sizable share of the total tax revenue and requirements for capital formation; but he argues that government spending should have been on a smaller scale so that fiscal requirements would have been consistent with a lighter agricultural tax burden. Specifically, he asserts that military and educational expenditure at about half the level actually undertaken would have been just about right. This level of military outlays, he suggests, would have been sufficient to safeguard Japan's national independence but not large enough to have encouraged the military adventures which began with the Sino-Japanese War of 1894–95 and culminated with the nation's disastrous defeat in World War II. Similarly, he suggests that a goal of 50 per cent coverage rather than universal primary education would have been a more appropriate objective for a poor nation in the early phase of development, and that this would have realized most of the benefits for development that stem from general education (73).

It is well to point out that many of Japan's cultivators would not have enjoyed the benefits of a lighter tax burden. The demand for land was such that it is unlikely that a lower land tax would have induced landlords to reduce rents. Particularly in the years following the Matsukata deflation of 1881–85, the burden of the land tax declined, and heavy rents that had to be paid by the considerable majority of Japanese farmers who were tenants or part-tenants were the more oppressive burden. The lot of Japanese farmers would certainly have been a more tolerable one if land reform legislation had not awaited the midwifery of the Allied Occupation. It is also tempting to suppose that both the economic and political prospects of Japan would have been brighter if the incomes and pur-

chasing power of the peasant had risen more rapidly in the 1920's when, as is mentioned shortly, deficiency of effective demand, associated with inappropriate economic policies, was probably more important than shortage of investable funds in slowing the process of structural transformation. But with Japan's basic problem of "too many people on too little land" and the political power of the landlord class, it would have been extremely difficult to limit the amount of rent extracted from tenants who were in desperate need of land on which to eke out a livelihood.

It should also be noted that agricultural progress during the 1920's and 1930's compares very poorly with the impressive advance realized during the four decades prior to 1920 and again in the period since World War II. The present writer has suggested quite tentatively that the relative stagnation of agriculture and the slowing down of the process of structural transformation during that period can be attributed to a considerable extent to faulty economic policies pursued by the nation's leaders during the 1920's—an overvalued exchange rate, deflationary monetary policies, and policies that permitted and in fact encouraged an excessive concentration of investment in the large-scale, capital-intensive firms (40, pp. 241-47). The adverse effects of these policies on the farm sector were accentuated by the large shipments of cheap rice from Korea and Taiwan that satisfied much of the growth in demand for food in Japan.⁴

The present paper is not intended as another description of the process of agricultural development in Japan, although the distinctive features of Japan's approach are emphasized. Its object is rather to consider explicitly and in some detail the ways in which the agricultural development strategy pursued in Japan is—and is not—relevant to the contemporary underdeveloped countries. But before considering the relevance of Japan's experience in Section III, an attempt is made in the following section to examine some of the reasons underlying the basic policy decisions of the Meiji leaders that set the pattern of Japan's development. Attention is also given to some of the factors that influenced the execution of those decisions by the new governmental bureaucracy as well as the response to new opportunities on the part of entrepreneurs and the population at large.

II. DISTINCTIVE FEATURES OF JAPAN'S APPROACH TO AGRICULTURE AND ECONOMIC DEVELOPMENT⁵

In view of the potential significance of the Japanese experience for other developing nations, it seems important to ponder why the Japanese approach to development was so successful. Why were the leaders in Meiji Japan able to make and effectively implement policy decisions which appear to have been so appropriate to the goal of economic development? Why was the response and performance on the part of the mass of the people so energetic?

In its most fundamental aspect agricultural development in Japan has been

⁴ Professor Ohkawa suggests that this interpretation places too much emphasis on the faulty economic policies that were pursued during the 1920's. Although he agrees that they were important contributing factors, he would stress the inevitable consequences of over-rapid expansion of the economy during World War I. He also would emphasize the effects of a slowing down in the rate at which profitable technical innovations became available during the 1920's, partly a result of having at least temporarily exhausted the easy opportunities for technical progress in agriculture (68, 70).

⁵ I owe a debt in this section to a brilliant paper by John Brewster (4) that is indicated only in part by the specific citations in the pages that follow.

similar to agricultural progress in all nations that have achieved modern economic growth. In identifying the fundamental features of this process, Brewster notes first that output per farm worker expanded with sufficient speed to enable an ever larger proportion of the population to engage in nonfarm pursuits, the importance of which is indicated only in part by the array of nonagricultural goods and services that bulk large in consumption as per capita incomes rise. The newly important nonfarm activities have a direct impact on the agricultural sector in providing the fertilizers, farm implements, insecticides, and other off-farm inputs that play an increasingly significant role in the expansion of farm output. Furthermore, it is research and other nonfarm employments that are so important in generating the increasingly productive farm technologies and related skills and knowledge which enable farmers to make steady increases in their productivity (4, p. 1). Quite clearly, these changes affecting the entire economy are the key to the fact that the average American farm worker produces enough to feed himself and 27 others, and that today the average farm worker in Japan coaxes sufficient output from his tiny plot of land to feed himself and seven others. In the 1880's each farm worker in Japan was producing enough only to feed himself and 1.3 other persons. (One should say, to feed himself or *herself*; Japan's farm labor force, which consists almost entirely of persons classed either as "self-employed" or "unpaid family workers," includes a somewhat larger number of women than men.)

In this view a crucial—perhaps the crucial—requirement for economic growth is for the citizenry of a developing country to acquire the ability "to concert their individual behaviors into a national (international) network of increasingly large-scale specialized units of collective action which are necessary for development and widespread use of increasingly productive technologies" (4, p. 2). The final link in Brewster's analysis of the fundamental requisites for modern economic growth is to emphasize that in national economies the role of a reasonably efficient, progress-oriented national government is the most strategic of the requirements relating to the need for "large-scale specialized units of collective action." The importance of this factor is underscored by Gerschenkron's well-known theory of relative backwardness which suggests that the role of government in fostering development will be especially important in a late-developing nation such as Japan (24, pp. 16–21).

Why was the Meiji government able to meet this test so well? How are we to account for the fact that it was not only strong and progress-oriented, but was also able to command sufficient "professional competence to conceptualize and implement interconnected institutional and organizational reforms necessary for achieving sustained economic progress"? Among the minimum requirements that need to be fulfilled by a progress-oriented government, Brewster stresses items that figured prominently in the agenda of the Meiji leaders: the ability to formulate and back up rules that give agreements among individuals the dependability of legally enforceable contracts, that shift resources from less to more efficient users, and which reward people in line with their productive contributions. He also emphasizes the importance of "tax and public investment rules that generate social overhead services like roads, schools, credit facilities and power installations which people cannot provide for themselves, but which they

must have for developing and using their capabilities as fully as possible" (4, p. 8).

Attention here will focus on two aspects of the broad questions raised above. First, what were the reasons that made it possible for the government and private entrepreneurs to mobilize the capital required for the substantial investment in infrastructure and in the new manufacturing, commercial, and transport enterprises that were to become the dominant elements in a modern, industrial economy? Thomas C. Smith poses this aspect of the problem with great clarity (82, pp. 210-11):

Even though a government is strong and has the will to modernize, it must still find the means to invest on a grand scale in schools, factories, roads, harbors, railways, and so on, or its ambitions will come to nothing. If funds cannot be had from foreign sources, they must be taken from the domestic economy—which in most cases means from agriculture: thus the ability to modernize comes to depend largely on the productivity of agriculture and the willingness of the peasantry to part with current income for distant and half-understood goals.

The second question to be explored in this section is closely related: How are we to account for the fact that Japan's leaders were able to choose and effectively implement a strategy for agricultural development that made significant gains in agricultural productivity possible while making only minimal demands on the scarce resources of capital and foreign exchange that were indispensable for industrial expansion?

A Strong, Progress-Oriented Government and the Mobilization of Capital

The Meiji leaders' heavy reliance on agriculture to shoulder a disproportionate share of the burden of the country's economic development in the early decades of the modern period seems to have been a conscious policy. Takao Tsuchiya, the economic historian, sums up their policy as follows (89, pp. 4, 7):

The urgent necessity of protecting and fostering other industries compelled the government to impose a heavy land tax on the agricultural population to obtain the wherewithal to carry out industrial development programs.

The government's armament expansion program and its policy of protecting industry and commerce increased the burdens of the rural community, and the development of big industries proceeded at the expense of the countryside.

Resolve on the part of the Japanese government and people "to secure first the independence and then the fullest possible economic and military development of their country" was certainly the fundamental factor that explains the determination and the ability of the Meiji regime to implement the policy described by Tsuchiya (79, p. 441). The national watchword of the period—*Fukoku Kyōhei*, "A Rich Country and a Strong Army"—sums up the basic consideration that shaped the development of economic policy under the Meiji leaders.⁶ Clearly, the "reactive nationalism" that has often been singled out as

⁶ See Sansom (79, pp. 250-60) for a summary of the historical events and the development of attitudes that were crystallized in the phrase "*Fukoku Kyōhei*."

a powerful motivating force for economic development was of decisive importance in Meiji Japan.

Members of a threatened elite can react, however, in many ways: all too often they seem to have taken their cue from the ostrich or the dodo bird. Various attempts have been made to explain why Japan's elite, motivated by "enlightened conservatism," reacted appropriately and with vigor and why the Japanese leaders and people at many levels demonstrated an ability "to concert their individual behaviors" into the large and specialized public and private organizations that perform the multitude of functions on which modern economic growth depends.

A number of writers, including particularly anthropologists such as G. M. Foster, the Wisers, E. C. Banfield, and Robert Redfield, have suggested that the primacy of family and village loyalties, accompanied by distrust and fear of the world outside the individual's own village, constitute a formidable barrier to the organizational requisites of progress. Brewster summarizes the argument (4, p. 23):

In leading people to impute helpful attitudes to their primary groups and predatory intentions to outsiders, the social structure of relatively unmodernized farm societies erects a formidable human barrier to the formation of increasingly large-scale units of collective action which are necessary for achieving the gadgets of progress.

That Japan was an exception Brewster explains, following Francis Hsu, by the fact that the Japanese Emperor was viewed as the "divine" heir of the progenitor of the Japanese race so that family loyalties were extended to include the Emperor and therefore the nation (4, p. 26). Hsu, who regards this as a major contrast between Chinese and Japanese society, suggests that the corruption that plagued the government of Nationalist China was simply a reflection of a basic difference between the loyalty called for within the intimate family group and the standards applicable to larger organizations such as the government which, being outside the primary loyalties, are a fair target for corruption and nepotism. But in Japan, the kind of loyalty characteristic of primary groups was extended to the relationship between the Emperor and his subjects so that it is not surprising to find "bureaucratic corruption . . . as rare as corruption in the family and the small community" (35, p. 346).

A conscious and highly effective effort to develop national patriotism by strengthening loyalty toward the Emperor at the time of the Meiji Restoration, a policy summed up in the slogan, "Revere the Emperor and Expel the Barbarians," was clearly of great importance. This slogan with its appeal for loyalty to Emperor and to anti-foreign sentiments, at a time when the visit of Commodore Perry's Black Ships was only one of a number of ominous gestures by foreign powers, helped unite the opposition that brought an end to the Tokugawa Shogunate (1603-1867) and launched the Meiji era in January 1868 (79, p. 298 and *passim*).

The views of other students of Japanese history suggest, however, that the loyalty to the Emperor stressed by Hsu should be regarded as a reinterpretation of attitudes that had evolved during the Tokugawa period. Extension of kin-

ship loyalties to a larger political unit had already taken place within the smaller and more personal community of the clan; and the idea of public service as the proper image and role for a civil servant had emerged at the *han* level during the long period of feudalism. Thus Scalapino emphasizes that a system of *political* loyalty and "the supremacy of *public politics*" had already been established prior to the Meiji Restoration. His argument is that a system of obligation and rights transcending family and clan had emerged during the feudal period and had only to be transformed into a national loyalty centering on the Emperor (81, p. 70):

The lord had enjoyed primary loyalty, not the parents; the state had triumphed over the family. It remained only to broaden the scope of existing political concepts: to transform the *han* into the nation, and loyalty to the lord into reverence for the emperor. We have only to contrast feudal Japan with traditional China, where blood ties were supreme, to perceive how early the nation had cultivated a political consciousness anticipating the modern. In considerable measure, the supremacy of *public politics* had already been established in traditional Japan.

Thomas C. Smith introduces additional factors in seeking to explain the special character of Japan's "aristocratic revolution" (83). The rare phenomenon to be explained is that in Japan the warrior class "did not merely surrender its privileges. It abolished them. There was no democratic revolution in Japan because none was necessary: the aristocracy itself was revolutionary" (83, p. 370). Smith's analysis runs like this. The long period of stability and peace under the Tokugawa Shogunate had profoundly altered the nature of feudal society in Japan. The phenomenon of warriors without war turning increasingly to the tasks of administration had brought about a considerable bureaucratization of the aristocracy, weakening the bonds and status rewards based on ascription and replacing them with greater emphasis on ability and performance. Real power passed to the lower echelons due to the increasing complexity of administration and the disparity between the talent of the lords, whose positions were hereditary and often filled by men lacking in force and intelligence, and the officials at the lower echelons who were men of real ability. This change in the nature of the aristocracy was also strongly influenced by the great weakening of the ties of the warrior class to the land which, apart from about 250 large lords (*daimyō*), became merely an administrative tie since support of the samurai came in the form of payments from their lord in cash or kind.

In a recent essay contrasting industrialization in Japan and Europe, David Landes also argues that the weak ties of the warrior class to the land had an important and favorable impact on economic progress (49, p. 170):

In Japan the system of land ownership and tenure seems to have conduced to other values. The Tokugawa had made it a point to separate the samurai from the soil, thereby depriving them of autonomous control over revenues and manpower. The motives and direct consequences of this policy are well known. After a long period of civil conflict, Japan had come to appreciate the disadvantages of an independent and inevitably insubordinate aristocracy; and under the Shogunate there were to be no Junkers or great barons to exercise local sovereignty and challenge the

authority of the central government. But for our purposes, it is the indirect and unintended consequences that are of interest: land ownership never became the symbol of social eminence and prestige, the hallmark of quality, and hence did not have the attraction for new wealth that it had in the West. So that when Japan entered on the path of industrialization, the successful businessman, whatever his social origin, did not feel it necessary to put the seal on his economic ascent by placing a good part or all of his fortune into estates.

Smith's emphasis on the significance of the fact that the warrior class "had long since been removed from the land and stripped of seignorial rights" is related particularly to the way in which this helped to make possible the creation of a highly centralized government in the years immediately after 1868. Since, apart from the two or three hundred *daimyō*, the aristocracy's direct tie to the land had been broken, "only the great lords had to be deprived of their power, and the deed was sooner done because their powers had come to be exercised, in fact, by officials who might trade them for similar powers within a vastly larger organization" (83, p. 377). The emergence of a new and higher loyalty to the Emperor sanctioned, even demanded the transfer of all power to a central government. And it was this loyalty to the Emperor in whose name the "aristocratic revolution" was carried out and which indeed accounts for its curious name—the Meiji Restoration.

Responsible leadership in Meiji Japan, and the vigorous response that it evoked among a substantial part of the population, also seems to have been in part a legacy of the version of Confucianism that was a dominant intellectual influence and which was responsible for the considerable spread of education in Tokugawa Japan. R. P. Dore argues that the "public spirit" engendered by Confucian education and the values and attitudes that it imparted affected not only the leaders in the higher echelons of government and business but extended to cooperation at the village level as well (14). G. B. Sansom is even more emphatic in suggesting that the Confucian tradition had "inculcated in the whole nation habits of discipline and obedience" with the result that "the most sweeping transformations were accomplished with relative ease, because the mass of the people were schooled in respect for authority and the privileged classes included a great number of men blessed with courage, trained in public affairs, and moved by a high sense of duty" (79, p. 185). Particularly important was the influence of this tradition on the samurai, who played a highly important role in the Meiji bureaucracy and in Japan's new industrial and banking enterprises.⁷

George DeVos also notes the influence of "Confucianist ideology which colored the thought of the governing classes throughout the Tokugawa period, as well as the subsequent innovators of modernization in the early Meiji period . . ." (11, p. 586). And he and Dore both attach importance to the Confucian

⁷ To illustrate his point that Japan's leaders "began the period of industrialization with their political consciousness well developed," Dore quotes Yamaji Aizan, a samurai of the Meiji period: "Politics is my mistress. I love politics, I adore politics, I live and breathe politics. My fate is bound up with the fate of the Japanese nation" (12, p. 306). Craig's account of the key role played by the Chōshū han in the Restoration also stresses the influence of the Confucian tradition and the way in which "han nationalism" and "the sense of duty and obligation to the han" contributed to bureaucratic efficiency, lack of corruption, and "the great emphasis on the attainment of collective ends" (7, p. 355).

emphasis on the individual's capacity for self-improvement which engendered attitudes congenial to economic progress.⁸ DeVos places major emphasis, however, on the special features of the family structure in Japan, influenced by Confucianism but also by many other factors. The crux of his argument is that

socialization within the Japanese family inculcated in many Japanese a type of self-motivated achievement orientation which, present in a sufficiently numerous segment of the population, made it possible to adequately man the operation of the society that was being self-consciously guided toward gaining a position of eminence in a world that was then exclusively dominated by Western states (11, p. 578).

Especially relevant here is DeVos's contrast between Japan and the type of "amoral familism" described by Banfield in the southern Italian family, which strongly influenced Brewster's analysis of the way in which social structure and associated attitudes impede the ability of people in a traditional, peasant society to concert their individual behaviors in effective units of collective action. DeVos argues that Japan was an exception to this type of society where "the family is a fortress held against outside society which is perceived with hostility and distrust" because for the Japanese "the community beyond the family is united by a network of inter-penetrating obligations and expectations" (11, p. 583). It is along these lines that DeVos would explain not only the Japanese capacity and even obsession for hard work but also "a feeling of 'we-ness' in the society" so that "class divisions did not interfere with a sense of cooperativeness of purpose throughout the society." On the contrary, the leadership "became devoted to the national polity, including the rural folk" and "a tremendous resource of human energy was directed into new channels" (11, p. 580).

There would seem to be a danger of overstating the contrast between Meiji Japan and contemporary peasant societies and to exaggerate the importance of the "amoral familism" emphasized by Banfield and others. It is not surprising that in a traditional economy the outside society "is perceived with hostility and distrust" in a situation in which villagers' contact with representatives of the outside world has been pretty much limited to encounters with the tax collector and the policeman. It may in fact be no more difficult to change the attitudes of villagers in this respect than to alter the attitudes and behavior of government workers called upon to perform a new and positive role in introducing profitable innovations and in other ways fostering increased farm productivity and output.⁹

The fact remains, however, that the sense of national unity and the considerable homogeneity of the Japanese which contributed to the feeling of "we-ness" that DeVos describes were important assets that are seriously deficient in a number of developing countries today. For example, in comparing Meiji Japan and contemporary Africa, Claude Welch makes the point that the lack of national

⁸ DeVos notes the contrast with Buddhism and its preoccupation with release from worldly problems, whereas Dore, in his comparison with Latin America, is contrasting the influence of Japan's Confucian tradition with "those versions of the Catholic tradition still surviving in Latin America that make the Bible a forbidden book . . ." (14, p. 235).

