THE PROCESS OF INDUSTRIALIZATION IN TAIWAN

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The industrialization of Taiwan has recently been in the limelight as an example of success rare among those underdeveloped countries which have received U.S. aid. This does not mean, however, that the achievement of industrialization in Taiwan has necessarily been due to U. S. aid. Clearly, a more basic factor supporting the progress of industrialization has been the high level of accumulation in the agricultural sector, which has its historical foundation in the development of agriculture. The function of such accumulation has been to sustain the rapidly expanding surplus population; to provide an abundant labor force; and to form the base for capital formation for labor-intensive industry. The bold introduction of foreign capital and technology, resting upon this solid achievement, has provided the opportunity for industrial development.

I. DETERMINANTS OF INDUSTRIALIZATION

1. Historical Determinants

Agricultural development in prewar Taiwan, if examined from the point of view of the mechanics of economic development, is the fundamental factor determining the course of postwar industrialization. In the decades of the 1910's and 1920's, Taiwan's agriculture underwent a change which took the form of an agricultural revolution. There was extensive development in the production of commodities, centering on sugar and rice. The capitalistic mode of production of sugar was extensively adopted during the 1910's, when mechanized sugar refineries were established by the Japanese sugar industry. Subsequently, the production of refined sugar also made rapid progress.[1] Simultaneously there was parallel progress in the production of rice as a commodity particularly with the successful cultivating of *Japanica* in the 1920's.[2] This development of monocultural commodity production of both rice and sugar accelerated the improvement and progress of agricultural technology, thereby greatly enlarging Taiwan's capacity for agricultural production.

Taiwan's agriculture, which may be summed up as the production of rice and sugar, recorded its highest prewar levels of production in 1938–39, with

1 Cf. Tadao Yanaihara, *Teikokushugika no Taiwan* (Taiwan under Imperialism), Tokyo, Iwanami-shoten, 1928, and Benji Negishi, *Nampō nōgyō mondai* (Agricultural Problems of Southern Countries), Tokyo, Nihon-hyōronsha, 1942.

2 Cf. Shigetō Kawano, *Taiwan beikoku keizai-ron* (The Economics of Rice Production in Taiwan), Tokyo, Yūhikaku, 1941, p. 14.

sugar at 1.37 million tons and rice at 1.40 million tons. With the ensuing confusion of the war, agricultural production followed a generally declining path for the next seven years until 1945. In the postwar era, it took another seven year period—until 1952—for agriculture to recover the productive capacity of its prewar peak. As a result, the period from 1945–52 was one in which the restoration of agricultural production to its prewar level was a tacit and deliberate target figure. So far as this is concerned, agricultural production, the basic elements of which are land and labor, was generally characterized by its ability to recover easily without waiting for massive doses of capital investment, wartime limitations having been lifted and labor inputs having recovered sufficiently. In this sense, we may say that the prewar base for agricultural productive capacity was inherited without difficulty in the postwar era, and restored productive capacity by 1952. This base has been an important factor in the promotion of industrialization in Taiwan's postwar economy, in that it has contributed greatly not only to the achievement of food production to meet the demands of the rapidly increasing population, but also to the supply of raw materials to industry.

It is necessary to point out that another determinant in the historical reorganization of the economy after the end of the war was the transfer to government management of key enterprises accounting for 90% of the total capital of Taiwan's enterprises, which was accomplished by the requisitioning of Japanese assets.[3] Due to this, in the period immediately after the war, the management of all of the key enterprises was placed in government hands, and public enterprises bore the burden of industrialization from the start. The subsequent process of industrialization took the form of private enterprises catching up with and surpassing public enterprises. It goes without saying that the character of Taiwan's industrialization differs according to whether the burden was born by public or private enterprise.

Thus, we may say that the inheritance by the government of key enterprises and by agriculture of prewar productive capacity, severely conditioned the character of Taiwan's postwar industrialization and the mechanism of capital formation.

