RELEVANCE OF THE EXPERIENCES OF JAPAN TO CONTEMPORARY ECONOMIC DEVELOPMENT

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1. Introduction

History is a set of multi-sided, once-and-for-all events. So is a particular experience of any one country in the past. If the interest in such an experience is historical, the totality of that experience matters. If the interest stems from the specific purpose of acquiring some hint or clue for identifying the interrelationship of factors behind some particular development issue of a contemporary developing country or if the purpose is to derive some lesson in formulating an effective policy to resolve that particular development issue, one has to choose from the history of another country, a certain specific experience which involved a similar issue, and to focus attention to some causally related facts and factors which were responsible for having brought about that particular issue. In order to identify these facts and factors however, the other facts and factors involved in the same experience, which originated from the conditions particular to that country in the past, especially those which came from the natural environment, initial conditions and international environment, must be effectively controlled.

Based on previous studies on contemporary economic development or on the experience of prewar Japanese economic develop-

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ment since the early Meiji era,[1] it seems increasingly important to keep in mind the difference of the above two approaches to historical experiences. The present paper aims mainly at elaborating this point.

In the following, three different approaches to what should be "relevant" Japanese experiences to contemporary economic development are elaborated by referring to various examples, and the merits and demerits of each of them are discussed. Section 2 takes up an approach which considers the entire prewar development. Section 3 shows the approach to specific success stories as "relevant" without paying due attention to the various conditions particular to Japan. Section 4, whether successful or not, pays attention to certain specific experiences to explore really relevant factors, by controlling the particular conditions of Japan. Most of the concrete examples are taken from the author's works.

2. A Stylization of Japan's Development Process

Japan's experience in prewar economic development has, since the early 1960s, been increasingly referred to in development literature as relevant for contemporary developing countries attempting to "learn by reference". There are three reasons for this. (1) Among the countries which so far succeeded in economic development, Japan is the latest "late comer" country, and the economic level and structure in her development stage retained the most number of similarities to those of today's developing countries in terms of per capita income, factor endowments, industrial structure, technology gap, and some other criteria; (2) for the developing countries in Asia, the Japanese experience, in particular those relating to the development of rice agriculture, constitutes a more relevant and more easily applicable experience than that of other developed countries; and (3) the entire process of Japan's economic development is by now well documented and even statistically outlined with a fair degree of precision and detail.[2]

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1. Ishikawa, S. (1967) and Ishikawa, S. (1981).

2. The most important statistical study is published in 13 volumes of Ohkawa, K., Shinohara, M. and Umemura, M. (eds) (1965). The last 3 volumes are forthcoming. For the summarized version in English, see Ohkawa, K. and Shinohara, M. (eds) (1979).

These reasons are quite legitimate and hence reference to the Japanese experience is usually made, *per se*. The reference to it becomes useful and even desirable. Some caution must be exercised, however, in taking the reference value of Japan's story of success in resolving developmental issues and in its applicability to contemporary development problems. If this careful attitude is lacking, the reference to various success stories in Japan is misleading, and sometimes even dangerous.

In the case where a success story refers to the successful transformation of an underdeveloped economy to a developed one or to similarly successful events of a comprehensive scope, one should not overlook the fact that in Japan, unique initial conditions and international environment were favorable to success, and these conditions and environment are easily identifiable. The reference to such a success story of a comprehensive scope is even useful, if it is stylized as a logical sequence of certain factors under certain clearly defined constraints. Moreover, such stylization leads to the formulation of a special theory of economic development. It may then become possible for one to refer to such a theory as a standard process of comparison with which to analytically evaluate particular development processes of a contemporary developing country.

In fact, some of the existing development models were formulated in a similar process and played a similar role for contemporary economic development. Examples are (1) A.W. Lewis' "classical" model of dualistic economic development with unlimited supplies of labor[3] which is based on the stylization of experience in British industrialization in the 18th and 19th centuries; (2) A. Gerschenkron's hypothesis of "relative backwardness", or of "late comer" countries' industrialization[4] based on the comparative experience of industrialization in the Western European countries; (3) G.A. Feldman's model of heavy industrialization under centralized economic planning[5] based on the Soviet Russian planned economic development; and (4) M.H. Watkins, J.W. McCarty, D.C. North and others' "Staple Theory" of trade and development[6] based

3. Lewis, A. W. (1954) and Lewis, A. W. (1958). The development model by John Fei and Gustav Ranis is formulated essentially according to the Lewis model. Fei, J.C.H. and Ranis, G. (1961).