⁹ I am indebted to Raj Krishna for raising this issue and encouraging me to articulate these reservations. He would further emphasize that in the village, as in the city, small and large social units and purposes coexist; and the strengthening of relatively broad loyalties is one of the important positive contributions of nationalism.

integration in the African states, containing as they do a variety of ethnic groups and traditional and modern leaders who are often in competition, stands out as "the fundamental contrast" with 19th century Japan with its much greater homogeneity (93, p. 21). And certainly the sharp divisions between social classes in many Latin American countries, often accentuated by the antagonism between Indians and ladinos, would appear to seriously impair the sense of national unity and cooperativeness of purpose that was such an important favorable factor in Japan.¹⁰

A consideration more directly relevant to Japan's success in mobilizing capital from agriculture concerns the nature of the antecedent system. In the Tokugawa period, a substantial agricultural "surplus" already existed which was being extracted from the Japanese peasantry as a feudal levy or tribute. As Smith has emphasized,

high as the rate of tax on land was [in the Meiji period], it did not represent an increase over the Tokugawa period. Already at the end of that period the take from agriculture by the warrior class was immense, and the Meiji government merely redirected it into new channels. Modernization was achieved, therefore, without reducing rural living standards or even taking the increase in productivity that occurred (82, p. 211).¹¹

Thus one of the essential points to be explained is why the Meiji leaders were prepared to act in such a revolutionary way in sharply curtailing the large payments from current revenue that had gone to the samurai class (79, pp. 327-29). Even though there was some compensation in the form of bonds and cash, this Meiji reform was in many respects comparable to the dispossession of a landed gentry by a program of land distribution. But, as noted earlier, it was facilitated by the fact that the direct tie to the land on the part of most of the aristocracy had already been severed. Although the sense of national purpose and other factors considered above help to explain their behavior, the revolutionary character of many of the decisions of the Meiji leaders appears in retrospect to be not merely impressive but somewhat surprising.

Mobilization of capital in the Meiji period was undoubtedly made somewhat easier by the timing of Japan's development. Conditions that might have led to rapid and substantial increases in consumption levels were not present in force; and the continuing strength of tradition and the degree of isolation from outside influence combined to slow or even to postpone "the revolution of rising expectations." Similarly, the "demonstration effect" associated with the development of modern communication techniques and mass media that permit a remote villager to become conscious of the affluence of far away countries as well as the relative affluence of his own urban centers was not adding fuel to

¹⁰ One other attempt to explain why economic growth began in Japan should be mentioned. In his book *On the Theory of Social Change*, Everett Hagen argues, in line with the major theme of the book, that a period of alienation of key groups in Japan led to a period of retreatism that influenced patterns of personality development in such a way as to encourage the emergence of creative behavior conducive to economic growth (29, Chapter 14). The present writer finds, in this subjective realm, more enlightenment in the ideas reviewed in the text which seem to be reasonably consistent and, by and large, to reinforce one another.

¹¹ A tentative but highly interesting analysis by Alan Gleason suggests that the rise in rural consumption was appreciable; but this conclusion must be qualified to some extent because of the unknown but considerable channeling of funds from agriculture to other sectors by landlords (27).

popular demands to raise consumption levels as fast or faster than the growth of national product. R. P. Dore has suggested that the Meiji government's efforts to act as a damper on social and political change had significant favorable effects on economic development: "The authoritarian exploitation of tradition postponed the establishment of liberal democracy until industrialization and the development of education had sufficiently transformed the social base to give democratic institutions a good chance of stability" (14, p. 241). Dore goes on to suggest that because of the welfare-state ideals which have since emerged, an underdeveloped country is "forced to accept responsibilities toward its citizens which, however admirable in themselves, divert into consumption resources needed for economic development. Again, Japanese governments could resist such demands until the economy could easily afford them" (14, p. 242).

The relevance of these considerations to the mobilization of capital is clear. They must have made it somewhat easier to continue the heavy burden of taxation imposed on the Japanese peasantry, a burden which was to some extent made more onerous because the feudal levies in kind were converted into an obligation fixed in money terms. This led to an appreciable increase in tenancy so that the share rents that landlords collected in kind rose not only because of the increase in crop yields but also because of a rise in the percentage of tenanted land (13, pp. 17-19). Hence a significant part of the increment in national product that resulted from rising agricultural productivity was available for capital formation, partly as a result of agriculture's direct contribution via the land tax to financing government investment and in part through the private investment financed by the increased profits and savings of landlords.

Japan's Approach to Agricultural Development

Let us now turn to the second question relating to the reasons why the Meiji leaders were able to choose and successfully implement an appropriate and efficient strategy for agricultural development. In examining this aspect of agriculture's role, Ranis has stressed that it was possible to generate a substantial increase in farm output with a relatively small increase in capital inputs because of the "slack" that existed in the agricultural sector (75, p. 440). Although this notion of "slack" is useful in calling attention to the potentialities that existed for increasing agricultural productivity with "a minimum need for additional investment," it is equally important to emphasize that there was nothing automatic about the process.

The success of Japan's agricultural development was the result of impressive foresight. Decisions of a long-term nature were reached early in the Meiji period—the decisions that led to the creation of the agricultural colleges, research stations, and other institutions needed to realize the potential inherent in Japan's rural economy for inexpensive gains in productivity and expanded farm output.

Strengthening of education at various levels was important for its influence on those who were to enter farming but also because of the value of the training received by rural youth who were to move into jobs in industry, commerce, and government. Significantly, many of the agricultural scientists and other professionals serving agriculture came from farm households and were able to begin their climb up the educational ladder in a rural schoolhouse. The rapid increase

in elementary schools, "technical supplementary schools" which stressed topics useful to agriculture, and middle schools served not only to impart technical knowledge but also to strengthen the decision-making capabilities of individual farmers and to enhance their receptiveness to innovations and their ability to recognize development opportunities. Particularly noteworthy was the emphasis given in Meiji Japan to practical and technical training. The preamble to the Education Code of 1872 expresses this viewpoint in a manner that seems to anticipate the recent discussions of investment in human resources: "Every man only after learning diligently according to his capacity will be able to increase his property and prosper in his business. Hence knowledge may be regarded as the capital for raising one's self; who then can do without learning?" (as quoted in 46, p. 68).

Dore suggests that the respect for education engendered by Confucianism and the considerable number of small private schools that existed at the time of the Meiji Restoration constituted a significant advantage and indeed "prompted the new central government in the early 1870's to institute compulsory education as one of its first acts of reform . . ." (14, p. 235). The popular demand for education also made it somewhat easier to require local governments to shoulder most of the burden of financial support for the schooling that was made compulsory by the central government.

Important also was the fact that the goals of education came to be viewed as a process of preparing people for a multiplicity of roles, not merely as the narrow task of qualifying selected individuals for government positions.

Sansom has emphasized the radical modification of attitudes toward education required for the creation of an educational system appropriate to the role that it was to perform in facilitating economic growth. "In Japan of the feudal age," Sansom writes, "it was held that the purpose of education was not to fill a young man's mind with useful facts but to make him virtuous by teaching him the wisdom of gods or sages and so forming his character to meet the needs of the society—and particularly the class—of which he was a member" (79, p. 453). The sharp shift in attitudes is illustrated by the contrast between Yukichi Fukuzawa, a prolific writer who played a highly important role in promoting the spread of knowledge about the Western world and its ideas, and Fukuzawa's father, a samurai who adhered rigidly to feudal ideals. Upon hearing that his sons were being taught the multiplication tables, the elder Fukuzawa "took them away from school in a rage crying: 'It is abominable that innocent children should be taught the use of numbers—the tools of shopkeepers. What will the teachers do next?'" (79, p. 427). A sharper contrast can hardly be imagined than the utilitarian emphasis of the younger Fukuzawa. In his influential book, *The Encouragement of Learning*, Fukuzawa epitomizes the attitude of the Meiji reformers in his strong emphasis on the value of a practical education and his scornful characterization of the traditional scholar as "a man who has penetrated deeply into the classics and history but cannot carry out a business transaction—such people as these are nothing but rice-consuming dictionaries, of no use to their country but only a hindrance to its economy" (79, p. 454).

The break with the past was in fact less complete than the foregoing would suggest. Although compulsory primary education and a curriculum dominated

by practical subjects were a new departure, there was much of the traditional in official educational policies as prescribed by the Ministry of Education. This was especially evident in the stress placed on moral training and on strengthening attitudes of filial piety, loyalty to superiors, and the view that "learning must subserve the purposes of the state . . ." (79, p. 460 and *passim*).

Recent contributions by Hayami, Sawada, and other Japanese scholars have led to fuller appreciation of the importance of the innovational activity of individual farmers and of their vigorous response to economic opportunities—and pressures (30, 80). Smith has described the impact of the sweeping reforms carried through "at a single willing stroke" and which resulted in an

explosion of individual energies that followed the sudden abolition of status distinctions. Until then opportunity was very limited; men looked forward to following the occupations of their fathers, and even to living out their lives in their same villages and towns and houses. After it, everything seemed suddenly changed, and young men strove with leaping hope and fearful determination to improve their characters, to rise in the world, to become something different from their fathers . . . (83, p. 375).

The social and institutional reforms instituted during the first half dozen years of the Meiji period—1868 through 1873—gave a strong impetus to the development of agriculture by striking down restrictions on the sale and cropping of land, on the choice of occupation, and other feudal restraints. In particular, the removal of the Tokugawa restrictions on the movement of goods and people and the creation of a unified nation and national economy must have accelerated the spread of knowledge and of improved varieties. Yamada's detailed analysis of changes in farm output and in conventional and nonconventional inputs underscores the importance of the largely spontaneous diffusion of the practices that had been developed by outstanding farmers during the Tokugawa period (95). Both the central and prefectural governments sought to facilitate this diffusion of knowledge of improved practices. Local meetings were held to promote the exchange of promising varieties and techniques and "agricultural improvement societies" were organized in a number of prefectures. In 1880 the Ministry of Agriculture and Commerce instructed all prefectural governments to encourage the establishment of such societies, and a year later 110 leading farmers were invited to Tokyo to consider measures for improving the nation's agriculture. Some of these farmers were appointed as instructors at the newly established Komaba Agricultural College and others were employed as "itinerant instructors" to tour the country and meet with groups of farmers and demonstrate improved farming techniques.

An attempt to introduce "western" methods of large-scale farming in the 1870's had been a failure. Thereafter efforts were concentrated on increasing the efficiency of the prevailing system of small-scale farming. The so-called "Meiji Technology" that was evolved has been aptly described as a "combination of indigenous know-how and very selective borrowing from the West" (65, p. 625). Intimate knowledge of the best of traditional farming methods was thus the starting point for agricultural research and "extension" activities. Procedures were devised to insure adaptation of improved varieties to varying local condi-

tions. Considerable attention was also given to the analysis and mapping of soil types and to the preparation of instructions for the rational use of fertilizers on different crops and under various soil and climatic conditions.

It is apparent that political leaders and government officials at all levels regarded agricultural improvement as a matter of great importance and gave significant support to the work of agricultural research and extension personnel. Prefectural governors as well as village leaders promoted and took part in country fairs and agricultural meetings. Prizes and subsidies were awarded to encourage improved farming practices and new farm enterprises such as agriculture. The net effect of these activities was to give recognition to the importance of agriculture and to foster attitudes favorable to agricultural progress. It is also noteworthy that in the Meiji period landlords generally lived in the countryside and frequently took an active part in promoting the adoption of improved practices and in organizing and often financing the extension of irrigation facilities or improved layout of farm units. Since land taxes were revised only rarely and landlords commonly received approximately half of the rice crop as rent (although lesser percentages for other crops), they had a strong incentive to promote measures that would raise productivity and output. For owner-cultivators and tenants as well, economic incentives and pressures were probably much more important than the less tangible motives of national pride and patriotism.

This final point deserves emphasis. Although the "progress-oriented government" of Meiji Japan played a crucial role, it limited its activity to certain strategic measures that helped to create a favorable economic environment. It helped to generate and disseminate promising innovations in agriculture, particularly yield-increasing innovations based on varietal improvement and increasingly heavy use of fertilizers, and the government's "model factories" pioneered new industrial activities. But economic advance on a broad front depended on the decisions and energy of a great many entrepreneurs, including some five million farm operators, responding to market-determined prices. Subsidies or sales of government factories at a loss gave a stimulus to certain enterprises. With few exceptions, however, cost-price relationships were not distorted and acted as a spur to efficiency.¹²

III. RELEVANCE OF THE JAPANESE EXPERIENCE TO THE DEVELOPING NATIONS

Before turning to an examination of the relevance of Japan's experience to contemporary underdeveloped countries, a disclaimer is in order. Japan's own experience strongly supports Gerschenkron's criticism of the concept of specific "prerequisites" to modern economic growth. It also illustrates the importance of "processes of substitution" for what appear to have been "prerequisites" in previous historical experience. The influence of Japan's Confucian tradition and other socio-cultural factors considered above were, in this sense, a "substitution" for—a "functional equivalent" of—the role of the "Protestant Ethic" in western Europe as stressed by Weber and Tawney. Each country that responds to the

¹² It is tempting to speculate that because of the "unequal treaties" that restricted her ability to impose protective tariffs, Japan may have been spared the serious distortion of price relationships that seems to have had adverse effects on growth in a number of developing countries in recent years (57).

challenge of modern economic growth is, of course, unique in important respects, and the actors on stage at this moment in history must confront "the creative task of finding their own answers and shaping their own future" (24, p. 6). The Japanese experience certainly suggests factors that are potentially of great importance. Certain features of the "Japanese model" are clearly relevant in the current context, but it also seems important to identify areas in which the need for "processes of substitution" is likely to be especially great. Thus the distinctly higher rates of growth of total population and labor force that characterize underdeveloped countries today have implications that are examined in some detail in the following pages.

Two questions are singled out for consideration here. To what extent is it appropriate for the underdeveloped countries to follow the Japanese pattern of drawing heavily on the agricultural sector for much of the tax revenue and capital required for infrastructure, expanded governmental services, and industrial expansion? And the second closely related question: Should contemporary developing countries pursue a strategy for agriculture development which seeks to expand farm output mainly by increasing the productivity of the relatively abundant resources of labor and land already committed to agriculture?

Agriculture and the Capital Requirements for Structural Transformation

In a comparative study of Japan and western Europe, David Landes notes that in western Europe, unlike Japan, agriculture was probably not a net source of capital for industrial expansion. His terse conclusion is: "In short, the land gave men and nourishment to the burgeoning industrial society. Need one ask for more?" (49, p. 171).

He thus poses one of the key issues of development policy today: "Need one ask for more?" Gerschenkron has pointed out that the late-developing countries in Europe used devices for mobilizing long-term capital for industry that were not resorted to in countries that developed at an earlier stage: "The more gradual character of the industrialization process and the more considerable accumulation of capital, first from earnings in trade and modernized agriculture and later from industry itself, obviated the pressure for developing any special institutional devices for provision of long-term capital to industry" (24, p. 14). On the other hand, in countries characterized by a greater degree of "relative backwardness" the scarcity of capital and entrepreneurial talent gave rise to a need for special institutional arrangements to mobilize capital. Gerschenkron suggests that the industrial investment banks, which were such an important innovation in France and Germany, represented an intermediate situation. But in Russia in the late 19th century the relative backwardness was more marked, the scarcity of capital was greater, and the resistances to industrialization that had to be overcome were more formidable. Hence, Gerschenkron argues, "supply of capital for the needs of industrialization required the compulsory machinery of the government, which, through its taxation policies, succeeded in directing incomes from consumption to investment" (24, p. 20).

Japan's own experience and the general problems faced by a late-developing country in mobilizing capital for industrialization seem to emphasize the need for agriculture to make a net contribution to the capital requirements for indus-

trial expansion during the early phase of development. And there seems little doubt that the agricultural sector must provide a substantial part of the increased tax revenue that is required for the expansion of education, research, and other developmental services as well as the capital needed to strengthen the economic infrastructure.

There are, however, at least four significant differences between the development experience in Japan and the problems faced by the underdeveloped countries today. The first difference, and one that has profound implications, is the much higher rates of growth of total population and labor force that characterize today's less-developed countries. A second difference is associated with the pressures, both economic and noneconomic, that give rise to a rather capital-intensive pattern of investment in spite of the scarcity of capital and relative abundance of labor. The third difference to be noted is the possibility of supplementing domestic resources by foreign aid; and a final contrast relates to the current climate of opinion and other factors that make it difficult to tax agriculture, especially via a land tax.

Population growth and the arithmetic of structural transformation.—It is increasingly clear that the rates of population growth in the underdeveloped countries at the present time—typically 2 or 3 per cent per annum—are very much higher than the growth rates that characterized the “population explosion” in western Europe and Japan as they experienced their “demographic transition.” One obvious and important implication of these high growth rates is that with even a modest rate of increase in per capita incomes, the growth of demand for food is very rapid.¹⁸

Another implication of the “awesome power of compound interest” merits much greater attention than it has received to date. The rate of structural transformation as reflected in changes in the occupational composition of a country's labor force depends on the rates of increase of the total labor force, the nonagricultural labor force, and on the initial share of the agricultural sector in the total labor force. It is obvious that the process of structural transformation will be slow for countries in which some 70 to 80 per cent of the labor force is in agriculture and where total population and labor force are growing at 2 or 3 per cent annually.

The growth paths in Chart 1 compare the changes in total, farm, and nonfarm labor force in two hypothetical countries over a 50-year period on the basis of alternative assumptions with respect to the rates of growth of the total labor force and nonfarm employment. Projections for both countries were made starting with a total labor force of 10 million; but for Earlyphasia it was assumed that the initial farm labor force accounted for 80 per cent of the total, whereas in Middlephasia the total labor force is divided equally between agriculture and nonagriculture. Chart 1-1 is based on the assumption that the total labor force is growing

¹⁸ The rapid increase in demand for food would seem to cast some doubt on the relevance of the “Mill-Marshallian model” recently emphasized by Wyn Owen (74, pp. 47–55). It requires considerable optimism to expect the terms of trade to turn against agriculture as a result of a rightward shift of the supply schedule at a more rapid rate than the demand schedule is shifting if the demand for food is increasing 3, 4, or even 5 per cent per annum. (And population growth of 3 per cent, increase of per capita income at 3 per cent, and a coefficient of income elasticity of demand for food of .7 implies a rate of growth of demand of slightly over 5 per cent.)