2. *Land Reform*

The land reform policy of establishing owner-cultivators not only brought from 1953 about the destruction of the landlord class, but also influenced the formation of the labor force as well as agricultural production and industrial investment. A further matter for consideration is how the destruction of the landlord class is related to the formation of a class of industrial entrepreneurs. There are two factors determining agricultural management. The first factor

3 For a discussion of Japanese enterprises in prewar Taiwan, see Japan: Ōkurashō kanrikyoku, "Taiwan no sangyō" (Industries in Taiwan), in *Nihonjin no kaigai katsudō ni kansuru rekishiteki chōsa* (A Historical Investigation of Japanese Overseas Activities), Vol. XIII-2, Part 4. For the postwar disposition of Japanese enterprises, see *Taiwan tchienshe* (Construction of Taiwan), Ming Tzu Press, 1950.

is the increase in owner-cultivators. If we glance at the structural composition of the agricultural class, we may note that in 1952, owner-cultivators accounted for 38%, part-owner part-tenant cultivators for 26%, and tenant farmers for 36%. In 1953, the year in which the land reform was completed, the percentages were 55%, 24% and 21%, respectively; while by 1965, owner-cultivators had risen to 67%.[4] The second factor is the trend toward diminution of the scale of farm management. The trend toward "miniaturization" may be seen in the following figures: in 1952, the average area of cultivated land per farm household was 1.29 ha.; per capita, 0.21 ha. In 1953, the corresponding figures were 1.24 ha. and 0.19 ha.; while by 1965, they had become 1.05 ha. and 0.16 ha. respectively.[5] The expansion of the number of owner-cultivators has been a direct result of the land reform, and the diminution of the scale of farm management has been a result of an increase in farm population which took place while the area of cultivated land has remained constant.[6]

These two factors have promoted labor-intensive cultivation and brought about remarkable increases in level of production per unit of cultivation. While labor-intensive cultivation slowed the labor-extensive production of sugar-cane, in contrast it also led to the promotion of the development of labor-intensive rice production and to diversification of commodity products.[7]

Moreover, labor-intensive farm management drifted toward pursuit of agricultural profits through capital investment, and this brought about the increased use of fertilizer. At the same time that this supported the development of the fertilizer industry, it provided the opportunity for publicly managed monopoly fertilizer capital to make deep inroads into farm management. For this reason, despite the fact that the increased utilization of fertilizer was able to greatly increase productive capacity, we cannot say that it necessarily brought about an increase in agricultural profit. This is probably due to the fact that the system of fertilizer supply is linked with the system of rice collection by the government, and has become the sole mechanism for absorbing surplus rice in farm household economy.[8]

The expansion of owner-cultivators has facilitated capital formation by

4 Council for International Economic Cooperation and Development, *Taiwan Statistical Data Book, 1966,* p. 21, (hereafter referred to as *TSDB*).

5 *Ibid.,* p. 22.

6 For example, while the area of land under cultivation was 876,000 ha. in 1952 and had increased to only 889,577 ha. by 1965, during the same interval agricultural population increased from 4,257,000 to 5,379,000. *Ibid.,* p. 20.

7 For example, the output of brown rice per hectare increased from 1,998 kgs. in 1952 to 2,348 kgs. in 1965. Similar figures for peanuts show a jump from 741 kgs. to 1,214 kgs.; for bananas, from 6,811 kgs. to 16,478 kgs.; for pineapples, from 10,731 kgs. to 20,829 kgs. *Ibid.,* pp. 27–28.

8 Cf. Takeharu Sasamoto, "A Salient Feature of Capital Accumulation in Taiwan," *The Developing Economies,* VI–2 (March 1968); and Tadashi Kawata, *Gendai kokusai keizai-ron* (Theory of Modern International Economics), Tokyo, Iwanami-shoten, 1967, pp. 235–245.

the farmer class while, in direct opposition, the diminution of the scale of management has made such capital formation more difficult. Therefore, funds for agricultural production still rely of necessity on loans from the non-agricultural sector.[9] However, the role of landlord capital, centering on the circulation of agricultural capital, has been destroyed and in its place government banks and money-lenders serve as the chief suppliers of agricultural funds. But after the land reform, with the introduction of legal regulations regarding land ownership by noncultivators, the mechanism by which capital was turned into land ownership became a thing of the past. As has been pointed out above, the expansion of owner-cultivators is probably a concomitant evidence of this. The fact that non-agricultural capital could no longer be attached to land meant that it became the socio-economic base for expanding the supply of capital to industry, directing Taiwan's social capital toward the non-agricultural sector.