4. Gerschenkron, A. (1962).

5. Summarized by E. Domar (1957), ch. 9.

6. Watkins, M. H. (1963); McCarty, J. W. (1964) and North, D. C. (1955).

on the experience of the early period of development of Canada, Australia and United States where the economy was developed first on the basis of expansion of natural resource-based export production and where the manufacturing sector was finally built up through the backward linkage effect.[7]

Unfortunately, the Japanese development experience does not seem to have been stylized and formalized as a development model from the point of view of relevance to contemporary economic development. There were a number of serious attempts, of course, to summarize the Japanese experience in internationally comparative terms on the basis of the analysis of carefully collected and processed statistical data.[8] These works however, seemed to identify those aspects of Japanese economic development which were unique as compared to those of other Western industrialized countries, and to explain why such uniqueness arose, rather than relate the Japanese experience to contemporary development issues. Nevertheless, the existing data and studies are already fairly sufficient for an attempt at the stylization of the prewar Japanese experience and to pinpoint its relevance to contemporary developing countries. A tentative stylization and some of its essential components are given below.

A. The basic conditions of the economy

1. The economy consisted of two institutionally different sectors: a 'traditional' and a 'modern' sector.[9] Broadly, these

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7. In connection with the development model of the Staple Theory, H. Myint's "Vent-for-Surplus" model might be refered to (1971), ch. 5. The model is based on the experience of the opening-up of land frontier for export production in the small natural-resource rich and sparsely populated countries like Thailand and Burma since the mid-18th century. This experience, however, lacked the process in which natural resource development led to the creation of the modern industry sector, or at least to the increase in land productivity. The Vent-for-Surplus model accordingly lacks the formalization of an endogenous mechanism leading to industrialization such as the Staple Theory.

8. Among those specifically noted are Ohkawa, K. and Rosovsky, H. (1973), Shinohara, M. (1962) and Fujino, S. (1965).

9. The production units of the traditional sector consisted of individual families whose major objective was maximization of family-welfare. Often, member families of the same village community were treated in the same way as quasi-members of the same family. The production units of the modern sector consisted of capitalist firms whose emphasis was maximization of capitalist profits.

two sectors corresponded to the agricultural and non-agricultural sectors, respectively.

2. Natural resources were not rich. In the earlier period of development, capital was scarce, labor was abundant and even in considerable surplus.[10] The rate of population growth was low by the contemporary developing countries' standard.
3. The economy was mostly open and exposed to foreign trade.

The process of economic development

1. During the whole prewar period, technological progress and its geographical diffusion in the traditional (agricultural) sector brought about a steady increase in labor productivity and, correspondingly, the ratio of the amount of agricultural products which were marketed to the modern sector increased substantially, although the intersectoral commodity terms of trade did not change substantially in favor of agriculture until World War I. After that, however, they changed substantially despite the large influx of rice from Korea and Taiwan.
2. Side by side with the increasing inflow of agricultural products, surplus labor in the traditional labor was supplied to the modern sector almost without limit at least until World War I. This led to the expansion of the modern sector at a very high growth rate, while maintaining a very large relative share of non-labor income judged by international standards.

10. The definition of "surplus labor" in this paper follows the conventional one, namely that part of the labor force in the farm sector that can be removed without reducing the total amount of output produced, even when the amount of other factors is not changed (but by some reorganization of the inter-farm structure). This state of "surplus labor" arises in micro-economic terms when in the farm sector, at least some farms' willingness to work more at the existing wage rate or marginal income is not satisfied because of the insufficiency of demand. Sen, A.K. (1966) and Ishikawa, S. (1967) ch. 4. In this state, it is quite likely that the marginal productivity of labor in the farm households is lower than the market wage rate as indicated in Ryoshin Minami's (1973) definition of "disguised unemployment" or "unlimited labor". Meanwhile, Harry Oshima's (1958, 1981) well known definition of "surplus labor" purely in terms of seasonal unemployment is very interesting. Recently, he even associated an essential part of his development model of monsoon Asia with this surplus labor concept. While I agree with this conception to a large extent, I do not suggest here a reconciliation of these two approaches.

3. The choice of industries and technologies in the modern sector was such that there was a gradual and evolutionary improvement and upgrading of the industrial and technological structure. It also involved an alternating process of import substitution and export promotion in each of the successively expanding industries.

Some of the important aspects in the above stylization are taken up again in later sections.[11]

3. Initial Conditions and the Role of Agriculture

The presentation of a success story such as Japan's was misleading mainly with respect to particular events or aspects of less comprehensive scale. Two examples are shown below from the discussion of the Japanese experience during the 1950s and the 1960s.

First, there was an argument[12] that Japanese agricultural development since the Meiji era took place on the basis of (1) small family size farms and (2) technical progress made possible by both varietal improvement and increased application of quick-pay-off purchased fertilizers. Therefore, in contemporary developing countries in South and Southeast Asia, agricultural development as a

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11. The kind of model anticipated by this stylization is a dualistic development model of industrialization such as Lewis' model described above. But it differs significantly from Lewis' model in the following two points: (i) As a necessary condition for the development process to proceed smoothly, it puts a greater emphasis on the productivity increase of the traditional agricultural sector, and for this to be promoted, on the changes in the terms of trade as a factor of that sector, even in the stages where surplus labor remains. The existence of surplus labor itself implies the potential unlimited supplies of labor from the traditional sector, but this potentiality is only realized when that sector is capable of supplying the amount of food (wage goods) to feed the labor thus supplied. In other words, it is essential that the ratio of food output that can be marketed increase at the same time as the surplus labor is supplied. (ii) As another necessary condition relating to the process of development, the process of capital accumulation in the modern sector is to be formalized in greater detail in terms of the choice of industries and techniques. This is necessary essentially because the process of Japanese economic development was typically a process under the open economic system exposed to foreign competition.