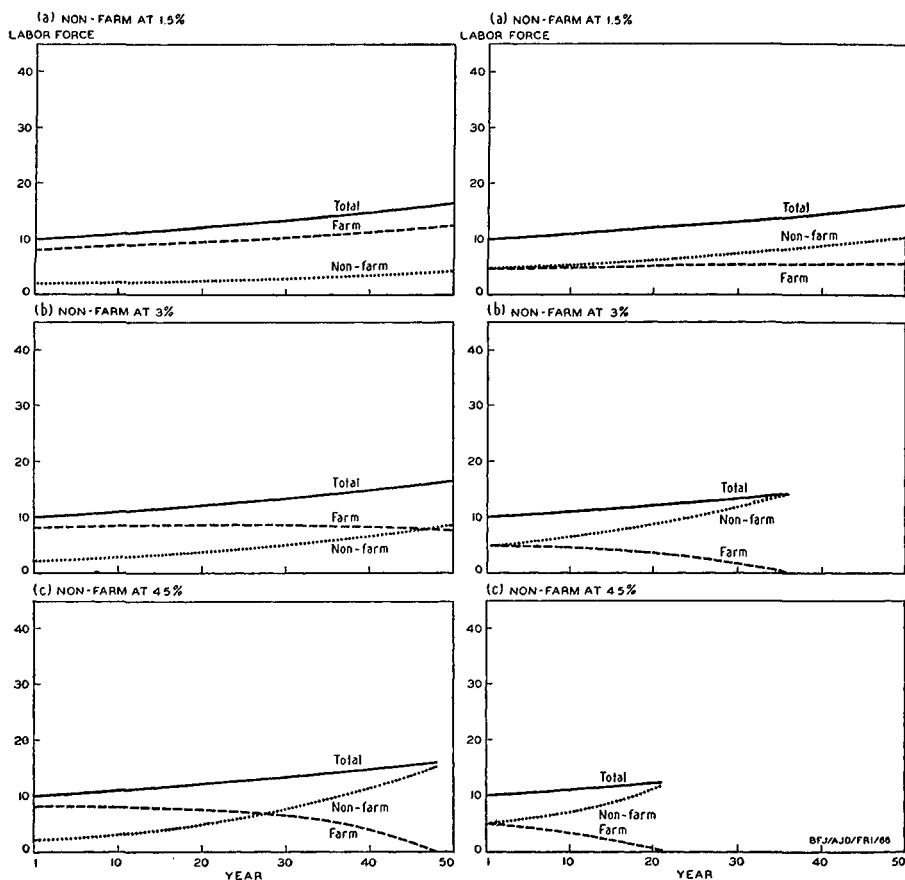
CHART 1-1.—HYPOTHETICAL GROWTH PATHS FOR TOTAL, FARM, AND
NONFARM LABOR FORCE OVER 50-YEAR PERIOD
IN EARLYPHASIA AND MIDDLEPHASIA

(Initial labor force = 10 million)

Assumption 1, Moderate Growth of Total Labor Force: 1%

(A) Earlyphasia

(B) Middlephasia



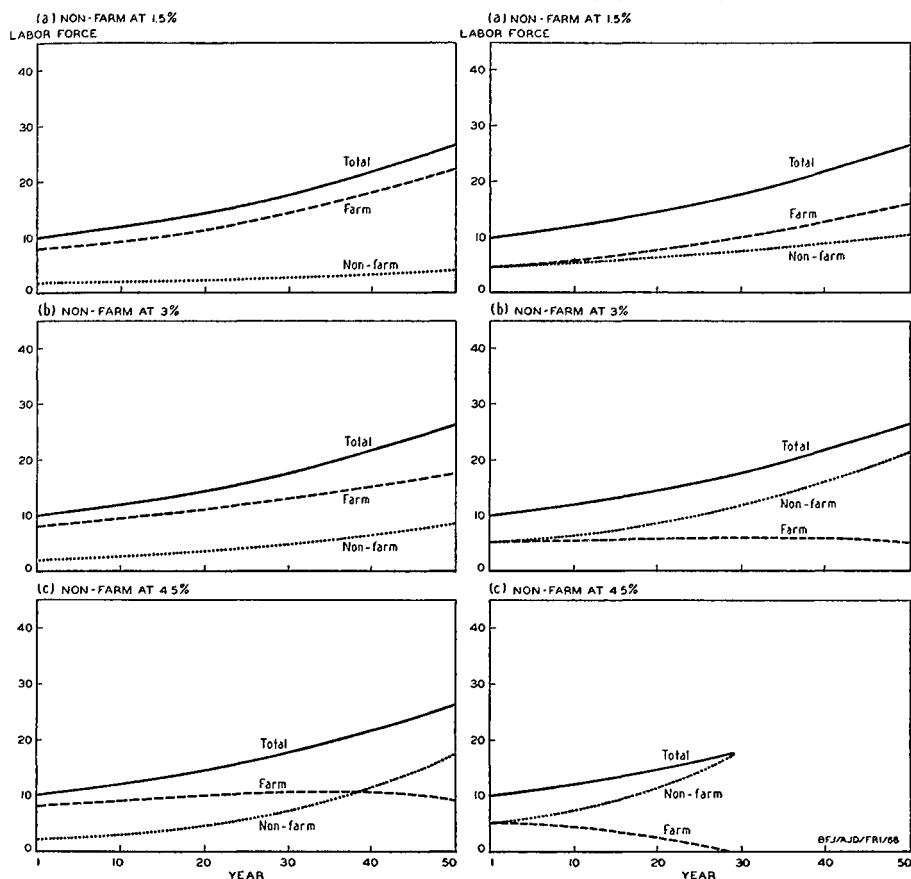
at a "moderate" rate of 1.0 per cent per year; the two following charts are based on "rapid" and "very rapid" rates of growth of the total labor force of 2.0 and 3.0 per cent respectively. (Ignoring the lag of, say, 15 years between a change in rate of population growth and a change in rate of growth of labor force, and abstracting from changes in labor force participation rates or changes in age structure, these assumed rates of change in labor force imply identical rates of change in total population.) Then for each of the assumptions with respect to the rate of growth of total labor force, the growth path of the farm labor force was computed on the basis of three different assumptions with respect to the growth of employment in the nonfarm sector—moderate, rapid, and very rapid growth, defined as 1.5, 3.0, and 4.5 per cent respectively. The left- and right-hand panels of the charts

CHART 1-2.—HYPOTHETICAL GROWTH PATHS (CONTD.)

Assumption 2, Rapid Growth of Total Labor Force: 2%

(A) Earlyphasia

(B) Middlephasia



show the sharp contrast between Earlyphasia and Middlephasia that stems from the assumptions concerning the farm sector's initial share in the total labor force. (It will be noted that in the two instances in Chart 1-1 and the one instance in Chart 1-2 in which the Earlyphasia nonfarm labor force reaches 50 per cent of the total within the 50-year period, the Middlephasia panels are merely a continuation of the Earlyphasia panels from that year, except that the total labor force starts to grow again from 10 million.)

The computations were made by iteration, using the identity

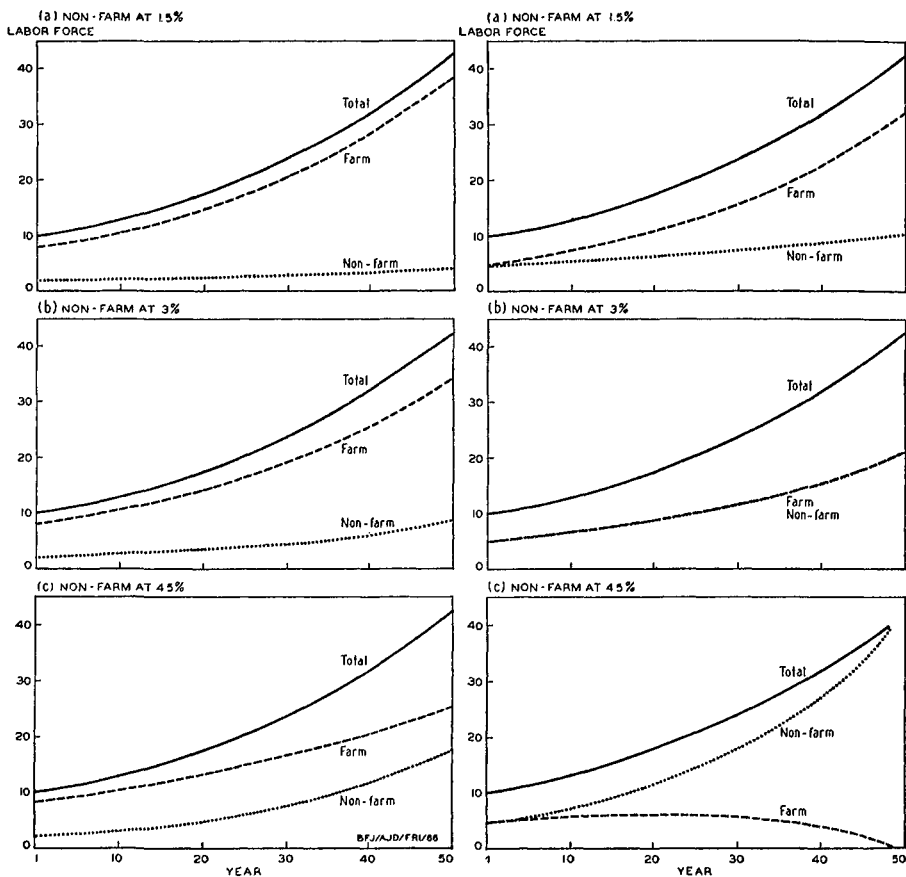
$$P'_A = (P'_T - P'_N) \frac{1}{P_A/P_T} + P'_N$$

where P'_A , P'_T , and P'_N are the annual percentage rates of change in the agricultural, total, and nonagricultural labor force and P_A/P_T represents the share of agriculture in the total labor force. As noted above, P'_T and P'_N are assumed to

CHART 1-3.—HYPOTHETICAL GROWTH PATHS (CONTD.)
 Assumption 3, Very Rapid Growth of Total Labor Force: 3%

(A) Earlyphasia

(B) Middlephasia



change at a constant rate and the values for P'_A and P_A were computed iteratively for 50 years. The values for P_T and P_N for successive years were, of course, a direct result of the assumed constant rates of change in P'_T and P'_N .

This procedure thus assumes that the size of the farm labor force is determined as a residual on the basis of exogenously determined rates of change in the total and nonfarm labor force. This assumption is fairly reasonable during the early phase of growth when an economy is still predominantly agrarian, but it becomes increasingly implausible as the relative importance of the nonfarm sector increases. For certain sets of assumptions, the assumed constant rates of growth of total and nonfarm labor force lead to the absurd result that the nonfarm labor force exceeds the total and the farm labor force becomes negative. When this occurs the hypothetical growth paths in Chart 1 are shown only up to this "year of absurdity."

For the nonfarm population of a country to increase more rapidly than its

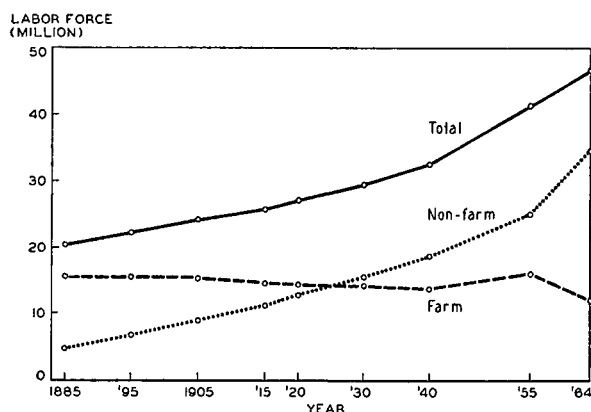
total population, leading to a decline in the share of agriculture in the total population and labor force, implies an increase in output per farm worker (or increasing food imports). But when the farm labor force continues to bulk large in the total, the "required" rate of increase in farm productivity is fairly slow; so, again, the assumption that the change in the size of the farm labor force is determined essentially as a residual seems plausible for a country at an early phase of development.¹⁴ As is noted later, there is another factor that somewhat modifies the extent that the farm labor force is determined as a residual. In a number of developing countries urban growth seems to be greatly in excess of the increase in nonfarm employment, implying that the "floating population" that is characteristic of such areas must also be considered as a "self-employment" sector that absorbs a part of the residual that does not find nonfarm employment.

Although the projections shown in Chart 1 are merely hypothetical, they embrace a sufficiently wide range of possible values for the relevant variables to be extremely suggestive of the prospects for many contemporary underdeveloped countries. They certainly reinforce the earlier assertion that the process of structural transformation will be slow when the total population and labor force are growing at 2.0 or 3.0 per cent annually. If, for example, the total labor force in Earlyphasia is increasing at 2.0 per cent and the nonfarm labor force is increasing at 3.0 per cent, at the end of a half-century the farm labor force would still be increasing at 1.5 per cent annually and would account for 68 per cent of the total labor force (Appendix III). In fact, if one accepts the implausible assumption that the total and nonfarm labor force would continue to increase at those rates, it would take nearly 100 years for the nonfarm labor force to reach 50 per cent of the total, and the farm labor force would not begin to decline in absolute numbers for a century and a quarter. With the same rates of growth of total and nonfarm labor force, but with the Middlephasia assumption that agriculture initially accounts for only 50 per cent of the total labor force, the turning point when the farm labor force begins to decline in absolute numbers would be reached after only 32 years.¹⁵ For a country that approximates the Earlyphasia conditions, the prospect that it would require well over 100 years to reach this turning point must certainly seem intolerable. It is to be expected that in many countries efforts will be made to speed the transition by encouraging a reduction in the birthrate and also by trying to achieve more rapid expansion of nonfarm employment opportunities. If, for example, the rate of increase in the total labor force in Earlyphasia were reduced from 2 per cent to 1 per cent after 25 years, the situation at the end of 50 years would be markedly different. This change alone would mean that in a half-century the farm population would have increased from 8 million to 12 million (rather than nearly 18 million) and would have declined to 59 per cent of the total labor force. Moreover, the turning point when the farm labor force

¹⁴ For further discussion of the assumption that the growth of the nonfarm labor force will be limited by the rate of expansion of employment opportunities rather than an insufficient rate of increase in farm productivity, see Appendix III.

¹⁵ Table IV of Appendix III summarizes the situation at the end of 50 years with respect to the size and composition of the labor force, the timing of the turning point (if any), and the rates of change of the farm labor force in Year 1 and Year 50 (or for an earlier year for those cases in which a "year of absurdity" is being approached). Projections for Latephasia, defined as having an initial farm labor force equal to 25 per cent of the total, are also summarized.

CHART 2.—JAPAN: GROWTH OF TOTAL, FARM, AND NONFARM LABOR FORCE, 1883-1964*



* Data from Appendix I. Figures plotted for 1885, 1895, 1905, and 1915 are midpoints of five-year averages. Lines are interpolations from labor force estimates for years shown.

begins to decline in absolute size would have been reached after 40 years, and it would be declining at an annual rate of 4 per cent in the fiftieth year.

Comparison of the hypothetical projections of Chart 1 with the historical changes in Japan's labor force as summarized in Chart 2 points up the fact that considerably more than 70 years would have been required for Japan to reach the turning point when its farm labor force began to decline if its total population and labor force had been growing at 2 to 3 per cent annually instead of about 1 per cent. (The rate of 1.4 per cent for the 1955-64 period was exceptional and resulted from an abnormal rise in entrants to the labor force and the fact that the post-1950 decline in birthrates had not yet begun to influence the rate of increase in the labor force.)¹⁶ It is also noteworthy that the rate of increase in employment opportunities in the nonfarm sector during the decades prior to 1920 was sufficiently rapid to forestall an increase in the farm labor force in spite of the fact that agriculture weighed so heavily in the total.

It has been rightly emphasized that Japan's strategy for agricultural development was appropriate, in part, because it was adapted to a situation in which the farm labor force remained large and farm units extremely small; but at least the expansion of nonfarm employment was sufficient to prevent a reduction in the average size of farm units. Apart from a few of the less-developed countries in Latin America where the weight of agriculture in the total labor force has been reduced considerably, the underdeveloped countries today are faced with a certain and very substantial increase in their farm population and labor force. Moreover, countries that now have 70 to 80 per cent of their labor force in agriculture will continue to be predominantly agrarian economies for well over a half century unless there is an appreciable reduction in the present rapid rates of growth of

¹⁶ The birthrate in Japan declined with unprecedented speed after the Eugenics Protection Law came into effect in 1949 (87, pp. 269, 311). For some years the legalization of abortion was the principal factor but more recently family planning based on contraception seems to have been more important.

total population and labor force and/or very rapid growth of nonfarm employment opportunities. The demographic transition in the industrialized countries of western Europe and North America was influenced powerfully by the social and economic changes associated with urbanization, including the effects of city life on attitudes toward family size and availability of the knowledge and motivation necessary for the practice of birth control. But contemporary underdeveloped countries that resemble Earlyphasia face *the challenge of finding effective means to bring about a rapid lowering of birthrates within societies that are still predominantly agrarian in character.*

It is necessary to mention a curious but important qualification at this point. A conspicuous phenomenon in many of the less-developed countries is that the growth of urban populations has, within a considerable range, been limited neither by the rate of increase in food supplies for the nonfarm population nor by the rate of increase in employment opportunities outside of agriculture. In short, the residual "self-employment sector" has not been limited to agriculture but has also included, in J. P. Lewis's words, "the urban in-migrant who, instead of doing absolutely nothing, joins Bombay's army of underemployed bootblacks or Delhi's throngs of self-appointed (and tippable) parking directors, or who becomes an extra, redundant salesman in the yard goods stall of the cousin, who according to custom, is going to have to provide him with bed and board anyway" (50, p. 53).

There is a deplorable lack of quantitative information concerning this phenomenon, but it seems to be especially conspicuous in Latin America where substantial growth of urban centers had taken place prior to World War II. Kingsley Davis has demonstrated that much of the mushroom growth of Latin-American cities has been a result of rapid growth of population already resident in urban areas, and only in part a consequence of rural exodus. This has resulted from the fact that these 20th-century cities have been marked by a continuation of high birthrates comparable to those in the countryside, whereas the decline in mortality has, if anything, been more pronounced in urban than in rural areas. This rapid growth of urban centers which has not been accompanied by a corresponding expansion of nonfarm job opportunities prompts Davis to point out that many of the less-developed countries face a twofold dilemma: "If they do not substantially step up the exodus from rural areas, these areas will be swamped with underemployed farmers. If they do step up the exodus, the cities will grow at a disastrous rate" (10, p. 51).

In the very long run, rapid population growth anywhere is a disconcerting fact if only because geometric growth eventually implies "standing room only." But the rapid growth of cities in underdeveloped countries may be "disastrous" in a more immediate and much more significant sense because of the disparity between growth of labor force and growth of employment opportunities. That is to say, much of the current increase in urban populations in cities such as Rio de Janeiro, Lima, or Léopoldville seems to represent the growth of a "floating population" or "self-employment sector" that poses problems somewhat comparable to those that arise with excessive density of population in the countryside. For both types of problem, it is of crucial importance whether there is "moderate," "rapid," or "very rapid" growth of nonfarm employment opportunities.