The reverse side of the trend toward diminution of the scale of cultivation which accompanied the increase in farm population is expressed in the fair degree of underemployment in agriculture. As industrialization progressed, surplus labor in the agricultural sector came to provide an abundant and significant source of labor for the industrial sector. The combination of diminution of the scale of farm management and the system of compulsory collection of rice through the rice-fertilizer barter system brought poverty to farm households in general.[10] Consequently, the living standard of laborers drawn from farm villages was unavoidably low and has come to be the socio-economic base for Taiwan's low-wage labor force. The significance which the land reform has had in relation to the promotion of industrial investment may, as indicated above, be said to lie in the twin points of capital and the labor force.

3. The Population Factor

In the twenty years since the end of the war, Taiwan's population has doubled from 6 million in 1945 to 8.13 million in 1952, 10.79 million in 1960, and 12.63 million in 1965. The reason for this population explosion lies in the mass migration from the Chinese mainland in the latter half of the 1940's plus a high (3.4%) annual population growth rate. Here, I would like to examine just how this population explosion is related to industrialization.

Generally, population increases in underdeveloped countries are understood as being fetters to that country's industrialization. Certainly, in countries low in capital formation, population increase is related to consumption

9 Taiwan Provincial Department of Agriculture and Forestry, *Taiwan nontchia tzutchin konsū chingshin entchiou* (A Study of Supply and Demand of Farmer Funds in Taiwan), February, 1961.

10 In 1962, 52% of farm households (those whose scale of cultivation was less than 0.8 ha.) had no surplus provisions. Taiwan Provincial Food Bureau, *Taiwan liansū tchenchan chinshin tchi yeū kaikuan* (A Summary Report on Food Production and Its Administration in Taiwan), 1963, p. 43.

and makes capital formation increasingly difficult, probably making it impossible to seize an opportunity for industrialization. But population, while being a prime factor in consumption, is at the same time also a productive entity. Whether or not population increases transform into a productive labor force, is a criterion for the evaluation of the relationship between increased population and industrialization in underdeveloped countries. However, before a population increase may result in an increase in the labor force, food production sufficient to maintain the increased population is necessary primarily because of the consumption factor involved in such an increase.

In the period immediately after the war, the population explosion in Taiwan was certainly a major fetter to industrialization. In particular, surplus agricultural production hardly moved during the early part of the 1950's and there were fears that capital would be devoured by the increased population. Some have even said that without the introduction of U. S. aid, it would have been difficult to have weathered the crisis. However, the production of food proceeded smoothly in the latter half of the 1950's. If we look in passing at the figures for rice production, we may note that in 1952, production was 1.57 million tons; in 1955, 1.62 million tons; in 1960, 1.91 million; and in 1965, 2.35 million, showing an increase of 49.6% in the thirteen-year interval from 1952 to 1965. Again, total agricultural production for the same years recorded a growth rate of 191.1%.[11]

Thus, in that self-sustaining food production did not present a problem, Taiwan's relative overpopulation underwent a qualitative change to become a surplus labor force, and was able to become "an industrial labor army" supplying the labor demands of industrialization.

One point concerning which caution should be exercised is that the process of qualitative change in which relative overpopulation is transformed into a surplus labor force did not occur unconditionally in Taiwan. If we suppose that in underdeveloped countries the diffusion of primary education promotes the formation of a labor force, then we must point to the remarkable postwar advances in the level of educational diffusion in Taiwan despite the population explosion and the great financial burden incurred. If we look briefly at the rate of primary school attendance among school-age children, the rate increased from 84.0% in 1952 to 92.3% in 1955, 95.6% in 1960, and 97.2% in 1965.[12] Thus, it is clear that if we examine the factor of population increase from the aspects of achievement of self-sufficiency in food production and diffusion of education, ultimately the population factor is positively related to the expansion of the domestic market and the formation of the labor force in the process of industrialization.