12. See for instance, Ogura, T. (1963), Part IV which was written by the experts who participated in the FFHC of FAO's Expert Meeting on Japanese Agricultural Development in January 1963.

prerequisite of economic development should be made possible, *institutionally*, on existing small-farming system even without land redistribution and *financially*, by inexpensive methods of technical change.

In the 1970s and thereafter it became apparent that these arguments and, in particular, the policy suggestions based on them were too simplistic to be realistic. Detailed surveys of the existing studies as well as additional studies brought out the following points as effective counter-arguments. (i) Flood control, irrigation and drainage projects are essentially the precondition for yield increase in rice-based agriculture by way of introducing biological and chemical innovations; (ii) these land infrastructure projects usually require a huge amount of resource costs and (iii) while in Japan such land infrastructure were already completed in elemental, basic forms for nearly all rice lands before the Meiji Restoration, this was not so in most developing countries in South and Southeast Asia. (iv) Diverse patterns of complicated land ownership and tenurial relationship existed in South and Southeast Asia; interfamily distribution of both land ownership and operational holdings in most areas were much more skewed.[13]

Second, there was an influential argument which is closely related to the first argument during the 1950s. In prewar Japan, in particular during the Meiji era, the agricultural sector supplied on a net basis a significant amount of savings to the emerging modern industry sector, thereby contributing to the success of her industrialization. The land tax was considered among the major instruments of this saving transfer out of agriculture in the earlier period. In the early stage of industrialization where agriculture was the only major sector the source of investments for funds should derive from the savings surplus to be generated in the agricultural sector. Otherwise, industrialization cannot successfully proceed. This should also be the case in industrialization of contemporary developing countries.[14]

As against this argument, a debate on the size and direction of saving or, more generally, resource transfer between agriculture and nonagriculture, to be stricter, between the farm and nonfarm sectors in the process of contemporary economic development began in the

13. Ishikawa, S. (1967), ch. 2.

14. See for instance, Johnston, B. and Mellor, J. (1961).

mid-1960s. It was hypothesised by critics that in the contemporary developing countries where basic land infrastructure in agriculture was yet to be built up, the farm sector had to be supplied with capital required for it from outside. If food and agriculture would not become a bottleneck impeding deliberate industrialization, the required capital must be larger, especially because a higher, post-war rate of increase in agricultural population tended to make the ratio of the amount of agricultural products that was marketed to the nonagricultural sector smaller than expected. Therefore, it was considered possible that once a deliberate attempt at industrialization was started and continued in the contemporary developing countries, the intersectoral resource transfer had to turn sooner or later to the net inflow from industry to agriculture. Major factors in this net outflow were either or both of the change in the intersectoral commodity terms of trade in favor of agriculture and the government investment in land infrastructure in agriculture.

In the same line of argument, it was held that if it had been statistically confirmed that the net intersectoral resource flow in prewar Japan was, as claimed, a net outflow from agriculture, that would mean that agriculture in Japan contributed not only to the substantial amount of unlimited supplies of labor to industry (i.e., both actual labor and the constantly cheap wage goods to feed it,[15] at the same time), but also at least part of the funds to employ such labor freely. The reason why this contribution was made possible was the specially favorable conditions surrounding Japan, e.g., the initially existing land infrastructure investment, the successful technological progress in agriculture achieved on that basis and the low rate of growth of agricultural population.[16]

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15. For simplicity of discussion, the agricultural raw materials are assumed away as part of the agricultural products supplied to the non-agricultural sector.

16. Ishikawa, S. (1967), ch. 4. The debate has been made from the beginning on the basis of the preparation of precise statistical concepts and framework on the intersectoral resource flow. For instance, the sectoral division of agriculture and nonagriculture or farm or nonfarm, capital transfer and more comprehensively, resource transfer comprising both capital and current transfers and the resource transfer at current prices arising from the intersectoral commodity transactions or the resource transfer at constant prices (i.e., the resource transfer taking into account the terms of trade effect also).

By now, many economist seem to agree that the policy suggestion of the 1950s advising the contemporary developing countries to extract as much saving surplus as possible from agriculture, was too simplistic, although careless statements favoring the same policy suggestion are still heard frequently. There are also a few statistical works on the subject. It is worthwhile to note however, that a study of India for the years between the early 1950s and the early 1970s estimated that the net resource flow of agriculture was an inflow in the early 1950s at both current and constant 1960-61 prices.[17] Then it turned into an outflow and the amount increased, but after the mid-1960s, the period when a new agricultural development policy associated with the Green Revolution was enforced, the direction of net flow turned to an inflow.