Industrial investment, capital intensity, and the growth of nonfarm employment.—Although industrial expansion may be limited by various factors, including failure of food supplies to keep pace with the increase in demand on the part of a growing nonfarm population, the rate of industrial investment and the average level of capital intensity are likely to be the critical factors determining the growth of employment in the nonfarm sectors.

Gerschenkron notes that late-developing countries have usually given a relatively high priority to heavy industry and have tended to adopt the latest technology from more advanced countries—technology evolved, of course, in an environment in which labor is scarce and costly and labor-saving innovations are emphasized. Hence, industrial expansion in late-developing countries has been associated with a much more capital-intensive pattern of investment than would be indicated by the relative availability and “true” prices of capital and labor (24, pp. 9–11). Whereas Gerschenkron seems to regard this as a rational response to the situation that they confront, Ranis and Fei argue that this tendency of underdeveloped countries to emphasize capital-intensive investment is a phenomenon that can and should be avoided or at least minimized. Their comparison of Japan’s experience and recent developments in India suggests a marked contrast. In Japan, at least until World War I, growth of the nonagricultural sectors was characterized by a low capital-labor ratio, and the rate of growth of industrial employment was considerably more rapid than the rate of increase in capital stock. But in India, investment during the years 1949–60 was so capital-intensive that the industrial labor force seems to have increased at something less than half the rate of increase in the capital stock (19, pp. 125–46).

The importance of this issue of capital intensity and the rate of increase of nonfarm employment is pointed up emphatically by the effect of rapid rates of growth of population and labor force on the process of structural transformation. Clearly, the issue is especially critical in countries that resemble Earlyphasia. In such countries—where agriculture initially accounts for 80 per cent of the total labor force—the farm labor force will still account for 59 per cent of the total and will be growing at 2.0 per cent per annum after 50 years if the rate of growth of the total labor force is 3.0 per cent even on the highly optimistic assumption that nonfarm employment will grow at 4.5 per cent annually (Appendix III).

The recent experience of some of the developing countries that have achieved rapid growth seems to suggest that a rate of increase of nonfarm employment of 4.5 per cent extending over a period of years is indeed an optimistic expectation. Between 1950 and 1960, the nonfarm labor force in Mexico increased at nearly 4.0 per cent. Apart from Taiwan, where special circumstances existed, this is the only instance that I have found that exceeds the 3.7 per cent rate registered in Japan between 1955 and 1964.¹⁷ But the “coefficient of differential growth”—i.e., the difference between the rates of growth of nonfarm and total employment which determines the rate of change in sector proportions—was much lower in

¹⁷ It appears that the rate of growth of nonfarm employment in Taiwan was considerably greater than 4 per cent in 1951–55 and again to a smaller extent in 1963. During the former period urban employment expanded rapidly with the influx of refugees from Mainland China. In 1963 the rate of increase in population and also in total labor force was 3.2 per cent; employment in primary industry increased by 1.9 per cent, whereas employment in secondary and tertiary industry went up by nearly 5 per cent (34, p. 108).

Mexico because the total labor force was growing at 3.1 per cent compared to the rate of 1.4 per cent in Japan. The rates of increase in the nonfarm labor force in Italy and Greece between 1951 and 1961 were 2.5 and 1.5 per cent respectively. There is some difficulty in interpreting the labor force data for the Soviet Union, but apparently the increase in nonfarm labor force between 1939 and 1959 was about 2.5 per cent.¹⁸

A more detailed analysis of the relationship between growth of manufacturing output and employment in a number of developing countries by Baer and Hervé also draws attention to the relatively slow growth of nonfarm employment opportunities. Data that they present comparing the rates of growth of manufacturing output and employment in nine countries indicate that in all instances the growth of manufacturing output has been much more rapid than the increase in employment. The purpose of their essay, however, is "to show that the lack of labor absorption in the manufacturing sector of developing countries is not necessarily due to conscious or wrong choices . . ." (2, p. 107). And to this end they consider some of the reasons why techniques that employ more labor per unit of output do not always yield a larger output per unit of capital.¹⁹

In the light of Japan's experience, it would appear that Baer and Hervé—and many other analysts as well—overlook a highly important dimension of the labor absorption problem. Highly pertinent is the fact that a two-sector model does not really do justice to Japan's pattern of development because the nonagricultural sector has itself had a "dualistic character." Thus, Ohkawa makes a distinction between a "modern sector," characterized by large enterprises, relatively high capital-labor ratios, and comparatively high wage rates, and a "semi-modern sector," made up of numerous small-scale units, using relatively small amounts of capital, and paying wages only a little above the average incomes of the farm population (66, p. 483). Moreover, many of these small units have been family enterprises, and to some extent they represent a "self-employment sector" in the sense that Ohkawa has aptly described Japanese agriculture as constituting the "self-employment sector" of the economy.²⁰

In an excellent discussion of the dual structure of Japan's industrial sector, Saburo Okita points out that as late as 1956 nearly half of the manufacturing labor force in Japan was working in small enterprises with less than 30 employees. He

¹⁸ These rates of change are based on labor force estimates in 21 and 90. Comparison of the labor force estimates for India in the 1956 and 1964 *Demographic Yearbooks* indicates a 6.7 per cent rate of increase in the nonfarm labor force. But most of this increase is due to the more inclusive definition of the labor force used in the 1961 estimates. The same data indicate an increase of 6.4 per cent in the total labor force and 6.2 per cent in the farm component; so the apparent rapid growth of nonfarm labor force cannot be taken seriously—and certainly does not imply rapid structural transformation.

¹⁹ Their own argument emphasizes an extreme version of one aspect of Hirschman's proposition that "machine-paced" rather than "operator-paced" technologies are likely to result in higher efficiency in a developing economy. Taking the rather surprising position that in "talking about development problems and their solution we are concerned about the short run," they assert that skilled labor should be considered a separate production factor and that it may be shortage of skilled labor rather than of capital that limits the expansion of employment (2, pp. 99–102).

²⁰ A recent monograph by S. C. Hsieh and T. H. Lee emphasizes that a "system of dual industrial structure" has also evolved in Taiwan; a large majority of industrial firms and virtually all farms are small units utilizing capital-saving, labor-using technologies (34, p. 96 and *passim*). This has been of great importance to Taiwan, as the employment problem there was potentially grave; population growth exceeded 2 per cent as early as 1926–30, reached 4.6 per cent during 1951–55 when the influx of refugees from the mainland augmented natural increase, and was still 3.2 per cent in 1963 (34, p. 108).

notes that there are wide differences between the large and small firms in capital intensity and wage levels, and emphasizes that most of the labor force must of necessity be absorbed in medium and small enterprises because of the limited increase in employment associated with the establishment of large-scale, capital-intensive enterprises. Okita suggests that this "double structure of the economy is a difficulty that underdeveloped countries have to face on the way to industrialization." If attention is paid only to the creation of capital-intensive industries, a wide gap is likely to be created between the great majority of the labor force and the employees of modern, large-scale factories who become "an aristocracy of labour" (72, p. 382 and *passim*).

Inukai and Tussing's account of Japan's first "development plan" makes it clear that this dual pattern of industrial development was no mere accident. A report, *Advice for the Encouragement of Industry (Kōgyō Iken)*, which embodied this "development plan," was completed in 1884. It consisted of 30 volumes of description and analysis of economic conditions during the early years of Meiji and a detailed statement of policies and targets for a ten-year period. Of special interest is the conscious emphasis that was given to the mobilization of labor and entrepreneurial skills on a broad front in small-scale enterprises which constituted a "quasi-agricultural sector"—sericulture, *sake* brewing, tea, leather, weaving, spinning, wood products, etc. Major emphasis was given to the improvement of productive techniques in traditional indigenous industries in the belief that with adequate guidance and technical assistance these small and scattered activities would foster overall economic development. Thus the report states: "Manufacturers are to be directed to postpone the establishment of a factory with big machines, and at present to pay more attention to the improvement of machines which they now use . . ." (quoted in 36, p. 29). It was recognized that some activities would have to be more capital-intensive and that there would be a general evolution in that direction, but in the meantime indigenous industries and abundant labor would make their contribution to the expansion of output and provide complementarities to the rising large-scale industry (36, pp. 34-37).

This dual pattern of industrial development, which made it possible to expand nonfarm employment at such a rapid rate, was facilitated by several characteristics of the Japanese pattern of development. Many of the traditional products manufactured by the small-scale, labor-intensive industries remained in strong demand; and many of the new farm implements that were widely used, such as a rotary cultivator-weeder that was pushed by hand, improved plows, and the foot-pedal thresher, were readily manufactured by such enterprises. Organizational arrangements, such as subcontracting between large-scale enterprises and small factories or household workshops, were a major factor in making it possible for the latter to operate and expand as efficient and viable firms utilizing techniques appropriate to the factor proportions prevailing in Japan (77, pp. 216-17). The spread of transport and communications facilities and the availability of electric power in rural areas were also of great importance in facilitating this type of development.

Japan's own experience following World War I suggests some of the reasons why the labor absorption problems facing contemporary developing countries are more difficult than those that prevailed during the Meiji era. Not only do these

countries have to contend with more rapid rates of growth of population and labor force, but in addition the nature of the industrial technologies currently available often dictates a much more capital-intensive pattern of investment. For some lines of production—steel, petrochemicals, automotive vehicles—the technical superiority of the latest processes is so decisive that it is uneconomic to use more labor-intensive technologies even when relative factor prices differ enormously.

The slowing down of the rate of growth of nonfarm employment in Japan during the 1920's and early 1930's was the result of increasing emphasis on capital-intensive investment by the large-scale, modern sector together with circumstances that discouraged the expansion of smaller firms in the semi-modern sector. It has been argued elsewhere that the consequent slowing down of the process of structural transformation had serious political as well as economic consequences, and that the slow rate of labor absorption in the manufacturing sector, as compared to the 1880–1920 period, was influenced strongly by inappropriate economic policies (40, pp. 241–47). To some extent, however, the greater emphasis on capital-intensive investment in the 1920–32 period was undoubtedly dictated by the changing structure of Japanese industry and the need to carry through “rationalization” policies to make the country's exports more competitive in world markets, although the latter problem was certainly aggravated by the maintenance of an overvalued exchange rate due to the stubborn determination of Japan's financial authorities to return to the gold standard at prewar parity. During the 1955–64 period the rate of increase of nonfarm employment—3.7 per cent annually—has been much more rapid than in the 1920's and early 1930's, but this has been associated with a rate of increase of GNP of 10 per cent and an incredibly high rate of investment, averaging 34 per cent for the period 1955–63 (39, p. 415). It is noteworthy that the rate of increase in nonfarm and manufacturing employment between 1883–87 and 1893–97 was nearly as rapid as during this recent period in spite of the fact that the rate of growth of GNP was less than a third as high.

In considering the policy options available to contemporary countries, it would obviously be a mistake to regard the implications of rapid growth of total labor force associated with a rate of growth of nonfarm employment that is only marginally higher as something immutable. There is a distinct possibility that the reduction of birthrates in the contemporary underdeveloped countries will take place more rapidly than in the “demographic transitions” of the past in spite of the special problems that must be overcome in bringing about the necessary changes in attitudes, motivation, and availability of knowledge and contraceptive devices within a population that is still predominantly rural.

There is also the possibility that some of the underdeveloped countries will achieve unprecedentedly high rates of growth of nonfarm employment. But—for reasons that are well summarized in W. A. Lewis's treatise on development planning—it is no easy matter to counter the forces that lead to an unduly capital-intensive pattern of investment (53, pp. 55–68). Japan's experience underscores the importance of pursuing what J. P. Lewis has termed a “secondary strategy” of industrial development—that is, policies and programs aimed at encouraging greater decentralization of industrial development and more rapid growth of

small- and medium-sized labor-intensive enterprises in order to promote fuller utilization of manpower and more rapid overall growth (50, Chapters 3 and 7). In fact, this sort of parallel development of modern and semi-modern industries seems to offer the principal hope for the rapid growth of nonfarm employment that will make possible a satisfactory rate of structural transformation.

A further advantage of such a dual pattern of industrial development is that it opens up possibilities of tapping sources of capital and entrepreneurial talent that the modern, large-scale sector is not capable of mobilizing. As the more progressive and successful farmers in a developing country raise their productivity and incomes, they acquire, in aggregate, a considerable capacity to invest in nonfarm enterprises as well as in agriculture. The extent to which such potential savings are translated into productive investments depends a great deal on the sort of investment opportunities that are perceived by individuals who have the capacity to save if the inducement is sufficiently attractive. Thus, the parallel development of small-scale, rural-based industries is in considerable measure complementary to the development of the large-scale, modern sector, especially when subcontracting arrangements and other institutional innovations exploit the possibilities that exist for using small, labor-intensive units for a wide range of products and processes for which the economies of scale are unimportant. Nevertheless, a certain amount of competition for scarce resources between the large-scale, modern sector and the development of small-scale industries is inevitable. And there is often a danger that the growth of the rural-based industries will be strait-jacketed by exchange controls, licensing requirements, or similar restrictions.

It appears, to cite an important recent example, that the rapid expansion of private tubewells in West Pakistan would not have been possible except for the happy though unforeseen circumstance that liberalization of foreign exchange regulations took place at an opportune moment so that small rural workshops were able to obtain certain essential materials for producing the simple pumps and diesel and electric motors that were required. In the event, there was vigorous interaction between growth of these local supplier industries and the rapid expansion of tubewell irrigation that has been a major factor in the gratifying expansion of farm output in Pakistan's west wing during the past decade (18). And it is significant that these small-scale, rural-based industries were not only important in providing increased nonfarm employment but also made available essential farm inputs at much lower capital costs and smaller foreign exchange content than would have been the case if major reliance had been placed, as was originally contemplated, on large-scale, public tubewell projects utilizing larger and more sophisticated pumps and motors.

Two points stand out as especially significant in the present context. The nature of the strategy pursued for developing the agricultural sector will have a strong influence on the success of efforts to encourage a dual pattern of industrial development. With the increasing commercialization of agriculture as structural transformation proceeds, a developing country's farm sector will make increasing use of purchased inputs. To the extent that this demand is directed toward relatively simple and inexpensive implements that are within the technical capabilities of small-scale, decentralized industries, the growing market for farm requisites can provide a strong stimulus to industrial expansion. A more capital-intensive

agricultural expansion path not only requires scarce capital and foreign exchange that are urgently needed for industrial development but also means that the growing commercialization of agriculture does not lead to the sort of dynamic interaction between agricultural expansion and development of rural-based industries that can contribute to more rapid growth of nonfarm employment opportunities as well as more rapid growth of national product.

The other conclusion to be emphasized is that even if one takes an optimistic view of the prospects for rapid growth of nonfarm employment, substantial growth of farm population extending over several decades is a reality that must be reckoned with in considering the choice of measures for agricultural development. Hence the view suggested by past historical experience that increase in farm productivity is needed not only because of the increase in the relative size of the nonfarm population but also because of the need to "release" labor for nonfarm employment has little relevance to contemporary developing countries of the Earlyphasia variety. For many years agriculture's distinctive role as the self-employment sector par excellence will be of major importance in making it possible for a rapidly growing labor force to find productive employment. This is a basic fact that must be reckoned with in considering the choice of measures for agricultural development. Current rates of population growth obviously imply a need for rapid expansion of agricultural output. But rapid population growth also greatly increases the capital requirements for structural transformation because a substantial rate of capital formation is needed merely to meet the requirements for infrastructure and other investments associated with a growing population and labor force without making any headway in reallocating the labor force or increasing capital investment per worker.

Availability of foreign aid.—The availability of foreign economic assistance at the present time is another important contrast with the Japanese experience and one that somewhat qualifies the somber implications of the preceding sections. During the early Meiji period even commercial credits from abroad were of very limited importance, and the climate of opinion that has given rise to substantial foreign aid programs had obviously not emerged. The rapid decline in mortality rates in the less-developed countries since World War II is itself an eloquent testimony to the potential effectiveness of technical assistance programs that can hasten the spread of modern technologies. It is now painfully obvious, however, that gains on the economic front are not so easily won because of both economic and noneconomic factors that limit progress. But most basic is the fact that the volume of foreign economic aid that is likely to become available is small in relation to the magnitude of the capital requirements for development; and the current leveling off in the volume of foreign assistance being made available by the industrialized nations would seem to reinforce such an assessment.

For certain countries, most notably small countries such as Israel and Taiwan that have received large amounts of foreign aid, external resources have been of great importance. Even for a large country like Pakistan, foreign aid has accounted for a substantial fraction of net investment in recent years and has made an important contribution in facilitating an increase in the country's rate of growth and an associated increase in the marginal saving rate (5, pp. 691-95). Aid

is, of course, particularly important when it helps a country to achieve a higher rate of increase in domestic output that leads in turn to continuing increases in domestic saving and investment and thus facilitates the mobilization of increasingly large quantities of domestic resources for growth. Clearly, foreign aid cannot be a substitute for domestic policies and efforts aimed at efficient use of the domestic resources currently available and at expanding the availability of resources—both physical and human—essential for future growth. In the agricultural field foreign aid can play a particularly strategic role in helping to create and strengthen the “specialized units of collective action which are necessary for development and widespread use of increasingly productive technologies” emphasized by Brewster. Helping to staff and to train personnel for agricultural colleges, research stations, and other supporting services to foster increased farm productivity and output can make a highly significant contribution to development—if the job is done well. In general, however, Ohlin’s conclusion seems valid: “What the experience of a decade of development assistance has brought home most sharply is perhaps the limits to the power of foreign aid and the overwhelming importance of political and economic efforts in the less developed countries themselves” (71, p. 100).

Providing economic and technical assistance that is really relevant and useful is a good deal more difficult than was commonly supposed when Point IV and related programs were launched. Foreign economic aid is in fact a mixed blessing for receiving countries. Some of the disadvantages of aid programs have received considerable attention, notably those associated with “tied” aid and the administrative problems that arise because of the diverse policies and requirements of various donor countries. Most important of all, of course, is that even “soft loans” pose a difficult repayment problem when they are of substantial magnitude, and a large and increasing fraction of economic assistance is in the form of loans. A recent shift in that direction of direct relevance to problems of agricultural development is the plan to phase out local currency sales of U.S. agricultural surpluses, the major component of the present P.L. 480 program, and to replace them with dollar sales financed by long-term credits, an arrangement that will obviously result in a much more onerous repayment problem—or possibly irksome negotiations leading to a debt moratorium or cancellation.

Of considerable importance in its effects on agricultural development strategy is the tendency for aid programs to bias investment toward excessive reliance on imported capital equipment. This is in part a consequence of the project approach to agricultural development that is discussed below. But it is also partly the result of the fact that at times development programs are shaped more by the export interests of a donor country than the development needs of the receiving country. In his study of aid programs in Uganda, Ralph Clark notes that under certain circumstances a country’s development plan “becomes skewed to meet the demands, not of a realistic appraisal of the country’s economic requirements, but of the conditions laid down for the loans under negotiation. Capital intensive projects have therefore been pushed forward and equipment has been purchased ahead of building up the capacity, the organisation and the technique to use it effectively” (6, p. 88). And, as will be argued later, before the country’s structural transformation has reached the point that makes it profitable to invest in

labor-saving mechanization. Thus scarce funds and trained personnel are diverted from programs to raise the productivity of the country's abundant resources of labor and land and used for projects of low social marginal productivity.