4. U. S. Aid

During the fifteen-year period between 1951 and 1965, U. S. aid to Taiwan,

11 *TSDB, 1966,* pp. 23–26.

12 Taiwan Provincial Government, Bureau of Accounting and Statistics, *Taiwan Statistical Abstract,* No. 26.

which annually averaged $90 million and totaled $1,337.24 million, contributed enormously to the economic development of Taiwan. This large-scale dollar aid accounted for an annual average of 7.4% of Taiwan's national income, occasionally rising to 10%.

Since from the outset U.S. foreign aid has been undertaken on the basis of the interests of U. S. foreign policy,[13] the question of what role such programs as defense support and direct force support, or such materials as surplus agricultural commodities play in the economic development of Taiwan are important problems dealt with in many studies.[14] Regardless of its purposes, however, it is a fact that during the fifteen years U.S. aid introduced investment and materials on a large scale, and thereby enabled many of Taiwan's technicians to go abroad to receive training. Turning to the subject of industrial investment during this period, there was investment of aid amounting to U. S. $108.61 million and N. T. $2,785 million in the electric power industry, while in remaining areas of industry investment amounted to U. S. $89.9 million and N.T. $2,824 million.[15] How these facts are to be related to the process of industrialization in Taiwan is a problem to be discussed here.

As has been mentioned above, the lack of social capital formation during the 1950's brought with it the danger that the population explosion and the burden of greatly enlarged military expenditures would go hand in hand with reduction of the scale of production of social capital. Setting aside the specific nature of aid, the introduction of economic aid amounting to 10% of national income arrested the reduction of social production during this era of economic poverty.

Let us assume that, as stated above, a certain portion of U. S. aid was diverted to military activities, and let us further assume that half of this aid (or 5% of national income) was diverted from the maintenance of production levels to expenditure on economically non-productive military activities, so that only the remaining 5% was applied to the maintenance of capital. Granted these assumptions, how should the latter category of U. S. foreign aid be evaluated? In passing, we may note that during the 1950's the rate of capital formation in national income averaged 17%, of which the 5% from U.S. aid constituted an average of one-third.[16] Aid on such a scale can only be said to be enormous, and was sufficient to control invesment activities in Taiwan. This aid was adequate for pump-priming investment in various fields. It is a fact that U. S. aid was concentrated on and sustained development of the electric power and fertilizer industries. The energy supply base necessary for industrialization was thus constructed with emphasis laid on the development of electric power. It cannot be denied that U.S. aid, no matter

13 Japan: Gaimushō keizaikyoku, *Beikoku no tai-Chūgoku keizai enjo jōkyō* (The Conditions of U. S. Economic Aid to China), Report of the Overseas Embassy Survey, No. 4, 1958, p. 4.

14 Cf. Neil H. Jacoby, *U.S. Aid to Taiwan: A Study of Foreign Aid, Self-Help and Development,* New York, Frederick A. Praeger, 1966.

15 *TSDB, 1966,* p. 136

16 *Ibid.,* p. 16

what its original aim, substantially spurred on industrialization in Taiwan, and constitutes a unique historical factor in that process.

II. THE STAGES OF INDUSTRIALIZATION

1. Prewar

It is possible to see the first blossoming of the process of industrialization in the decade of the 1930's. Forming the background of industrialization during this period are 1) a recognition that industrial development would be more preferable to development of agriculture which had already been achieved before that time; 2) the clear competitive relationship between Taiwan's rice production and the agriculture of Taiwan's overlord, Japan; 3) the importance of Taiwan as a link in Japan's policy of imperialist expansion, in which she became an industrial base for Japan's southward movement.[17] In the early 1930's, future prospects appeared promising for such industries as bagasse board, natural gas, alcohol, soda and fertilizers; and in 1934, the commencement of operations at the Ju-Ye-Tan power plant provided an opportunity for the introduction in 1935 of such newly developed industries as feroalloys, aluminum, paper, chemical fertilizers, and dehydrated alcohol, etc. These were followed in 1937 by the establishment of such industries as iron, machinery, petroleum refining, and oils and fats. In 1938 the Five-Year Plan for the Expansion of Productive Capacity was issued for the purpose of stimulating industrialization policies, and textiles, cement and light consumption goods were introduced, while plans for large-scale generating plants, communications, and expansion of port and harbor facilities were pushed forward.[18]