Taiwan's case of intersectoral resource transfer was also estimated systematically for the period between 1895-1960.[18] The result indicates invariably net outflows from agriculture for the entire period of 1911-15 to 1956-60 at both current and constant (1935-37) prices. This provided additional evidence aside from that of Japan that agriculture should be a net resource contributor for industrialization. It should be noted, however, that during the prewar years, Taiwan's external trade mostly with metropolitan Japan exhibited export surplus invariably and its amount was such that the net resource outflow out from agriculture was nearly entirely, or more than, counterbalanced, thereby leaving the amounts of net resource outflow remaining within the nonagricultural sector of Taiwan almost negligible, whether these be positive or negative. Prewar Taiwan's case seems to represent a typical pattern of resource transfer out of agriculture in a colonial type monoculture country, rather than a typical pattern in the course of deliberate industrialization.[19]

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17. Mundle, S. (1981).

18. Lee, T. H. (1971).

19. Two sets of figures in Lee's estimates are important in this connection.

Relation between agriculture's net resource outlow (A) and the economy's export trade surplus (B): T$ million at 1935–37 value.

	1911 –15	1916 –20	1921 –25	1926 –30	1931 –35	1936 –40

Systematic efforts at estimating intersectoral resource transfer for prewar Japan has also been carried on.[20] So far, however, only the estimates at current prices are nearly completed, which indicate that large proportions of agricultural savings were outflows on a net basis. Due to the non-availability of reliable price indices constituting the intersectoral terms of trade index, the estimates at real prices have yet to be completed.[21]

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1. A	50	62	60	59	89
2. B	11	41	60	65	91
3. A –B	9	21	0	–6	–2

II. Composition of net resource outflow of agriculture:

current T$ million

1. Net resource outflow	–	24	42	50	61
2. Net current transfer	–	26	44	55	70
3. Of which, land rent	–	22	42	50	57
4. taxes and fees	–	6	9	15	16
5. Net capital transfer	–	–2	–2	–5	–9

Panel II indicates that most of the net resource outflow of agriculture at current prices was realized through the payment of land rent by the farmers to the absentee landlords. Net capital transfer (net saving transfer) was negligible and even negative. These findings are in sharp contrast to the case of prewar Japan where (i) net capital transfer was positive and very large in the sense that the net capital transfer (*plus* taxes and fees) occupied about a half or more of total agricultural savings (*plus* taxes and fees) was negative and if *minus* taxes and fees was also negative and as large as to substantially offset the net capital transfer to the amount of net resource outflow (at current prices) very small. See Mundle, S. and Ohkawa, K. (1979).

20. By the group led by Kazushi Ohkawa. The latest version is published by Mundle, S. and Ohkawa, K. (1979). To be mentioned also is Teranishi, J. (1976), which concentrates on the estimates of the intersectoral resource flow from the financial statistics, confining the scope of resource flow to the capital transfer (*plus* tax payment) at current prices.

21. This means that of the two components of net resource flow of agriculture, namely, one, due to the terms of trade effect and two, due to the balance of intersectoral commodity trade at current prices, the amount of the second component and, hence, the direction and scale of the entire net resource

Upon reflection, it seems that the debate later tended to lost its substantive content from the point of view of economic development, with too much attention paid to the numerical results of the estimates. There was insufficient attention paid to the issue of net resource flow between agriculture and nonagriculture, an issue which arose when two kinds of products, one requiring the use of limited land resources for their production and the other not, are exchanged in the product market. More specifically the issue

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are not yet finally confirmed. It may be noted further that while more appropriate price indices for evaluating the terms of trade effect are yet to be constructed, the existing observation of a secular trend of change in the terms of trade in favor of agriculture (in particular that which emeged after around 1918) made in Ohkawa, K. and Shinohara, M. (1973) ch. 12 would not be changed drastically. If so, it is likely that the net resource transfer due to the terms of trade effect was an inflow into agriculture and it more than offset the net resource outflow by current commodity transactions in many prewar years. In evaluating the terms of trade index, the choice of appropriate base year always poses a problem. In this sense, the following calculation of the real resource flow by taking the average of 1888-92 price indices as 100 is nothing but a hypothetical one for simple illustration. But it may suggest the range of the above.

Real net resource outflow of agriculture in million yen at 1988-92 prices:

1. Real net resource outflow $(\frac{E}{Pe} - \frac{M}{Pm}) - 52.6$	152.0	
2. Of which		
due to the intersectoral trade balance $(\frac{E - M}{Pe})$	57.5	6.7
3. due to the terms of trade effect $[\frac{M}{Pm}(1/\frac{Pe}{Pm} - 1)]$	−110.1	−158.7

Notation: E = Export at current prices, M = Import at current prices,
Pe = price indices of agricultural products marketed,
Pm = price indices of manufactured products purchsaed.