Another risk associated with aid programs is that foreign "experts" with insufficient understanding of the economic and other constraints that prevail are sometimes prone to encourage the allocation of scarce resources for projects that are inappropriate given the harsh realities that should govern priorities in a low-income country. A striking example is the Master Plan prepared by an American company for the East Pakistan Water and Power Development Authority which calls for early implementation of an extremely costly investment plan based on the premise that flood control is a prerequisite for agricultural development in East Pakistan. In his critique of these proposals, Ghulam Mohammad of the Pakistan Institute of Development Economics takes the apparently more realistic position that during the early stage of the country's development, priority should be given to expanding farm output by irrigation schemes such as low-lift pumps and tubewells that can be executed in a large part of East Pakistan without providing major flood protection works. He recognizes that flood protection works will eventually be needed and will make a valuable contribution to the country's welfare. But because of the sheer magnitude of the flood waters in East Pakistan, the investment requirements for such a program will be enormous; and at this stage of the country's development, production should be increased by measures that have much more favorable benefit-cost ratios (25). Unfortunately, this is by no means an isolated example, although it is perhaps somewhat unusual that the plan advocated by the foreign experts has been challenged so cogently.

Factors influencing agricultural taxation.—It is commonly asserted that because of the political realities and welfare concepts which now prevail, the agricultural sector in underdeveloped countries cannot be expected to make a significant contribution to financing development through private savings and investment or via government taxation. It is a fact that the real burden of agricultural land taxes has been greatly reduced in many of the underdeveloped countries as a result of failure to adjust tax rates in accordance with the rise in price levels since World War II. It has been estimated, for example, that the land tax provided over 20 per cent of tax revenue in prepartition India in 1939, but land taxes accounted for only 9 per cent of total tax receipts of India's central and local governments in 1954 and only 5 per cent of total tax receipts in Pakistan in 1952 (92, pp. 44, 61-63).

Historical factors, including the tendency to associate oppressive land taxes with colonial rule, have contributed to the current reluctance to tax the agricultural sector. Administrative problems in countries where no cadastral surveys have been carried out are another obstacle, and even more difficult problems arise in countries where shifting cultivation and "communal" forms of land tenure prevail.

Although revenue from land taxes has generally not been of much importance, the farm sector in a number of developing countries has been heavily taxed by explicit or de facto taxes on exports and also by tariff protection and various non-tax policies that have the effect of taxing the agricultural sector. In countries

such as Ghana, Nigeria, and Uganda, where a substantial part of the increase in proceeds from agricultural exports that resulted from the postwar rise in commodity prices was siphoned off by marketing boards or by export taxes, agriculture has made a major contribution toward financing investment in infrastructure and industrial expansion. Much more widespread have been the efforts by less-developed countries to protect domestic industries by import duties, licensing systems for imports, and currency restrictions or multiple exchange rates. These have had the effect of turning the terms of trade against agriculture, and their quantitative importance as a "tax" on agriculture can be considerable.²¹

From an economic point of view these devices for taxing agriculture have significant drawbacks.²² In the present situation of stable or declining agricultural export prices, marketing board surpluses or export taxes are much less promising as a source of funds to finance development programs than in a period of rising world prices when they represent a tax on "windfall" profits. Moreover, since these taxes fall on marketed output, and are often very heavy, they are likely to have important disincentive effects and lead to distortions in resource allocation, notably in discriminating against crops that earn foreign exchange that is badly needed.

In Nigeria marketing board surpluses were a major source of government "tax" revenue between 1947 and 1954; in the latter year these trading surpluses actually exceeded the total tax revenue of all levels of government. Between 1955 and 1962 the marketing board surpluses brought in only about one-fifth as much revenue as in the previous period and accounted for a relatively small fraction of total revenue as the importance of revenue from import duties and the proceeds from domestic excise taxes had increased considerably (33, pp. 35-36).

There would seem to be an acute need in Nigeria and other developing countries for a tax structure that would yield increasing revenue from the agricultural sector as its taxable capacity rises with the growth of cash farm income associated with expansion of the domestic market for purchased agricultural products. Where institution of a land tax is particularly difficult to administer because of the prevailing systems of land tenure, it may be advisable to place considerable reliance on a graduated "personal tax." Such a tax also gives rise to difficult administrative problems, but Ursula Hicks, John Due, and others argue that a graduated personal tax is feasible when it is assessed and collected locally to defray the cost of education and other public services at that level (16, 31). At present these local services are often heavily dependent on grants from the central government, and decentralized administration of land taxes or personal taxes is

²¹ By the interesting device of computing "implicit exchange rates," S. R. Lewis has shown that the quota and tariff restrictions in effect in Pakistan have had the effect of "taxing" the agricultural sector very heavily. The adverse effect on agriculture's terms of trade of these "non-tax" devices appears to have been at a peak during the 1950's. Lewis estimates that during 1954/55, when particularly tight quantitative controls on imports were imposed following a trade crisis, Pakistan's farmers received only about Rs. 3.25 per dollar's worth of agricultural products that they sold but paid around Rs. 9.50 per dollar's worth of manufactured products that they bought. Agriculture's terms of trade have subsequently become more favorable as "the disequilibrium of Partition and its aftermath" has been eliminated, but even in the mid-1960's the farm sector received only about Rs. 5.00 for agricultural products worth one dollar but paid over Rs. 8.00 for manufactured goods worth one dollar (51).

²² S. R. Lewis provides an excellent analysis of the advantages and disadvantages of various tax and non-tax devices in a forthcoming paper on "Agricultural Taxation in a Developing Economy" (52).

desirable not only to reduce the huge burden of the central government but also because, as Arthur Lewis has argued, "teaching the people to pay taxes for the services they want is the chief fiscal problem of underdeveloped countries" (53, p. 129; also see his Comment on 52). Japan clearly enjoyed special advantages in the extent to which the Meiji leaders were able to mobilize support, including tax support, for national goals; but even so, prefectural and local authorities were required to raise revenue locally for many public services, including the universal primary education that was made compulsory as a matter of national policy.

The importance of agriculture's contribution to the financing of industrial development in Japan is abundantly clear in spite of the lack of data concerning private capital flows. Agriculture's share of government tax revenue was on the order of 85 per cent during the years 1888-92 and still accounted for some 40 per cent in 1918-22; and government investment represented about 30 per cent of gross domestic fixed capital formation for the period 1887-1936.²³ The government outlays to extend and improve the rail network and for other types of infrastructure, to establish "model" factories, and to subsidize the fledgling merchant marine and the shipbuilding industry were particularly significant. Such outlays accomplished the lumpy investments in infrastructure, and the support of "pioneer industries" helped to create the external economies that fostered entrepreneurial activity by the private sector.

Although the inter-sectoral flow of private savings and investment funds cannot be estimated, there seems to be agreement that savings by agricultural landowners were substantial and that a good deal of the investment that they financed was in nonagricultural enterprises. Nakamura reports that a recent study of financial institutions during the Meiji era by Kokichi Asakura "demonstrates that the rural landlord-merchant played a major role in early Meiji financing by providing savings, by establishing and operating financial institutions and industrial and commercial enterprises" (62). The increase in agricultural productivity clearly led to a considerable increase in the profits of landlords, and a sizable fraction of those profits was invested in industrial enterprises, frequently in establishing the small-scale factories that were a conspicuous feature of rural Japan (84).

The most conclusive feature of Japan's experience is in demonstrating the importance of development that brings about a transformation of the predominantly agrarian character of an underdeveloped economy. This aspect is brought out clearly by the sharp contrast between Japan's experience following the Meiji restoration and Java's experience in the late 19th and early 20th century. In both countries small-scale peasant agriculture based on production of paddy rice made a considerable technical advance during this period. But in Japan the traditional labor-intensive, small-scale farming system "came to be complementarily related to an expanding manufacturing system in indigenous hands . . ." while "Javanese peasant agriculture came to be complementarily related to an expanding agro-industrial structure under foreign management" (23, p. 135). And, as Geertz rightly concludes, it was "the dynamic interaction between the two sectors which kept Japan moving and ultimately pushed her over the hump to sustained growth" (23, p. 141).

²³ This figure, which excludes military investment, is given by Landes (49, p. 100). It is based on Rosovsky's study of capital formation in Japan (76), but with a rough adjustment intended to correct for the exclusion of agriculture from Rosovsky's estimates. See also 40, 70, and 75.

Three aspects of this interaction seem to have been of particular importance to the agricultural sector: (1) the expansion of the market for cash sales of agricultural products as a growing percentage of the population came to depend on purchased food; (2) the enlarged use of purchased inputs by farmers that reflected the availability of new and improved inputs (such as fertilizers, improved plows, foot-pedal threshers, insecticides, nylon sheeting for "covered nursery beds," and small tractors) as well as the enlarged money income that made such purchases possible; and (3) the growth of nonfarm employment opportunities that was sufficient to absorb the natural increase in the labor force and has recently made possible the reduction in the absolute size of the farm labor force.²⁴

The burden placed on Japan's farmers by the policy of simultaneous growth may have been excessive; but it can be said that "the willingness of the peasantry to part with current income for distant and half-understood goals" has paid dividends. In contrast, the technical advance in agriculture in Java has supported a sixfold increase in population between 1850 and 1961 but very little structural transformation has taken place. In fact, in recent decades the increase in the farm population and labor force may have even exceeded the rate of increase in total population and labor force; according to the estimates that are available, agriculture's share in the total labor force rose from 66 per cent in 1930 to 72 per cent in 1962 (21). Thus, Geertz concludes, "the real tragedy of colonial history in Java after 1830 is not that the peasantry suffered. It suffered much worse elsewhere, and, if one surveys the miseries of the submerged classes of the 19th century generally, it may even seem to have gotten off relatively lightly. The tragedy is that it suffered for nothing" (23, p. 143).

Japan's experience lends strong support to Kuznets' observation that "one of the crucial problems of modern economic growth is how to extract from the product of agriculture a surplus for the financing of capital formation necessary for industrial growth without at the same time blighting the growth of agriculture, under conditions where no easy *quid pro quo* for such surplus is available in the country" (47, p. 115). The major differences between the conditions faced by Japan and those faced by the contemporary underdeveloped countries accentuate the importance of this problem. The issues that it raises cannot be pursued here. Not only do they lie afieid from the major preoccupations of this paper but they are complex and heavily dependent upon specific circumstances. (Rapid expansion of tax revenues from a burgeoning petroleum industry in Nigeria, for example, will presumably modify considerably the appropriate role of agricultural taxation in that country.) For some countries the problem is primarily one of failing to recognize the importance of developing a tax structure that insures that the agricultural sector makes a contribution to total revenue commensurate with its importance in the economy. Elsewhere there is a need to reform the structure of tax and non-tax devices which add up to a total "tax" burden on agriculture that is sometimes excessive and often inefficient because of its adverse effects on production incentives and resource allocation.

More directly relevant to the present paper is the fact that the type of strategy adopted for achieving an expansion of agricultural output has an important im-

²⁴ Ohkawa has given particular attention to the sectoral interdependence between agriculture and nonagriculture in Japan (67). For a discussion of this interaction in terms of a simple, general model, see 43, pp. 280-87.

pact on this problem of agricultural taxation. The increase in the taxable capacity and savings potential of the agricultural sector in Japan was large relative to the increase in gross farm income because the expansion of output resulted in such large measure from increasing the productivity of the farm-supplied inputs of land and labor. By the same token, rapid industrial expansion was facilitated because the demands of the agricultural sector for the scarce resources of loanable funds and foreign exchange were held to a minimum. A key issue that arises in considering the choice of strategy for agricultural development in the following section is whether a similar option exists for the contemporary less developed countries. Vernon Ruttan, for example, has argued that the investment requirements for agricultural expansion are so large that, in contrast to the Japanese experience, it is likely that the agricultural sector may require a net flow of capital from the industrial sector. There is no doubt that the developing nations face a formidable challenge in the need to simultaneously satisfy the resource requirements for agricultural expansion and for industrialization—but the fact of rapid population growth accentuates not only the problems of food supply but also those related to achieving the structural transformation that is a necessary condition for sustained economic growth. It is argued shortly that there is currently a very large potential for raising the productivity of the relatively abundant farm-supplied resources. Hence, the needed expansion of farm output can be achieved by measures that yield large returns relative to their cost. Thus Ruttan's gloomy conclusion does not appear to be warranted. If—and the proviso is obviously an important one—an efficient strategy of agricultural development is pursued, the savings potential and taxable capacity of the farm sector can be increased significantly as output is expanded to satisfy the requirements of a developing economy.

Two other interactions between agricultural development strategy and overall economic growth may also be of importance. The broad thrust approach to agricultural development as pursued in Japan would seem to offer a more propitious environment for bringing about changes in knowledge and attitudes with respect to birth control than a pattern of agricultural development that concentrates progress within a small sub-sector of large-scale, capital-intensive agriculture. In addition, a situation in which rising productivity and incomes are achieved by a large majority of the farm population, and in which a part of the increase in cash income is subject to land or personal taxes that do *not* allow exemptions or deductions for dependent children, could have an appreciable impact on the motivations that are a crucial element in the success of family planning.

Choice of Strategy for Agricultural Development

The diversity that characterizes agricultural economies because of differences in climate, soils, historical experience, population density, and a host of other factors is so great that the only safe generalization is that generalizations must be eschewed. Nevertheless, in one form or another most of the less developed countries face a basic issue of agricultural development strategy that can be crudely defined as a choice between the "Japanese model" and the "Mexican model." These two countries happen to represent success stories in their respective categories, but both categories include a good many failures as well. Whatever policies may be adopted to foster agricultural development, the final outcome depends very largely upon their implementation—upon hard work and effective

increasingly specialized and elaborate "units of collective action" required to develop and support the widespread use of productive technologies.

In essence, the contrast between the Japanese and Mexican approaches to agricultural development lies in the fact that the increase in farm output and productivity in Japan resulted from the widespread adoption of improved techniques by the great majority of the nation's farmers whereas in Mexico a major part of the impressive increases in agricultural output in the postwar period have been the result of extremely large increases in production by a very small number of large-scale, highly commercial farm operators.²⁵

In Japan, although there were naturally individual differences in skill, energy, and receptiveness to new opportunities, the bulk of the nation's farmers were involved in the increases in agricultural productivity associated with use of improved varieties, fertilizers and other current inputs, and improved but simple implements such as the short-soled plow, the rotary weeder, and the foot-pedal thresher. But until the 1950's when reliance on purchased inputs began to rise sharply, Japan's farmers continued to rely predominantly on the farm-supplied resources of labor and land, and apart from substantially increased purchases of fertilizer, their reliance on capital inputs remained very limited. The great bulk of the nation's farmers participated in the considerable increase in Japan's total farm output and the somewhat more rapid increase in the marketable surplus.²⁶

To a remarkable degree growth of farm output in Mexico has been concentrated in the semi-arid regions in the north where large-scale commercial operators rapidly expanded production of cotton and wheat as major irrigation projects made possible expansion of the cultivated area (32). These enterprises were both technically progressive and highly mechanized. The average yield of wheat increased from about 1,000 kilograms in the early 1950's to over 2,500 kilograms in 1964 (60). Owing to somewhat special circumstances, these large operators were able to obtain ample credit, much of it from large cotton merchandizing firms in the United States. Particularly for cotton production, the technology was largely transferred from the southwestern United States where cotton was being grown under similar ecological conditions. These heavy investments in rather capital-intensive farm enterprises were profitable in part because credit was obtainable on favorable terms but more basically because the market outlets were available for a rapid expansion of output. In the case of cotton, the export market was especially attractive during the 1950's because of the so-called "umbrella effect" of the United States price support program. Presumably, acreage quotas on cotton in the United States sharpened the interest of the large American merchandizing firms in assisting Mexican producers to expand their output and exports. For

²⁵ The "Soviet model," which represents a third option that is not considered here, differs from the "Mexican model" in two fundamental ways: (1) the large-scale farm units are not only large in terms of area and output but also have a large labor force, and (2) the managers of farms are agents of government and subject to a high degree of direct control by the central government (though somewhat less for collective than state farms).

²⁶ The expansion of sales of farm products appears to have been relatively slow in the 1920's and 1930's. There was retardation in the rate of growth of nonfarm population dependent on purchased food, the income elasticity of demand for food was surprisingly low, and imports from Korea and Taiwan satisfied much of the growth in domestic demand that did occur. Also the rise in farm receipts from sericulture tapered off—first because of the decline in prices, and subsequently from a decline in volume as well. That a relationship existed between the distressed condition of Japanese agriculture and the emergence of extremist political movements and the military take-over in the early 1930's has been argued elsewhere (40, p. 247).

wheat, there was a potential for rapidly expanding sales on the domestic market because of the scope that existed for import substitution, together with a fairly rapid increase of total consumption.

It is always hazardous to challenge success, and in any event it would seem that the Mexican approach was well-suited to exploiting the opportunities that existed for rapid and profitable expansion of cotton and wheat. It should not be overlooked that the bulk of the nation's farmers have been largely bypassed by recent progress, and the Mexican economy is now sharply divided between a relatively affluent sector engaged either in modern industry or the commercial sub-sector of agriculture and a large backwater still eking out an existence in semi-subsistence agriculture. Yet the process of structural transformation has already progressed far enough in Mexico so that in perhaps another 20 or 30 years a large proportion of the small-scale ejidal or private operators will be able to find employment in the modern, high-wage sector of the economy if nonfarm employment continues its rapid growth and the rate of increase of population and labor force begins to taper off.²⁷

Although the broad strategy underlying Japan's approach to agricultural development seems to have considerable relevance to many contemporary underdeveloped countries, it certainly does not follow that the techniques that were used to increase farm productivity and output in Japan can merely be copied. In fact, one of the principal lessons to be derived from the Japanese experience is the importance of progressively modifying existing farming systems rather than attempting the wholesale substitution of "modern" for "traditional" agriculture.

Japan's experience does demonstrate the potential that exists for increasing farm output within the framework of a small-scale, labor-intensive agriculture by the development and widespread adoption of yield-increasing innovations. This is not to deny that under particular circumstances medium- or large-scale farm units may have important advantages even with the structural conditions that characterize Earlyphasia. Attention is given shortly to some of the circumstances that may justify large units and which commonly make it desirable to allow scope for variation in farm size.