Notes: Data for E and M are taken from Mundle, S. and Ohkawa, K. (1979). Pe and Pm are taken from Ohkawa, K. and Shinohara, M. (1979).

involving competing claims of capitalists (profits) and landlords (rents) for the surplus created in the capitalist (modern) sector and the consequences of the rivalry can be traced to the changes in intersectoral terms of trade. When the resource interflow outside the market mechanism assumes a significant weight, this should not be overlooked. However, the primary channel of resource transfer is still that which is realized through relative price adjustment in the product market.[22]

4. Controlling the Conditions Particular to Prewar Japan

Cases of the "relevant" Japanese experience in economic development are mainly the ones that suggest possible critical factors which work behind current developmental issues and which contemporary developing countries are struggling to identify to formulate effective measures. The experience of the country on the basis of which universal causes and effects of a particular issue can be reasonably identified, by controlling the conditions particular to Japan. In fact, the experiences investigated in the two sections above are intended to become useful experiences ultimately. In as far as the total experience of Japan's prewar economic development is concerned, what was presented was an attempt at stylization of the basic conditions of the economy and the processes of development. But this suggests that once thay are formalized as a model, they would serve as useful analytical instruments. As for the "success stories", an attempt was made to identify the effect of the initial and other conditions particular to Japan and on that basis it was argued that what were often held as the caused for the successes are not relevant to the developing countries. But in these cases, too, it would probably be possible to find out the underlying factors and their interrelation that are relevant to these developing countries.

In these sections, three other cases of Japanese experience will be shown, and for each case an attempt is made to control the effects of the particular conditions of Japan and thereby identify relevant factors and relations underlying each experience. As will be seen, these cases are different from the two cases in the previous section in

22. Lewis, A. W. (1954). Also, see John Robinson's discussion on two kinds of prices which depend upon the two different bases of specialization respectively: one, natural endowments and the other, economies of scale. Robinson, J. (1960).

that the policy suggestions usually made in reference to these experiences seem broadly valid, but not necessarily relevant and specifically or rigorously useful. The effort of effectivity controlling the particular conditions become all the more necessary. Yet, it is not necessarily easy and efforts need to be continued.

Case 1: Large scale absorption of labor in rice-based agriculture.

An earlier inter-Asian comparative study on labor utilization in both single rice cropping and total agricultural production indicated that the per hectare labor input of Japan for the entire period after 1860 and before the 1950s, and to lesser extents those of other East Asian countries were significantly larger, often 4 to 5 times, than those in South and Southeast Asian countries.[23] This finding seems to have been shocking to some economists in the countries of South and Southeast Asia who were concerned about the employment problem which was becoming acute. Since the early 1960s it has been increasingly recognized that with the present rate of increase in population and labor force it would not be possible for most of these countries to begin absorbing a substantial portion of incremental labor force in the urban modern sector within the next decade or two, even with a significantly raised growth rate of that sector. An investigation of the practical possibilities and the policy measures for increasing the labor absorption in agricultural production in these countries was started several years ago and is still under way.[24]

Studies of conditions special to Japan necessarily pointed to the irrigation facilities that were widely constructed before the Meiji Restoration. More interestingly, it has led to a consideration of the difference in international environment which can be explained by a kind of "relative backwardness" hypothesis in agriculture. There is indeed a clear difference in the choice of techniques in rice and

23. Ishikawa, S. (1967) ch.3.

24. The investigation here denotes the ILO-ARTEP (Asian Regional Team for Employment Promotion) project on Labor Absorption in Asian Agriculture which was started when K.N. Raj was director of ARTEP. I was requested to write the "issues" paper for the project under the title of "Labor Absorption in Asian Agriculture – An 'Issues Paper" which was later incorporated in Ishikawa, S. (1981), ch. 1. The project has so far produced four publications: Bardhan, P.K. et. al. – (1978), ILO-ARTEP (1979A), ILO-ARTEP (1979B) and ILO-ARTEP (1980).

other crop production that could be made in prewar Japan as the early-comer country, with respect to modern rice production, and that can be applied presently in the countries of South and Southeast Asia as the late-comer countries. This is because, first, in Japan when deliberate effort was began to increase per hectare crop output most of the yield-increasing inputs were labor-using. But with the progress of industrialization and urbanization, technological change took place which replaced labor-using inputs gradually by labor-saving inputs such as chemical fertilizer, electric pumps, pedal and motorized threshers and even power tillers; second, for the countries of South and Southeast Asia even though the yield levels were substantially lower than that in the early Meiji era (one-half or less for rice for instance), the above yield-increasing and labor-saving inputs were in many cases, the only alternative inputs, because their prices were much cheaper than the existing inputs and some of the traditional yield-increasing and labor-using inputs in prewar Japan were simply not available now. This suggests the possibility that the scope for reducing the large differentials in labor absorption may not be as large as it first appeared to be.

It may be said, however, that the crucial stage of "relevance" study has just began. A number of important aspects of Japanese experience which remain even after controlling these particular conditions are noticeable. (i) the mechanization devises such as electrical pumps after the 1920s and pedal and motorized threshers after the 1930s, which were conventionally considered labor-replacing in its technical nature, often brought about a labor-using effect. This was made possible by using these devises to increase the ratio of land utilization, such as the expansion of the area of rice land with a second crop. (ii) the characteristic of the organizational structure of agriculture in which farm households were small-scale and fairly equally-distributed in terms of both ownership and operational holdings was certainly conducive to increased labor input to land. These are contrasted with the organizational structure of agriculture in contemporary developing countries of Asia where operational holdings are more less bipolarized. In some countries a large number of landless laborers exist. Mechanization for profit has taken place mostly by the richer classes in the agricultural sector. Hence mechanization has been seldom used to increase labor absorption. (iii) the importance of increasing irrigation facilities and choosing appropriate technologies relating to them and (iv) the importance

of encouraging a close cooperation between local farmers and local agricultural experiments for effective diffusion of better farming techniques in Asia which will increase labor absorption. The problem is how to add more cases in the list of "relevant" experiences and synthesize them for useful policy suggestions.

Case 2: The role of the small- and medium-sized firms in industrial development.

Since the first national factory census was made in 1909, the observed size structure of Japanese factories was continuously skewed toward the small (0-50 employees) and medium (51-400 employees) sized groups. To be more precise, observing for instance the proportion of total number of employees apportioned in each of the size classes with the number of employees 20-49, 50-99, 100-499, 500-999 and 1000+ (persons) for the years between 1909 and 1958, the weight of these size classes did not differ very much from one another and the relative weight of each size class did not change with the passage of time. This is in sharp contrast to countries like India and Pakistan where the weight of the largest size class transcends that of other size classes. In other developing countries in Asia, there is also a tendency for the larger sizes to be lopsided. In the cottage size class with employees below 20 persons, there is a clear tendency, common to many countries, for its weight to decrease with the growth of per capita output. Hence this size class was not included in the above comparison.[25]

Moreover, in Japan these smaller sized factories have significantly smaller capital equipment per worker and labor productivities, far lower than those of the larger sized factories. Due, however, to the considerably lower wage levels prevailing there, they could maintain their competitive power vis-à-vis the larger sized factories. The usual argument on the basis of the above observation is that Japan's experience indicates the crucial importance of smaller and medium industry development in the development process, both for industrialization by capital-saving methods and for relieving the unemployment problem, which the contemporary developing country should learn.

This is most probably a proper advice, especially because of the unfavorable initial conditions of the contemporary developing

15. Ishikawa, S. (1967), ch. 5.

countries such as rapid population growth and low capital endowment. This advice is weak, however, in that it lacks a concrete prescription, based on Japan's experience, of what steps should be taken for its implementation. In order to seek such a prescription one must first disentangle many factors involved in bringing about the macroeconomic behaviors of the small and medium enterprises as prescribed above. Here, only a few points can be made on the reasons for the long-term persistence of small and medium sized enterprises in Japan.

(i) The persistence of the smaller sized enterprise is essentially a market phenomenon arising from the equilibrium labor and capital allocation among the different sectors and among the different size groups in the manufacturing sector. It is by no means culturally or sociologically determine. (ii) The parallel expansion of the smaller sized groups and larger sized groups is explained by their complementary relationship in sub-contracting, long term sales-purchase agreements or their cooperation on the management level. This relationship is found to be stronger, as the size group becomes smaller, as the series of postwar comprehensive surveys of small and medium firms in Japan indicate.[26] But it should be noted that this relationship tends to arise and develop only after the size of the product markets for individual industries reaches certain minimum levels which enable the manufacturing firms of respective industries to capture sufficient economies of scale. These levels are not yet attained in most of the industries in the countries of South and Southeast Asia. (iii) As a factor which is related to the particular international environment surrounding the prewar industrial development, it should be noted that the prewar state of industrial technology development among industrial powers was such that the range of products for which the smaller sized firms in Japan were capable of adapting the imported technologies and even the products themselves to become competitive producers, was much wider than the range presently allowed for the smaller sized firms in South and Southeast Asia. This is to be discussed next.

Case 3: The technology development stage and appropriate technology.

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26. Ishikawa, S. (1981), ch. 4.

In previous studies on prewar Japanese experience with regard to choice of appropriate technologies in processing and the machinery industries, it was observed that in any prewar period, alternative production technologies actually chosen or attempted to be chosen consisted of the following seven catagories:[27]

(i) The kind of foreign technologies which the government or firms tried to introduce, but were not successful mainly because of insufficient human technological knowledge.[28]

(ii) The kind of foreign technologies which were transplanted under protective policies.

(iii) The kind of foreign technologies which were adapted locally in the labor-intensive direction by replacing ancillary equipment with labor or with even primary equipment redesigned to economize on capital investment required.

(iv) The kind of foreign technologies whose product design and market demand conditions, and hence whose capital and technological capability requirement, were made much smaller.

(v) The kind of foreign technologies which were outmoded in developed countries but were still appropriate given factor endowment and the prevailing factor price ratio.

(vi) The kind of foreign technologies which were established as domestic or naturalized technologies through channels (ii) – (v).

(vii) The indigenous technologies which survived due largely to the fact that the consumer maintained special preference over the products made from these technologies.