The earlier discussion of the interrelationships between agricultural development and structural transformation does suggest, however, that for many of the less developed countries it is even more important today than during the early period of development in Japan to emphasize the type of agricultural develop-

²⁷ This brief account is intended to point up the contrast between the Japanese and Mexican approaches; it obviously fails to do justice to the complex reality of agricultural development in Mexico. Moreover, Mexico does not contrast as sharply with the Japanese strategy of agricultural development as many other Latin-American countries because of the considerable emphasis in Mexico on agricultural research and rural education that have contributed to economic progress among some of the small-scale farmers and provide the potential for a considerably greater impact in the near future. Even this sketchy statement should also note that the Mexican land reform had a profound though largely indirect impact on development. Although the feudal haciendas were broken up, the actual implementation of the reform permitted large holdings to continue to exist—but on sufferance. Landholding ceased to be important as a source of political power or prestige; it became highly important as a business enterprise for profit-maximizing entrepreneurs able and willing to exploit the economic opportunities that emerged. On the other hand, the difficulty of obtaining credit and a host of other factors contributed to the lack of progress among most (though not all) farmers of the ejidal sector. Although the ejidatarios were supposed to have been the beneficiaries of the land reform, the major benefit seems to have been in its contribution to general economic growth. "Land reform," Edmundo Flores argues, "gave Mexico a government with a new concern for the people and the nation"; it destroyed the caste system, increased mobility, instilled the idea of progress and personal ambition, and helped create a climate favorable to road building, irrigation programs, and industrialization (20, p. 7).

performance on the part of individual farmers and on the strengthening of the ment strategy that is suggested by the "Japanese model." This means that it is enormously important to create the conditions necessary for expanding farm output mainly by making available new inputs such as improved varieties, fertilizers, and other biological-chemical forms of capital, improved implements useful for breaking seasonal bottlenecks, and improved technical knowledge inasmuch as these are *complementary* to the farm-supplied resources of labor and land which are and will long continue to be relatively abundant. On the other hand, there is a similarly strong presumption against achieving increases in farm output and productivity by relying heavily on the use of the scarce resources of capital and foreign exchange to purchase labor-saving equipment that is mainly a substitution for the resources of low opportunity cost.

Stated in those terms the implications of the Japanese experience would appear to be so obviously valid that it would seem to be a foregone conclusion that today's developing countries would be pursuing comparable strategies of agricultural development. That this is not the case points to the need for better understanding of the reasons for the general tendency for developing countries to underinvest in the institution-building that is a necessary condition for exploiting the potential that exists for expanding agricultural output at low cost.

In many of the newly independent countries this neglect seems to be due in part to a tendency to equate agricultural development with mechanization regarded as the symbol of a "modern" agriculture. This is often accentuated by a tendency of the urban-oriented leaders in such countries to turn their backs on traditional agriculture as something "primitive." Such an attitude is often associated with a lack of confidence in the possibility of increasing the efficiency of the existing small-scale farm units. Where the new leaders have been influenced by Marxism, these tendencies are reinforced by the strong tradition in Marxist thought of glorifying bigness and exaggerating the economies of scale in agriculture. That such views continue to hold sway in many developing countries is a little surprising in view of the chronic difficulties that have beset Soviet agriculture and the more recent setbacks experienced by the Chinese Communes. But considerations other than efficiency in resource allocation weigh heavily in such decisions. In the Soviet Union concern about the political power of an independent farm population and a desire to extract a maximum surplus from the countryside were clearly motivating factors. Collectivization together with the Machine Tractor Stations provided an effective means of siphoning off a large fraction of current output to meet the food needs of the nonfarm population and had the effect of making the farm population, rather than the industrial labor force, the residual claimants for available food supplies. It is this type of consideration that seems to underlie, for example, Dandekar's advocacy of collective farms as a solution for India's agricultural problems (8). And the appeal of a direct and coercive approach to mobilizing a surplus from agriculture is naturally strengthened if alternative methods of securing a significant contribution from the agricultural sector toward the development requirements for capital and tax revenue are ineffectual.

Working in the same direction is the tendency for economic planners to be preoccupied with the evaluation of specific "projects" which involve a decision to install a given production process or plant, associated with well-defined inputs

and estimated output. Nigeria is a striking example of a developing country that in recent years has heavily concentrated financial resources and skilled personnel on agricultural projects in the form of government-financed settlement schemes or plantations (17). These projects have affected only a minute fraction of the nation's farmers, returns have by and large been unimpressive, and the opportunity cost in terms of the adverse effect on research, extension, and other supporting services capable of having a broad impact on the agricultural sector has been high (94). There is also a danger that expansion of foreign aid programs for agriculture by international organizations such as the World Bank will accentuate a similar problem—the tendency to concentrate resources on a relatively small number of large units. When emphasis is given to loans for narrowly defined projects there is a built-in bias toward concentrating on such units because they are more easily identified as “bankable.” The widespread practice of restricting economic aid to the foreign exchange component of development projects has the unfortunate effect of encouraging emphasis on projects with a large foreign exchange content rather than the much more rational approach of emphasizing the mobilization of domestic resources. Large-scale, relatively capital-intensive projects of this nature may result in isolated islands of success, but they are likely to represent a poor allocation of resources when evaluated in terms of alternative strategies for developing the agricultural *sector*. Resources provided by such institutions can be much more effective in fostering a sound approach to agricultural development if they emphasize loans for roads, irrigation facilities, plants for agricultural processing or production of farm inputs, or the provision of funds for a local farm credit system that is able to make loans to small- and medium-size farm units.

Also pertinent is the fact that fiscal authorities are quite properly preoccupied with holding down expenditures for general administration. This tends to make it difficult, however, to obtain budget support for strengthening the programs that are essential to a successful effort to increase the efficiency of the existing labor-intensive agriculture. Because of the way in which increases in farm productivity and output depend upon the interaction between the quantity and quality of developmental services such as agricultural research and extension programs and the farm-level decisions and performance of individual farm operators, there are inherent difficulties in applying formal analytical techniques in this area. Nevertheless, there is clearly a need for imaginative efforts on the part of economists and agricultural scientists to devise techniques for planning and justifying such programs that are at least comparable to benefit-cost analysis. It should also be noted that in many of the less-developed countries professional and administrative salaries are very high in relation to the nation's average per capita income, and this means that the budget burden of such programs is considerably higher than it is in Japan where such income differentials have been much narrower.²⁸

²⁸ D. R. Gadgil has recently pointed out that “the salaries of professors in Japan, whose per capita income is roughly three times that of India, do not usually exceed Rs. 700 per month,” whereas the scale of salaries recommended for professors in India by the Radhakrishnan Commission is Rs. 900–1,350 (22, p. 106). This general problem of excessive income differentials is considerably more acute in some of the countries of tropical Africa where salaries of government personnel have often been geared to the salaries that were formerly paid to the colonial administrators of the metropolitan government.

Choice of an unduly capital-intensive approach to agricultural development may also result from circumstances that create a discrepancy between the private and social marginal productivity of investment in labor-saving equipment. This is particularly likely to occur where, as in much of Latin America, there is a "dual-size structure." The large landowners in such countries often have fairly easy access to capital and technical knowledge—and foreign exchange limitations that might curb imports of farm machinery are often (temporarily) overcome by Export-Import Bank or other credits. Moreover, as Nicholls has observed, this type of "socio-politically dominant landlord class will rarely be willing to tax itself in order to support such public services as education and agricultural extension" (63, p. 17). This type of situation, which is a result of the prevailing power structure, may in some countries be a more important factor limiting agricultural taxation than the "climate of opinion" discussed earlier.

The other factors that limit the relevance of the Japanese approach are of a more technical nature. Important among these is the acute lack of research and knowledge concerning agricultural technologies relevant to the tropical and subtropical regions in which most of the less developed countries are located. Up to the present time agricultural research has been concentrated mainly in the temperate regions. Although the basic principles and research techniques developed in these regions have great relevance, production technologies adapted to the various crops, soils, and climates of the tropics are, in large measure, yet to be invented. Moreover, the extreme diversity in the crops that are grown in some of the underdeveloped countries, especially in tropical Africa, complicates the problems facing local research workers. Even among the staple food crops there may be nine or ten "major" crops within a small country whereas in Japan research and extension activities could be more easily concentrated on rice and a few other basic crops; and except for Hokkaido, farming systems were fairly homogeneous in spite of the range of latitude.

Another significant difference stems from the fact that in many of the contemporary underdeveloped countries the backlog of indigenously evolved agricultural innovations does not seem to be as substantial as in Tokugawa Japan. This further underscores the need for organized research programs directed toward the development of feasible and profitable innovations that will enhance the productivity of the existing small-scale agriculture.

Efforts to increase crop yields in Japan through plant breeding and increasingly heavy applications of fertilizer were facilitated by the irrigation works that had already been developed to a considerable extent during the Tokugawa era, and further improvements were made during the Meiji period, including drainage systems that made it possible to grow two or more crops a year on paddy fields. Measures that tend to insure more adequate and reliable water supplies for growing crops also have an important indirect effect because they increase the returns that can be expected from heavy application of fertilizers.

The fact that investment in irrigation may be essential to realizing the potentialities of improved varieties and fertilizers has led some students of agricultural development to take an extreme position in discounting the possibilities for expanding agricultural output by accelerated technical progress. Shigeru Ishi-

kawa argues that Japan's experience with respect to agricultural development is of very limited relevance to other Asian countries because in many areas the preconditions in the form of adequate irrigation, drainage, and flood control measures have not been established (37). In a somewhat similar vein, Vernon Ruttan has argued that "without massive investment in irrigation" efforts to increase crop yields by innovations such as higher yielding varieties and heavier application of fertilizer will not result in higher productivity in the rice-producing regions of South and Southeast Asia. Ruttan goes on to suggest that the investment requirements for irrigation and other infrastructure and for expanded production of farm inputs "may require a net flow of capital from the industrial to the agricultural sector thus reversing the classical pattern assumed in most development literature" (78, p. 22).

If Ruttan's conclusion concerning the magnitude of the resource requirements for agricultural development is correct, the implications are disturbing in the extreme. But such a pessimistic view does not seem to be justified. The unprecedented requirements for enlarged food supplies that result from rapid growth of population in the less-developed countries understandably gives rise to concern whether sufficient efforts will be made to expand agricultural output. Equally significant, however, is the fact that rapid growth of population and labor force increases the capital requirements for the process of structural transformation. Thus, as was stressed earlier, development policy must reckon with the fact that if an underdeveloped country is to achieve significant economic progress, it must simultaneously satisfy the resource requirements for industrial expansion *and* for increasing farm output. (Nor must it be forgotten that in Earlyphasia rapid growth of population means that for a time labor inputs in agriculture will increase nearly as fast so that the required increase in output per farm worker is fairly modest.)

It is precisely for that reason that it is of such crucial importance to realize the potential that exists for achieving a substantial part of the increase in agricultural output by increasing output per unit of total input. And the evidence at hand suggests strongly that conditions today are considerably more favorable for accelerated technical progress than those that prevailed in Meiji Japan provided that appropriate steps are taken to exploit the potentialities that exist. The accumulated backlog of scientific knowledge and the research techniques now available add up to a much greater potential for windfall gains in raising agricultural productivity. Furthermore, the existence of such organizations as the International Rice Research Institute in the Philippines and the International Center for Maize and Wheat Improvement with headquarters in Mexico can contribute enormously to realizing those potentialities.

Until recently the strongest evidence with respect to the potential that existed for highly profitable yield-increasing innovations applicable to the tropical and subtropical regions related to export crops. Striking increases in yields of cocoa, coffee, oil palm, and other export crops can be obtained with relatively modest increases in production costs (58). In view of the very limited allocation of resources for research relating to food crop production it is not surprising that the progress in evolving valuable innovations applicable to those crops has been much

more limited. But for the three major food crops that have received significant attention in recent years—maize, rice, and wheat—the prospects range from good to spectacular.²⁹

The recent advances in the development of the Mexican dwarf varieties of wheat can only be described as spectacular. A promising beginning was made in breeding varieties resistant to stem rust, but as late as 1950 the varieties available in Mexico would not yield more than 3.5 tons per hectare. The use of short straw varieties, based on the Norin varieties developed in Japan, has sharply raised the level of yields obtainable. These varieties do not lodge even with very heavy applications of fertilizer, and the identification of the gene that determines sensitivity to photoperiodism has made it possible to breed varieties insensitive to differences in length of day. The current selections not only give extremely high yields but also demonstrate a remarkable range of adaptability to different physical environments. The best wheat farmers in Mexico are obtaining yields of eight tons per hectare, and the national average yield increased from about 760 kilograms per hectare in 1940 to a little over 1.3 tons in 1960 and then rose very sharply as the dwarf varieties were adopted and exceeded 2.5 tons in 1964 (60). Extensive trials of several of the Mexican dwarf varieties in West Pakistan, the Punjab regions of India, and in other countries have been highly successful, and the prospects for rapid expansion of wheat production based on widespread use of these high-yielding varieties is excellent. A well-informed student of Pakistan agriculture has gone so far as to suggest that wheat production in West Pakistan will be doubled in three to four years, mainly as a result of this development, if the government can move rapidly enough to expand fertilizer production and imports to permit fertilizer applications at close to the recommended rates.

The prospects with respect to rice are complex but highly promising. Until recently there was a good deal of pessimism concerning the yield potential of the *indica* varieties of rice suited to the short-day conditions of the tropics. Typically these varieties are susceptible to serious lodging with even moderate applications of fertilizer, and their yield ceiling was much lower than for the *japonica* varieties grown in the higher latitudes. Plant breeders at the International Rice Research Institute have been engaged in a major program to produce short, stiff-strawed varieties capable of giving a strong response to nitrogen and also insensitive to differences in length of day. Some of the promising varieties are giving yields of 6.0 to 8.0 tons per hectare compared with normal yields in Southeast Asia of 1.0 to 3.0 tons. Results obtained in trials of the IRRI varieties in East Pakistan and India make it clear that these varieties will have an important impact on rice production in those areas, although reports of disease problems in India suggest that local adaptive research and strengthened extension activity will have their usual important role to play.

The potential impact on food production in the underdeveloped countries as

²⁹ Considerable information concerning these developments is contained in The Rockefeller Foundation's *Annual Report 1964-1965: Program in the Agricultural Sciences*. The following paragraphs also draw on information kindly provided by Dr. Edwin J. Wellhausen, director of the International Center for Maize and Wheat Improvement, and Dr. Norman E. Borlaug, director of the International Wheat Improvement Program, during a visit to the Center in September 1966. I am also indebted to Mr. K. R. M. Anthony, agronomist and plant breeder with the Cotton Research Corporation and the Food Research Institute, for assistance in preparing this assessment of the prospects for technical progress.

a result of increased maize yields is difficult to assess because some of the most promising developments are so recent. Until a few years ago the major efforts of maize breeders were concentrated on the creation of high-yielding hybrids. Results at the experiment station level have been extremely impressive. The work of Wellhausen and other scientists with the Rockefeller Foundation team and the National Institute of Agricultural Research in Mexico have laid a strong foundation for progress in the knowledge that has been accumulated concerning the various races of maize and their characteristics. E. W. Sprague's account of the Rockefeller Foundation's maize improvement program in Asia provides striking evidence of the speed with which, given favorable circumstances, crop yields can be raised by a combination of plant breeding and the application of fertilizers. A regional program initiated in 1957 has already resulted in the development of varieties that yield 10.0 tons per hectare; and the average yield for the most economic fertilizer treatment at eight cooperating stations was 5.6 tons compared to an all-India average of less than one ton as late as 1955-59. This experience also emphasizes the important complementarity between varietal improvement and fertilizer use; the breeding program was based on a relatively high fertility level—80 pounds of nitrogen and 60 pounds of phosphoric acid per acre—"to allow superior germ plasm to express itself" (86, p. 59).

Success at the experiment station, however, has not been matched by commensurate success at the farm level. Far from it. Although many factors are involved, the limited impact of hybrid maize on farm level yields has unquestionably been due in considerable measure to two disadvantages of hybrids that are important in the context of a developing country: the seed must be renewed annually by purchase from seed producers, and hybrid varieties are very specific in their environmental requirements. The scientists at the International Center for Maize and Wheat Improvement are now convinced that a program aimed at the development and introduction of improved open-pollinated varieties holds much greater promise for the less developed countries than emphasis on hybrids. They are confident that the basic knowledge now exists to recommend a specific "recipe" of appropriate varieties and/or races of maize for a specific set of conditions. With the application of fertilizers the initial yields of these trial varieties will normally be well above those obtained with local varieties, but the Rockefeller scientists place particular emphasis on the fact that relatively simple techniques of recurrent mass selection that have been worked out can result in yield increases of close to 10 per cent per year for several years. This rate has held for the first three years of trials in Mexico, but it is expected that the rate of increase will soon fall off to 3 or 4 per cent annually. Yields of open-pollinated varieties obtained by this procedure are already nearly as high as those obtained with hybrid varieties, and in addition to avoiding the problem of annual seed replacement these varieties are considerably more adaptable to a range of physical conditions.

Realization of the yield potential of improved varieties depends on adequate water supplies, and frequently this can be assured only by irrigation. The emphasis that Ishikawa and Ruttan place on facilities for water control is highly pertinent, particularly to realizing the potential that exists for increasing rice yields. The water requirements of maize and wheat are, of course, considerably less than for rice; but for those crops as well additional or better distributed water

supplies are often essential to realizing the full yield potential inherent in improved varieties and heavy use of fertilizers. Nor can it be doubted that irrigation facilities, especially in the form of major projects, are expensive. But it does not necessarily follow that the outlays for irrigation and flood control, together with other essential agricultural investments, must be so massive as to make it impossible for the agricultural sector to provide a net contribution to the capital requirements for infrastructure and industrial expansion during the early phase of development.

The answer to this question—not the query posed by Landes, “Need one ask for more?” but rather “Can one ask for more?”—depends upon the various factors that determine the relationship between cost and returns associated with the most efficient agricultural expansion path that a particular developing country can reasonably be expected to follow. While it is true that irrigation works are costly, the per-acre costs vary a great deal. By concentrating initially, to the extent that the physical environment permits, on smaller and less elaborate projects the cost of such outlays can usually be held down considerably. Moreover, a substantial part of the labor and capital inputs can be provided by the farmers concerned if the cost-return relationships are favorable. And when programs to provide additional water supplies are associated with seed-fertilizer combinations with a high yield potential, the cost-return relationships are likely to be very favorable.

Moreover, in much of Asia substantial investments in irrigation have already been made. Frequently, the need is to increase the efficiency with which irrigation water is distributed and used and, above all, to provide supplementary irrigation for crops during periods when water from existing systems is unavailable or inadequate. These are not mere hypothetical possibilities. Rapid expansion of tubewells in West Pakistan, which has accounted for a good deal of the impressive increase in output since 1958, is a recent example of great interest. The additional water available from these tubewells markedly raised the productivity of existing inputs of labor, land, and bullocks by permitting an increase in the annual intensity of cropping as well as an increase in crop yields (26). The increase in returns is in fact so high that farmers realize the full cost of tubewell installation in a few years. Carl Gotsch has estimated that in a West Pakistan rice area that he studied, tubewells yielded internal rates of return of 50 to 150 per cent; and in a wheat-cotton area more representative of West Pakistan conditions he found that returns to investment in tubewells ranged from 65 to 140 per cent (28). It is not too surprising that a great many individual farmers manage to mobilize the resources to finance such investment with little or no government assistance.