Of these, categories (iii) and (iv) and the course of technology development in which category (i) was steadily converted to category (iv) through development of categories (iii) and (iv), were considered as relevant experience to contemporary developing countries. Among many examples for category (iii) were mining facilities in the Meiji period and improved hand-reeling of silk machines in the Suwa

27. Ibid.

28. It is assumed that a country's technological capability consists of two components: (i) objective technological knowledge either embodied in machinery and equipment or in written documents and drawings and (ii) human or subjective technological knowledge obtainable by formal and informal education and by experience. Broadly, there is a significant complementary relationship between the two components.

district made of ceramic kettlers and wooden frame (1875). The for category (iv) were power looms for single breadth cloth (18 three wheeled trucks (1910s) and small-sized passenger cats (19 In the light of these experiences special attention was focused on the recent events in Thailand and the Philippines regarding the des and manufacture of extremely simplified, adaptive models of imported power-tillers,[29] and some spread of low-cost four-wheele of the Asian Utility car type.[30] However, given the condition particular to Japan, this view appears somewhat simplistic.

Firstly, the following three points should be noted in connection with the above Japanese experience.

(i) With the exception of the cases which emerged in the earl Meiji period, the cases of process adaptation in category (iii) and product adaptation in category (iv) were realized in the modern larger-scale factories as a last measure to establish those industries whose technological sophistication was perhaps very high for Japan in respective periods after various efforts were taken to establish them by ordinary means relating to categories (ii) and (v). They were therefore by no means "minor improvements" without major devotion to the existing technological capabilities.

(ii) The level of industrial technologies which was achieved in the Japanese machinery industries by the end of the pre-war period was not very low as compared with the level of industrial technologies achieved in the western industrial powers at that time. Most of the western technologies which were then considered as "matured" were technologically mastered.[31] Exceptions were the frontier technologies such as those involved in the production of airplanes, passenger cars and machine tools, for which domestic markets were secured by deliberately making the products "lower in quality but cheaper in prices", hence non-competitive vis-à-vis foreign products.

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29. Ishikawa (1981), Postscript to ch. 4.

30. UNIDO (1978).

31. See a study of the development of Japan's industrial machinery industry according to the well-known Catching-up Product Cycle Pattern of industries (or Flying Geese Formation Pattern) in Mitsubishi Keijai Kenkyujo (1963), Part III.

32. See an analysis of the technology experts on the progress of Japanese industrial technology. See Hoshino, Y. (1956).

(iii) Many reasons are conceivable behind the above performances. But one should note a steady progress of formal education. This refers not only to the high enrolment ratio of primary school pupils which started from 28 percent around 1873 and soon after the turn of the century reached 98 percent. The system of middle and higher level education for technicians and engineers was steadily expanded in response to the demand increase. The effect of "learning by experience" in production was firmly based on human technological knowledge fostered by formal education in various dimensions.[33]

Thus, by way of elaboration, the process of the rise and development of the machinery industries in prewar China may be compared in some respects with that of Japan. As a framework of comparison, a fairly universally observable sequential pattern can be noted in the rise and development of the machinery industries in the "late comer" countries.[34] In this pattern, (1) the machinery industries started with the firms or workshops in the factories which were engaged in maintenance and repair of the imported machinery and equipment, (2) each of the machine industries progressed with the production of increasingly sophisticated replacement parts; (3) the development of such machinery industries in a number of branches led to the emergence of a market for replacement parts, tools and materials. Many specialized replacement parts maker also arose to cater to this market, (4) finally, the machinery industries capable of producing or even adapting the machinery arose in succession.

Following this framework, it is interesting to note that in both China and Japan the machinery industry started as the maintenance and repair section of the ship-building industry around the same period; in China around 1866 and in Japan 1861.[35] Furthermore,

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33. The number of students in the system of middle and higher education in industrial technology increased especially rapidly in three occasions: (i) around the Russo-Japanese War, (ii) after World War I and (iii) after the beginning of the Sino-Japanese War in 1937.

34. Ishikawa's preface to Odaka, K. (1982). This refers to the pattern which arose as a spontaneous process of the development. There was another pattern which arose when the establishment of the machinery industries took place as the state enterprises, which was not dealt with here.

35. For China, the year of the establishment of Fachang Machine Factory. For Japan, the year of establishment of Nagasaki Iron Works, the forerunner of Nagasaki Shipyard, Mitsubishi Shipbuilding Co. The establishment of this Iron

on the basis of the experience of the ship-building, textile machinery and some other branches of the machinery industries, the following may be said:[36] in China, the time intervals between the start of the industry as a repair and maintenance section and the manufacturing of the machinery by its capability were in general very long, and meanwhile the proportion of the number of factories in the industries that were specialized in repairing activities were continued to dominate.[37] In Japan, in contrast, the time intervals were very short and the major activities were soon turned into the manufacturing proper.[38]

Another important contrast is that in China, the weight of "learning by experience" on the production workers' level was throughout very large in the formation of human technological knowledge. This was exhibited in the establishment of a new machinery industry in which not only the skilled workers but also even the managers were supplied by the spillover effect of the previously existing industries. The increasing sophistication of the replacement parts manufactured in these industries was largely due to the learning by experience effect. Nevertheless, the manufacturing of spinning machines (1928), complete set of cotton power looms (1921), oil engines (1910) and diesel engines (1919) was made possible in the larger-scale factories and under the leadership of

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works was intended to make regular repair of the warship Kanrinmaru bought from Netherland. Before, whenever repairing became necessary the steam ship had to return to Europe. Mitsubishi Shipbuilding Co. (1957), pp. 119-121.

36. The scope of the machinery industries compared is limited, mainly because the nature of the data source of the Chinese side is confined here to that of the history of the machinery industry in Shanghai. Chinese Social Science Academy, Economics Institute (1979).

37. As for the ocean-going shipbuilding industry, the establishment of the manufacturing section had to wait for the establishment of the People's Republic of China (while a few ocean-going vessels were manufactured at the state-owned shipbuilding firm called Jiangnan Zhizao Ju, the management authority was in fact delegated to foreign advisers). If the inland shipbuilding is taken out, the situation was different. Inland shipping started expanding especially after the 1960s centering around Shanghai and the surrounding Lower Yangtze Delta area. Correspondingly, repairing and manufacturing of steam engines also began. As for the textile machines and engines, see the text discussion.

38. See Nihon Sangyo Kikai Kogyo-Kai (1964), Ishii, T. (1979) and Sanbei, T. (1941).

educated engineers. These factories produced a number of different machine products at the same time, thus using the available capacity of production more efficiently. In Japan, the factories starting the manufacture of ship-building, coal, mining and textile machines were mostly of the latter-type, and experience mainly of the engineers and technicians played an important role.

The above findings suggest very strongly the importance of formal education in different levels as a basic means of raising human technical knowledge. Technologies of categories (iii) and (iv) cannot be obtained, however, simply on the basis of learning by experience in production.

Next, there is another point which should be noted regarding the prewar Japanese experience, namely that industrialization and the accompanying development of technological capabilities in prewar Japan took place at the technology development stage of the Western industrial powers which is usually related to the First Industrial or Steam Power Revolution from the end of the 18th century and the Second Industrial or the Electric Power Revolution from the end of the 19th century.[39] Though with a considerable lag, Japan was able to achieve these two Revolutions largely before World War II. In contrast, the efforts at industrial and technological development of contemporary developing countries have been made at the technology development stage of industrial powers which is regarded as the Third Industrial Revolution initiated by the introduction of automatic control in the production process. And yet, on the basis of the technology development stage of their own industries many of these countries are still entering the Second Industrial Revolution.

An implication of this difference in international environment of technological advance is that even for the developing countries, the relative importance of formal education especially in the higher level becomes greater and that of experience less, for acquiring human technological knowledge.

As far as production operations are concerned, the requirement of human capability for manual workers tends to decrease, but the human capability required of technicians and of engineers for maintenance and repair of the greatly sophisticated plant and equipment tends to increase significantly.

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39. Hoshino, Y. (1956) and Minami, R. (1976).

A question, however, is how does the above difference affect the choice of industries and technologies in the process of contemporary industrial development. In terms of the seven categories of technologies observed above in connection with the Japanese experience, it seems that the scope of category (i) increases; in other words, the chances to reduce it by various efforts in connection with categories (ii) through (v), especially (iii) and (iv), tend to be smaller. Instead, the potential role of foreign direct investment as a measure to reduce the scope of category (i) would increase, a role which was rarely observed in Japan and hence not listed as a special technology category.

In the light of this inference, it is worthwhile to take note of the recent experience of the Republic of Korea.[40] First, it is observed authoritatively that many of the principal industries in her rapid industrialization use technologies that can be characterized as mature, in that "the mastery of well-established and conventional methods embodied in equipment readily available from foreign suppliers is sufficient to permit efficient production." In the case of new industries for which more sophisticated technologies were required, e.g., the ship-building industry and the integrated steel industry, only licensing and turnkey arrangements were relied upon. Except for electronics and certain chemicals, exclusive reliance on direct foreign investment was not observable. Second, despite this, the rate of growth of exports has been remarkable. In the case of machinery, the rate of export growth was especially rapid, and in 1975 the ratio of machinery exports to total machinery output reached as high as 32.3 percent. Moreover, 62 percent of total amounts of machinery exports in the same year was directed to the U.S., Japan and West Germany. This suggests that the potentials for the industrial powers to import labor-intensive and technologically simple machinery from the developing countries are expanding.

It is not yet certain, however, how far this Korean experience is suggestive of the future course of most of other developing countries where industrial and technological development is low. What is certain from the above studies is that in order to really understand the relevance of the Japanese experience in the appropriate technology issue, a much more intensive study than thus far conducted is necessary.

40. Westphal, L., Rhee, V. W. and Pursell, G. (1981). See also Odaka, K. (1982), the chapter written by Chuk Kyo Kim and Chul Hee Lee.

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