Government activity can, of course, be of strategic importance in facilitating this type of development by carrying out hydrological surveys, providing well-digging crews (at least until private operators respond to a demonstrated demand for tubewells), making available cheap power, and insuring the availability of complementary inputs such as seed and fertilizer. There is a great need for better information concerning the extent of such possibilities in other areas. Although the information available concerning the extent to which possibilities of this nature are available is insufficient, it is clear that West Pakistan is not a special case. A recent analysis of the possibilities that exist in East Pakistan, where the

natural environment differs enormously, indicates that investment in improved water control measures together with the complementary inputs of fertilizer and improved varieties will yield very high returns, especially when the investment emphasizes relatively inexpensive small-scale irrigation schemes based on low-lift pumps or tubewells (25).

Moreover, in the tropics as in the temperate zones, expanded use of fertilizers and pesticides can often lead to highly significant yield increases for rain-fed crops. According to a recent study carried out in a natural-rainfall zone of Mexico, it was found that the response of maize to nitrogenous fertilizer was uneconomic in only one of the 16 situations studied, an area with shallow soils and less than 600 mm. of rainfall. The study indicated that under relatively favorable conditions—rainfall above 800 mm. and deep soils—the application of 120 kilograms of nitrogen per hectare would increase yields by 2.6 tons (48). With the current high price of maize in Mexico, this represents an additional return of 2,400 pesos per hectare associated with an additional outlay of 600 pesos per hectare for fertilizer and roughly 200 pesos additional cost for weed and insect control. Admittedly, the age-old problems that stem from year-to-year variation in rainfall may become more serious when farmers begin to invest in purchased inputs. In parts of Africa, for example, the response to fertilizer may be nil or even negative in years of below-average rainfall, although on average the application of fertilizers would be profitable (42). Thus, the lack of facilities for water control not only reduces the average return to investment in fertilizers but also may make it considerably more difficult to gain farmer acceptance of the practice because the result in any one year is uncertain. Myren's study of factors influencing farmers' acceptance of the use of fertilizers and hybrid maize in Mexico led him to conclude that uncertainty with respect to the outcome in a particular year is a major reason that many small farmers have not adopted these innovations (60).

It has been emphasized that the yield potential of improved plant material almost invariably depends upon high levels of soil fertility that can only be provided by fairly heavy applications of chemical fertilizers. The exceptions, and they are sometimes very important, are instances in which plant breeders are able to incorporate resistance to insect or disease damage that had previously depressed yields. Striking examples are offered by the work of the cotton breeders in creating varieties with resistance to bacterial blight and other diseases and in the manioc breeding work in East Africa that led to varieties of this important root crop resistant to mosaic and brown streak disease. But of much wider significance are the situations in which the combination of improved varieties and increased fertilizer application permit substantial yield increases.

Although it is true that Japan pursued a "capital-saving" approach to agricultural development, it also needs to be stressed that the use of working capital—mainly fertilizers—increased at a very rapid rate. Moreover, this increased use of fertilizers was associated with a number of complementary inputs that made it profitable and feasible to use increasingly heavy applications of fertilizer. The importance of varietal improvement has already been stressed, and the need for research and education relating to appropriate levels and timing of fertilizer applications is obvious. Also important in Japan were improvements in farm implements that helped to overcome seasonal labor bottlenecks as agricul-

tural production was intensified; and in the case of the short-soled plow which permitted deeper plowing there was a direct effect in increasing the ability of plants to use large quantities of fertilizer.

In postwar years in Japan, as in other countries where agriculture is linked to a modern industrial sector, the use of insecticides and fungicides has expanded rapidly. The discovery of new chemical compounds such as DDT, BHC, malathion, and a host of others has greatly increased the effectiveness of pest and disease control operations—a development that is of especially great importance in the tropics where the need to control plant pests is a good deal more critical than in temperate regions. The need for and returns to plant protection measures are, of course, greatly increased as producers begin to grow higher yielding varieties in pure stand. There have also been important industrial innovations that have reduced the cost and increased the effectiveness of chemical fertilizers. These inputs are not only complementary to the existing resources of land and labor, but they have the further advantage of giving a quick payoff. This means that the farm credit problem is eased because total capital requirements are less and also because the discount for risk is less than for capital outlays that have a long payoff period. Moreover, being highly divisible, these biological-chemical inputs are neutral to scale so that they are readily incorporated into a system of small-scale farming. These considerations of complementarity and neutrality to scale also suggest that use of chemical weedkillers may become economic at a relatively early phase of development in situations in which they are effective in relieving a seasonal labor shortage.

Fertilizers and other current inputs require scarce foreign exchange for imports or the building of local plants which means heavy capital investment (and heavy outlays of foreign exchange for equipping such plants). But provided these biological-chemical forms of capital are accompanied by the associated inputs of technical knowledge—and the means of disseminating the knowledge—they can yield extremely high returns. The resource allocation problems that arise in determining targets with respect to the rate at which various new inputs are to be used by farmers need to be considered within the context of a country's development strategy for the agricultural sector. It seems likely, for example, that some 70 to 80 per cent of the farmers of West Pakistan will be planting the Mexican dwarf varieties within a few years. The appropriate target for fertilizer use in connection with the introduction of the improved varieties is a matter that calls for careful study. Some of the relevant economic considerations suggest that an initial goal of, say, 40 kilograms of nitrogen per hectare would be a more feasible and more appropriate goal than the 120 kilograms that would enable the new varieties to fully express their genetic potential.

The potentialities for increasing productivity and output by these inputs that are complementary to the abundant resources of labor and land are so considerable that there is a strong presumption against investing scarce resources of capital and foreign exchange in agricultural mechanization. As the process of structural transformation reduces the relative and eventually the absolute size of the farm labor force, the need to increase output per worker increases at an accelerating rate (44, pp. 282–83 and Appendix II). But until that time the use of animal draft power would seem to have a distinct advantage because it is a farm-supplied re-

source. Obviously there are situations in which it is profitable to use tractors, even though the opportunity cost of labor is low, because of technical reasons, for example, when timely soil preparation is critical because it makes the difference between producing one or two crops a year. In general, however, it is advantageous for countries with the economic structure that characterizes Earlyphasia to emphasize the introduction of simple, inexpensive equipment that eases labor bottlenecks and makes for more efficient utilization of the labor force rather than replacing farm workers. Improvements in the design of the small garden-type tractors that have expanded so rapidly in Japan in the postwar period suggest that these may also hold promise in some of the underdeveloped countries. They may, for example, find a place in African farming systems in areas where tsetse and the risk of trypanosomiasis rules out the use of animal draft power. Although larger tractors have an advantage in technical efficiency, this is likely to be unimportant because of the compelling economic considerations that dictate an expansion path characterized by low capital-labor ratios.

The uneconomic character of investment in labor-saving equipment with a fairly high purchase price is likely to show up as a scale problem that arises from the lumpiness of the investment. Paul David has shown that, with linear cost functions for alternative harvesting techniques, the minimum acreage—"threshold acreage" in his terminology—required to make it profitable to adjust to the more capital-intensive technique, is directly proportional to the cost of the piece of equipment and the cost of labor.³⁰ And the pioneering studies by G. K. Boon similarly suggest that when the opportunity cost of labor is low and the rate of interest is high, the threshold acreage will be large and labor-using, capital-saving techniques will be optimal (3).

It would, of course, be misleading to suggest that developing countries face an all or nothing choice between the Japanese and Mexican "models." There are situations in which large-scale farm units are the most economical forms of organization even though circumstances generally favor small, labor-intensive units. Sugar cane is an outstanding example of a crop for which large units have an advantage because of the need for close coordination between the growing and processing of the crop. Of more general significance is the need to allow scope for variations in farm size related to differences in the managerial capabilities of individual farmers. Moreover, it is often necessary in order to maximize returns to scarce resources, to give priority to extension and farm credit programs aimed at farm units somewhat above the average size. The establishment of consolidated farm units in Kenya and African farms with a cultivated area of 20 to 25 acres in the so-called Native Purchase Areas of Rhodesia led to significant increases in farm output and productivity, and the increased commitment to farming on the

³⁰ The relationship that David uses for analyzing the shift from the cradle to the mechanical reaper in the United States during the 1850's is:

$$S_T = \left(\frac{d + 0.5r}{L} \right) \left(\frac{C}{w} \right)$$

where S_T is the threshold acreage, d is the straight-line rate of depreciation, r is the annual rate of interest, L is the number of man-days of labor per acre harvested dispensed with by mechanizing the cutting operation, C is the purchase price of a reaper, and w is the money-cost to the farmer of a man-day of harvest labor (9, pp. 29–30).

part of those cultivating these more "economic" units was an important contributing factor. Farming on the consolidated or native purchase holdings is based on hand labor or animal draft power as in the smaller units. The marginal productivity of labor is very much higher than on fragmented or excessively small holdings with the result that members of farm households on the larger units work longer and harder at the job of farming.⁸¹

In considering the ambiguous and elusive concept of the "economic size" of a farm unit, the basic point to be emphasized is that the average farm size, or more precisely the number of farm workers per acre, can only be varied within fairly narrow limits. For the reasons considered earlier, in countries of the Early-phasia variety the farm labor force is large and, for several decades or more, will continue to grow nearly as fast as the total labor force unless nonfarm employment is expanding at an extraordinarily rapid rate. This will tend to hold down farm wages with the result that the "threshold farm size" will be very large and mechanization discouraged accordingly. For institutional reasons, however, the wage rate for farm labor is likely to be considerably higher than its opportunity cost. On the other hand, capital and land are likely to be available to certain large operators at prices considerably below their opportunity cost. To the extent those circumstances prevail, labor-substituting investment in agriculture is likely to be a result of discrepancies between private and social cost, a situation that seems to be fairly common in parts of Latin America where agriculture is characterized by a dual-size structure (I).

Also important is the tendency for some governments to try to overcome the factors that make mechanization uneconomic by ill-considered policies whereby the government encourages or itself creates large-scale "modern" units that are compatible with the use of mechanical equipment. It is remarkable how often mechanization schemes have been fostered by subsidies, duty free imports of machinery, and similar measures whereas an efficient strategy of agricultural development would usually call for precisely opposite policies, e.g., imposition of duties on farm machinery and fuel, to offset the effect of an overvalued exchange rate, or land taxes graduated by farm size.⁸² It cannot be emphasized too strongly that rational decisions with respect to agricultural development policy must be related to an overall strategy for the *sector*. Given the underlying conditions with respect to the size of the farm labor force and growth of demand for purchased food, establishment of a number of large-scale, highly commercialized units will mean increased overcrowding among the bulk of the nation's farmers and make it more difficult for them to expand their cash income and use of purchased inputs. On the other hand, pressure to invest scarce resources in large-scale, capital-intensive schemes will be minimized if vigorous and far-sighted efforts are being made to strengthen agricultural research and other programs that are raising the pro-

⁸¹ A comparative analysis by B. F. Massell and R. W. M. Johnson of a sample of farms in a Native Purchase Area in Rhodesia, with an average cultivated area of 24 acres, and a group of farms in a native reserve, with an average cultivated area of about 11 acres, points up the striking contrasts between the two groups in crop yields, value of output and sales, hours worked per acre, and in the marginal productivities of land and labor (56, pp. 22, 27, 41, and 90).

⁸² To cite a fairly moderate example of such subsidization, Jerome Wells points out that in Western Nigeria the government calculated the cost of capital allocated to the farm settlement schemes, a major element in the region's development plan for 1962-68, at 1.5 per cent because of extremely dubious indirect benefits that were supposed to result from the settlement projects (94, p. 286n).

ductivity of the abundant resources of labor and land. But if a large-scale sub-sector of agriculture is satisfying most of the commercial demand for farm products, the incentive for government and for individual farmers to take the steps required to create a progressive rural economy based on labor-using, capital-saving techniques will be weak.

IV. CONCLUDING OBSERVATIONS

Some 50 years ago Veblen wrote a characteristically provocative essay on "The Opportunity of Japan" in which he argued that the existence of a disciplined population still animated by the "feudal spirit" of Old Japan, in combination with the material efficiency given by modern technology, gave Japan a unique opportunity for rapid economic growth and imperial expansion. He concluded by suggesting that, to exploit this opportunity, Japan's "government must throw all its available force, without reservation, into one headlong rush; since in the nature of the case no second opportunity of the kind is to be looked for" (91, p. 266).

With the possible exception of Mainland China, the contemporary underdeveloped countries do not possess such an "opportunity," a fact that is scarcely a cause for regret. But they do confront another "opportunity" of immense importance in the potential that exists for drastically raising crop yields at relatively low cost in terms of the scarce resources of capital and foreign exchange. In the light of the formidable task that these countries face in transforming the structure of their economies, it would appear to be of the greatest importance for them to seize this opportunity and, further, to ensure that suitable fiscal and related measures are taken so that a sizable fraction of the increment in net farm incomes is channeled into investments that promote the process of structural transformation. Although much more is required to achieve success in such an effort, this would seem to be a necessary condition. Needless to say, it is important to avoid stifling the incentives that are essential for agricultural progress, and considerations of equity dictate that the already low levels of living of traditional farmers should not be further depressed. But as is suggested by Geertz's analysis of the effects of abortive development on the peasant population in Java, it is equally important that "they should not suffer for nothing."

In examining the distinctive features of Japan's experience in Section II, it was emphasized that success was dependent not only on appropriate policy decisions but also on their effective implementation, including an energetic response on the part of the mass of the nation's farmers. The question arises whether there was something unique about the ability of officials and entrepreneurs in Japan to pursue a goal with determination or in the capacity for hard work that was characteristic of Japanese farmers. This may be so, although it seems improbable that Japan has a monopoly on such qualities. Certainly of greater importance is the fact that in Japan the institutional requirements, broadly defined, for an effective approach to agricultural development were fulfilled. In terms of Brewster's analysis, the Japanese manifested the ability to create the organizations, public and private, that were necessary for the development and widespread use of increasingly productive technologies. In their interesting analysis of Taiwan's experience, which in important respects parallels that of Japan, S. C. Hsieh and T. H. Lee assert that "the main secret of Taiwan's development" was "her

ability to meet the organizational requirements" (34, pp. 103, 105). They even suggest, in a chapter that is influenced strongly by Brewster's analysis of the way in which traditional social structures and their associated attitudes can impede growth, that this aspect of Taiwan's experience is "unique" and may not be transferable to other countries. But is not the real point that there are organizational requirements that must be fulfilled, institutional and other obstacles that must be overcome, not that these are capacities possessed only by the Taiwanese, the Japanese, or certain other population groups.

The means whereby the requirements will be met and the obstacles overcome will no doubt have important "unique" features in every situation. The expansion and strengthening of education is likely to be a powerful influence in most countries given the commitment to that goal in so many of the developing nations. Moreover, the availability and adoption of more productive technologies and the presence of more and more examples of individuals who have seized new economic opportunities and profited thereby is a powerful yeast that is at work in many countries of Asia, Africa, and Latin America. The earlier view that peasant farmers respond perversely or not at all to economic incentives has now been pretty well discredited. Evidence accumulates that a goodly number of the unique population groups around the world share a pervasive human tendency to seize economic opportunities—and to create and staff the various organizations essential for the development and widespread application of more productive technologies. Highly relevant here is the proposition, emphasized by Elihu Katz in commenting on Brewster's analysis, that there is a reciprocal relationship between behavior and social structures: changes in behavior can be the cause as well as the consequence of changes in social structures and in the attitudes and values of individuals (45).³³

This is not to deny that it is a difficult, time-consuming task to "break the cake of custom," to create an institutional environment that fosters rather than impedes growth. Nor is it to deny that there are significant differences among social groups—especially at a given point in time—in their receptiveness to change and readiness to not only accept but devise innovations. The fundamental point is that there are cogent reasons that suggest that this type of approach is feasible and advantageous and which therefore justify the effort to create the conditions, institutional as well as technological, that are needed to expand farm output mainly by raising the productivity of the farm-supplied resources of labor and land.

For reasons suggested earlier, it may seem tempting to ignore the mass of the rural population and concentrate resources in an effort to develop a really modern sub-sector of large-scale, capital-intensive units in the expectation that in due course the families thus bypassed will be absorbed with the growth of output and employment in industry and large commercial farm enterprises. The

³³ Also pertinent and somewhat similar is a point that has been stressed by Arthur Mosher. On the basis of his extensive experience with agriculture in underdeveloped countries, he has emphasized the importance of "self-generating resources"—e.g., the way in which the success of one farmer tends to increase the confidence of other farmers in the possibility of greater production through changed practices. He also suggests that growth in the effectiveness of supporting organizations is often a cumulative process; experience and success in developing technical innovations through scientific research and in achieving their widespread application tend to build morale and a spirit of pride and confidence among research and extension workers (59, pp. 267–70).

analysis in Section III of "population growth and the arithmetic of structural transformation" suggests, however, that this is simply not a realistic expectation for most of the contemporary underdeveloped countries. Transformation of the structure of an economy is bound to be a slow and difficult process when population and labor force are growing at two or three per cent annually and agriculture still accounts for 70 to 80 per cent of the total labor force.

Under such conditions the prospect is that the farm labor force will double or triple over the next 50 years, and much more than a half century will elapse before the turning point is reached when the farm population begins to decline in absolute numbers. Hence the need for the underdeveloped countries to devise and implement measures that will bring about a lowering of birth rates—and within societies that are still predominantly agrarian. Not the least of the advantages of a strategy of agricultural development that involves the bulk of the farm population is the likelihood, as suggested earlier, that this will provide a relatively propitious environment for fostering the changes necessary to the spread of family planning.

Finally, there are persuasive considerations which suggest that the long-term goal of economic growth, as well as the welfare of the bulk of the population who will unavoidably remain in agriculture for some decades at least, will be far better served if agricultural development strategy is directed at raising the productivity of the existing small-scale, labor-intensive agriculture. The potential that exists for increasing productivity through yield-increasing innovations with fairly small investments in fertilizers and other complementary inputs means that labor-substituting investment can be deferred until the nonfarm population that depends on purchased food becomes fairly large relative to the farm labor force. This means that a higher proportion of the scarce resources of capital and foreign exchange can and should be allocated to the expansion of output and employment in the nonfarm sectors. It has also been suggested that pursuit of this type of strategy for agricultural development can be effective in stimulating the growth of a decentralized, labor-using, capital-saving industrial sub-sector capable of making a highly significant contribution to the expansion of nonfarm employment opportunities, increasing incomes, and facilitating productivity increases in agriculture by providing plows, pumps, cultivators, and a host of other inputs that become important as the need and ability of farmers to rely on purchased inputs increases.

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APPENDIX I

GROWTH OF TOTAL AND AGRICULTURAL OUTPUT IN JAPAN, 1879-1964

Growth of GNP

An exceptionally useful summary and analysis of Japan's economic growth, including comparative data for other countries, has been published recently by Angus Maddison (55). He presents comparative figures on growth of GNP for 18 countries which indicate that Japan's long-term growth is the highest recorded; a few of his comparative figures are reproduced below:

| | | <i>Annual average compound rates</i> | | |
|----------|-----------------|--------------------------------------|------------|-------------------|
| | | GNP | Population | Per capita GNP |
| Japan | 1879-1964 | 3.9 | 1.2 | 2.7 |
| U.S.A. | 1871-1964 | 3.6 | 1.7 | 1.9 |
| Canada | 1870-1964 | 3.5 | 1.7 | 1.8 |
| Mexico | 1895-1963 | 3.3 | 1.7 | 1.6 |
| U.S.S.R. | 1870-1963 | 2.9 | 1.0 | 1.9 |
| U.K. | 1870-1964 | 1.9 | 0.7 | 1.2 |

The long-term growth of employment in Japan averaged 1.0 per cent, a little less than the growth of population.

It is clear from Appendix Table I that Japan's rate of growth during the 1938-55 period, affected as it was by the economic disintegration at the end of World

APPENDIX TABLE I.—OUTPUT GROWTH IN JAPAN,
TOTAL AND BY SECTOR, 1879-1964*

(Annual average compound growth rates)

| Period | GNP | Per capita GNP | Primary sector | Secondary sector |
|------------------------------|------|-------------------|-------------------|---------------------|
| 1879-1913 ^a | 3.3 | 2.3 | 3.7 | 7.4 |
| 1913-38 | 4.4 | 3.1 | .8 | 6.9 |
| 1938-55 | .6 | -0.8 | 2.4 | .9 |
| 1955-64 ^a | 10.4 | 9.3 | .9 | 18.9 |

* Data from Angus Maddison, "Japanese Economic Performance," *Banca Nazionale del Lavoro Quarterly Review* (Rome), December 1965, pp. 5, 16.

^a The estimates of growth by sector for these periods refer to the years 1878-1913 and 1955-63.

War II, was much below the long-term average. The fantastically high growth rate in recent years is perhaps attributable in part to the special circumstances of recovery from wartime effects on the economy, but this does not seem to have been a major factor. In fact, it is not included among the six "major reasons for the explosive Japanese growth since 1955" cited by Maddison: (1) investment was at an unprecedentedly high level of about 33 per cent; (2) in contrast with earlier periods, labor supply grew faster than population; (3) high demand for labor led to rapid transfer of workers from low productivity employment; (4) world market conditions permitted exports to expand at the remarkable rate of 15 per cent annually; (5) the diversion of resources to military uses was small; and (6) owing to an effective educational effort, including a threefold increase in engineers during the 1950's, Japan's capacity for rapid and efficient absorption of capital was high (55, pp. 17-18).

Changes in Agricultural Output, Conventional Inputs, and Factor Productivity

The changes in gross and net farm output, in conventional inputs, and in factor productivity are summarized in Appendix Table II in terms of index numbers relating to five-year averages. Professor Saburo Yamada at Tokyo University has kindly permitted me to reproduce these estimates from his article, "Changes in Output and in Conventional and Nonconventional Inputs in Japanese Agriculture Since 1880," which will appear in the next issue of this journal. As explained in the text, there is considerable uncertainty with respect to the level of agricultural production during the late 19th century. Yamada's revised estimates are based on careful scrutiny of inconsistencies in the official estimates and the collateral evidence available, including prefectural estimates of rice yields

APPENDIX TABLE II.—INDEXES OF OUTPUT, CONVENTIONAL INPUT,
AND FACTOR PRODUCTIVITY IN JAPANESE
AGRICULTURE, 1880-1959*

| Average | Output | | Conventional inputs | Factor productivity ^a |
|---------|--------|-------|------------------------|-------------------------------------|
| | Gross | Net | | |
| 1880-84 | 100.0 | 100.0 | 100.0 | 100.0 |
| 1885-89 | 116.3 | 115.0 | 100.3 | 115.9 |
| 1890-94 | 122.7 | 120.0 | 100.8 | 121.7 |
| 1895-99 | 129.1 | 126.1 | 101.7 | 126.9 |
| 1900-04 | 140.6 | 136.9 | 102.7 | 137.0 |
| 1905-09 | 151.5 | 144.9 | 104.0 | 145.6 |
| 1910-14 | 166.7 | 155.1 | 107.7 | 154.8 |
| 1915-19 | 187.4 | 169.1 | 111.2 | 168.5 |
| 1920-24 | 190.4 | 172.9 | 111.2 | 171.3 |
| 1925-29 | 201.7 | 178.6 | 113.6 | 177.6 |
| 1930-34 | 209.4 | 187.2 | 115.4 | 181.3 |
| 1935-39 | 222.9 | 199.6 | 116.2 | 191.8 |
| 1940-44 | 202.6 | 187.6 | 113.8 | 178.0 |
| 1945-49 | 177.1 | 171.1 | 118.0 | 150.1 |
| 1950-54 | 210.2 | 177.0 | 127.7 | 164.6 |
| 1955-59 | 276.2 | 215.0 | 134.8 | 204.9 |

* Reproduced from Saburo Yamada, "Changes in Output and in Conventional and Nonconventional Inputs in Japanese Agriculture Since 1880," *Food Research Institute Studies* (forthcoming).

^a Gross output index divided by conventional input index.

and cultivated area. His figures represent an upward revision for the early part of this period so the indicated rate of increase is not as rapid as suggested by the official production series, but it is appreciably higher than is suggested by Nakamura in his drastic revision of the official statistics.

The index numbers in Appendix Table II indicate a very large increase in farm output between 1950-1954 and 1955-59 whereas the estimates presented by Maddison (and reproduced in Appendix Table I) for the change in primary output for a somewhat later period—1955-64—indicates a compound rate of growth of only .9 per cent. This can be explained in part by the relatively slow increase in rice production since 1960, but the figure is puzzling since it is substantially below the rates of increase for the primary sector indicated by the Ministry of Agriculture and Forestry's production index of the primary sector and is also below those implied by the Economic Planning Agency's estimates of net domestic product of the primary sector.

APPENDIX II

GROWTH OF THE TOTAL AND NONFARM LABOR FORCE IN JAPAN AND CHANGES IN AGRICULTURE'S SHARE IN THE TOTAL LABOR FORCE, 1883-1964

The process of structural transformation in Japan as reflected in the changing occupational composition of the labor force is summarized in Appendix Table III. The "coefficient of differential growth" shown in the last column is the term applied by Dovring to the difference between the rates of increase of the nonfarm and total labor force; it is so labelled because it indicates the rate at which the percentage share of the nonfarm labor force will increase (15).

These labor force estimates are subject to a considerable margin of uncertainty, especially for the years prior to Japan's first census in 1920. The approximations for the early years are from the Ohkawa and Rosovsky article, "The Role of Agriculture in Modern Japanese Economic Development" (70); data for the 1920-40 period are from *The Growth Rate of the Japanese Economy Since 1878* (69, p. 246); and the data for 1955 and 1964 are from the *Statistical Handbook of Japan, 1965* (38). All figures refer to estimates of "gainfully employed," which was defined for census purposes in Japan as an individual's "usual status." Hence, persons employed part-time or temporarily unemployed are included.

The statistical picture is somewhat obscured by changes in the importance of off-farm employment by members of farm households who may or may not be included in the farm labor force. This phenomenon, which has long been important, has become particularly common in the postwar period. The 1960 census figures showing the employment status of the farm population of age 16 or over indicate that 3.6 million adult males were engaged mainly or only in jobs other than farming while 6.0 million were engaged only or mainly in farming. For females in the farm population of age 16 or over, 8.5 million were engaged only or mainly in farming, 1.2 million were engaged mainly or only in jobs other than farming, and 2.0 million were not engaged in farming or other jobs (compared to 1.0 million for males). These figures are based on somewhat different definitions than the labor force estimates in Appendix Table III, the 1960 total for population 16 and over engaged only or mainly in farming being 14.5 million compared to a farm labor force estimate for that year of 13.9 million (39, pp. 50, 80-81).

APPENDIX TABLE III.—JAPAN: GROWTH OF TOTAL AND NONAGRICULTURAL LABOR FORCE AND
COEFFICIENTS OF DIFFERENTIAL GROWTH, 1883-1964

(1,000 persons except as indicated)

| Period | Agriculture as per cent of total labor force | Total labor force (1) | Nonagricultural labor force | | Annual percentage rate of increase (compound) from preceding period | | | Coefficient of differential growth Col. (5) - (4) |
|---------------|---|--------------------------------|--------------------------------|---------------------------|---|----------------------------------|---------------------------|--|
| | | | Total (2) | Manufac- turing (3) | Total (4) | Total non- agriculture (5) | Manufac- turing (6) | |
| 1883-87 | 76.2 | 20,360 | 4,849 | 1,524 | ... | ... | ... | ... |
| 1893-97 | 69.2 | 22,258 | 6,861 | 2,393 | .90 | 3.53 | 4.48 | 2.63 |
| 1903-07 | 62.6 | 24,252 | 9,068 | 3,263 | .86 | 2.83 | 3.28 | 1.97 |
| 1913-17 | 56.3 | 25,967 | 11,354 | 4,131 | .68 | 2.28 | 2.39 | 1.60 |
| 1920 | 52.4 | 27,263 | 12,976 | 4,357 | ... | ... | ... | ... |
| 1930 | 47.7 | 29,619 | 15,488 | 4,891 | .83 | 1.78 | 1.16 | .95 |
| 1940 | 42.3 | 32,478 | 18,636 | 7,160 | .93 | 1.87 | 3.88 | .94 |
| 1955 | 38.9 | 41,190 | 25,150 | 7,560 | ... | ... | ... | ... |
| 1964 | 25.6 | 46,730 | 34,760 | 11,370 | 1.41 | 3.66 | 4.65 | 2.25 |

APPENDIX III

HYPOTHETICAL PROJECTIONS OF TOTAL, FARM, AND NONFARM LABOR FORCE OVER A 50-YEAR PERIOD

The projected changes in total, farm, and nonfarm labor force summarized in Chart 1 (pp. 268-70) and Appendix Table IV were obtained by iteration on a computer using the identity given in the text. The influence of the existing occupational structure of an economy on the rate of change of the farm labor force is brought out even more clearly when this identity is written in a slightly different form:

$$P'_A = \frac{P_T}{P_A} P'_T - \frac{P_N}{P_A} P'_N$$

where P_T , P_A , and P_N refer to the total, agricultural, and nonagricultural labor force respectively and the symbols with primes refer to their annual rates of change. Appendix Table IV summarizes the changes in the three components of the labor force, at the end of 50 years, assuming an initial labor force of 10 million, on the basis of various assumed values for P'_T , P'_N , and an initial value of P_A/P_T . This initial share of agriculture in the total labor force was 80, 50, and 25 per cent respectively for the three hypothetical countries. Agriculture's share in the labor force at the end of 50 years, the initial and final rates of change of the farm labor force, and the year (if any) of the "turning point" when the farm labor force begins to decline are shown.

It is assumed in these projections that the change in farm labor force is determined as a residual according to exogenously determined rates of change in the total labor force and nonfarm employment. In discussing the reasonableness of this assumption in the text, it was noted that interpreting the rate of change in the farm labor force as the dependent variable implies a sufficient increase in output per farm worker (or in food imports) so that food supplies are available for the growing nonfarm labor force and population. It was further argued that this is a fairly plausible assumption in the early phases of growth because the "required" increase in farm productivity is fairly slow when agriculture still bulks large in the total population and labor force. This is demonstrated most easily by Tolley's model showing the annual percentage change in the share of the population in the nonfarm sector. On the simplifying assumption that the income elasticity of demand for food is zero, the percentage rate of growth in the share of the population in the nonfarm sector is given by $(f'/f) [(P_A/P_T)/(P_N/P_T)]$, where (f'/f) is the "required" annual percentage increase in productivity in the farm sector and P_T , P_A , and P_N refer to total, farm, and nonfarm population. Thus in Earlyphasia (80 per cent of the population in agriculture), a .5 per cent rate of increase in farm productivity is consistent with a 2 per cent rate of growth in the share of the population in the nonfarm sector, whereas in Latephasia (only 25 per cent of the population in agriculture) the required rate of increase in farm productivity to permit the same rate of structural transformation is 6 per cent (44, p. 375). The contrast is clearly exaggerated by the unrealistic assumption of zero income elasticity of demand for food since the tendency for the (farm level) income elasticity for food to decline from, say, .7 in Earlyphasia to .2 in Latephasia represents an offsetting factor. But the contrast is still important and

APPENDIX TABLE IV.—ALTERNATIVE PROJECTIONS OF TOTAL, FARM, AND NONFARM
LABOR FORCE AT THE END OF 50 YEARS (OR LESS)*

(Initial labor force = 10 million)

| Phase defined by farm labor force as per cent of total; assumed growth rates of total and nonfarm labor force | Farm labor force as % of total (at end of 50 years) | Turning point (year farm labor force begins to decline) | Year of absurdity ^a | Labor force at end of 50 years (million persons) | | | Annual (per cent) rate of change of | | |
|---|---|---|-----------------------------------|--|--------------|--------------|---|----------------------|--|
| | | | | Total | Nonfarm | Farm | Year 1 | Year 50 ^c | |
| A. EARLYPHASIA: FARM LABOR FORCE = 80% OF TOTAL | | | | | | | | | |
| 1. <i>Moderate growth total labor force: 1%</i> | | | | | | | | | |
| a. Moderate growth nonfarm labor force: 1.5% | 74.6 | > 50 | — | 16.28 | 4.15 | 12.14 | .88 | .83 | |
| b. Rapid " " " " : 3.0% | 47.7 | Year 29 | — | 16.28 | 8.51 | 7.77 | .5 | — 1.19 | |
| c. Very rapid " " " " : 4.5% | — | Year 6 | Year 48 | 16.28 | ^b | ^b | .13 | Year 40 | |
| 2. <i>Rapid growth total labor force: 2%</i> | | | | | | | | | |
| a. Nonfarm labor force at 1.5% | 84.9 | never | — | 26.39 | 4.15 | 22.24 | 2.12 | 2.09 | |
| b. " " " " : 3.0% | 67.8 | > 50 | — | 26.39 | 8.51 | 17.88 | 1.75 | 1.52 | |
| c. " " " " : 4.5% | 34.5 | Year 34 | — | 26.39 | 17.29 | 9.10 | 1.38 | — 2.75 | |
| 3. <i>Very rapid growth total labor force: 3%</i> | | | | | | | | | |
| a. Nonfarm labor force at 1.5% | 90.2 | never | — | 42.56 | 4.15 | 38.41 | 3.38 | 3.16 | |
| b. " " " " : 3.0% | 80 | never | — | 42.56 | 8.51 | 34.05 | 3.00 | 3.00 | |
| c. " " " " : 4.5% | 59.4 | > 50 | — | 42.56 | 17.29 | 25.27 | 2.63 | 1.97 | |
| B. MIDDLEPHASIA: FARM LABOR FORCE = 50% OF TOTAL | | | | | | | | | |
| 1. <i>Moderate growth total labor force: 1%</i> | | | | | | | | | |
| a. Moderate growth nonfarm labor force: 1.5% | 36.3 | > 50 | — | 16.28 | 10.37 | 5.91 | .5 | .12 | |
| b. Rapid " " " " : 3.0% | — | Year 1 | Year 36 | 14.17 | 14.06 | .09 | — 1.0 | Year 28 | |
| c. Very rapid " " " " : 4.5% | — | Year 1 | Year 21 | 12.20 | 12.06 | .14 | — 2.5 | Year 13 | |
| 2. <i>Rapid growth total labor force: 2%</i> | | | | | | | | | |
| a. Nonfarm labor force at 1.5% | 60.7 | never | — | 26.39 | 10.37 | 16.02 | + 2.5 | + 2.3 | |
| b. " " " " : 3.0% | 19.4 | Year 32 | — | 26.39 | 21.28 | 5.11 | 1.0 | — 2.17 | |
| c. " " " " : 4.5% | — | Year 1 | Year 29 | 17.41 | 17.15 | .26 | — .5 | Year 22 | |
| 3. <i>Very rapid growth total labor force: 3%</i> | | | | | | | | | |
| a. Nonfarm labor force at 1.5% | 75.6 | never | — | 42.56 | 10.37 | 32.19 | 4.5 | 3.48 | |
| b. " " " " : 3.0% | 50 | never | — | 42.56 | 21.28 | 21.28 | 3.0 | 3.0 | |
| c. " " " " : 4.5% | — | Year 21 | Year 48 | 40.12 | 39.58 | .54 | 1.5 | Year 41 | |

C. LATEPHASIA: FARM LABOR FORCE = 25% OF TOTAL

1. *Moderate growth total labor force: 1%*
 - a. Moderate growth nonfarm labor force: 1.5%
 - b. Rapid " " " " : 3.0%
 - c. Very rapid " " " " : 4.5%
2. *Rapid growth total labor force: 2%*
 - a. Nonfarm labor force at 1.5%
 - b. " " " " 3.0%
 - c. " " " " 4.5%
3. *Very rapid growth total labor force: 3%*
 - a. Nonfarm labor force at 1.5%
 - b. " " " " 3.0%
 - c. " " " " 4.5%

Agricultural population begins to decline immediately; declining at -10% in Year 50.
Same except reaches -10% in Year 7 and farm labor force turns negative after Year 15.
Agriculture declining at about 10% in Year 1 and turns negative after Year 9.

Failure case, farm labor force increasing at 2.7% in Year 50.
Farm labor force declining at -1% in Year 1, reaches -10% in Year 22, and turns negative after Year 30.
Farm labor force declining at -5.5% in Year 1, reaches -10% in Year 5, turns negative after Year 12.

Failure case, farm labor force increasing at 3.9% in Year 50.
Stagnation case.
Farm labor force declining at 1.5% in Year 1, reaches -10% in Year 13, and turns negative after Year 20.

* Hypothetical projections based on alternative assumptions concerning the initial share of farm labor force in total labor force and growth rates of total and non-farm labor force. For certain sets of assumptions the constant rate of growth of nonfarm labor force leads to the absurd result that the nonfarm labor force exceeds the total and the farm labor force becomes negative.

^a Last year before farm labor force becomes negative because of assumed constant rate of increase in nonfarm labor force.

^b Nonfarm labor force exceeded total labor force and farm labor force turned negative following the Year of Absurdity.

^c Or year that rate of decrease of farm labor force approximates -10%.

merely reflects the fact that initially the population dependent upon purchased food is small relative to the farm population. Tolley's model (not the simplified version given above) shows how the annual percentage change of population in the nonfarm sector will depend on the rates of change in average productivity in the two sectors and the income elasticities for food and nonfood (44, pp. 372-75). It does not, however, take account of relative price effects or the factors that determine productivity levels and changes in those levels.