Data concerning industrialization at this time are certainly poor. With the ensuing confusion of the war, industrialization policy was suspended in mid-air; plans that remained were never actualized, construction was discontinued, and existing facilities were partly destroyed. Despite this, it is impossible to deny that a certain degree of progress occurred. That is, the value of production of various industries in Taiwan during this period doubled during the five-year period for 1934–39, from ¥575 million to ¥1,243 million; and industrial production (including the production of sugar) as a percentage of total production rose from 40.7% in 1934 to 45.9% in 1939. On the other hand, the value of agricultural production to total production dropped during the same period from 50.9% to 44.9%.[19] The fact that in 1939 industrial production exceeded agricultural production is worthy of attention. The concrete achievements of industrialization in this assuredly brief

17 Kamekichi Takahashi, *Gendai Taiwan keizairon* (Taiwan's Modern Economy), Tokyo, Chikura-shobō, 1937.

18 Cf. Japan: Ōkurashō, *op. cit.*, "Taiwan no keizai II" (Taiwan's Economy II), Vol. XIII-4, Part 5; and Kunisuke Sakata, "Taiwan no keizai" (Taiwan's Economy), pamphlet, 1931.

19 Japan: Ōkurashō, *op. cit.*, "Taiwan no sangyō," Vol. XIII-2, Part 4.

interval may be said to have formed the base for postwar industrialization. For example, the plant and equipment of such industries as sugar refining, cement, electric power, paper, aluminum, alcohol, soda, natural gas, iron, machinery, petroleum refining, shipbuilding, etc., clearly were inherited from prewar industrialization.

2. Postwar

It is possible to divide the process of postwar industrialization into the following three stages. First, the transitional period from the immediate end of the war until 1951; second, the relatively stabilized period from 1951 to 1962; and third, the development period from 1963 to the present.

(a) The Transitional Period

This period may also be referred to as the era of confusion. Prewar industrial facilities had largely been destroyed during the latter part of the war, and industrial production at the end of the war had reached a state of paralysis. The first and natural step in postwar industrial activity was to recover from the devastation of the war. However, the economic and social repercussions of the civil war on the mainland were felt even in Taiwan; inflation was severe, and industrial recovery was limited to sugar, cement, paper, and fertilizers. With these exceptions, industrial recovery was generally postponed.[20] Sugar, stimulated by exports to mainland markets, quickly revived production, and damaged factories were soon restored. Cement production, sustained by the postwar construction and military demands, likewise recovered quickly. Paper and fertilizers soon followed suit, as they supplied essential goods to the domestic market which had up to then been cut off from Japanese imports.[21] However, with the increasingly severe inflation, other general productive enterprises found it difficult to undertake normal operations. This was due to the fact that the amount of produced goods sold was never enough for laying in stocks of raw materials, paying wages, and then making goods in similar quantity. Industrial activity necessarily stagnates when not only the basis for value multiplication through maintenance of production is destroyed, but also the maintenance of a given capital value is itself difficult. For this reason, production by private enterprises was brought to a halt, although the four industries mentioned above (i. e., sugar, cement, paper, and fertilizers) were able to stand up fairly well to inflation since they were public enterprises.

What merits attention in this period has been the import of mainland spinning capital into Taiwan since 1948. Two reasons for this immigration

20 For a discussion of the circumstances of postwar inflation on the Chinese mainland, cf. Nagao Watanabe, *Chūgoku shihonshugi to sengo keizai* (Capitalism in China and the Postwar Economy), Tokyo, Tōyōkeizai-shimpōsha, 1950, p. 174; and also Jon Fu Cheng, *Taiwan Hopī tchinjon, waihoe mauyī chiyuensū* (Money and Financing in Taiwan, Foreign Exchange Book), 1954.

21 Concerning the postwar restoration of industrial production, see *Taiwan tchiengshe,* pp. 408–412.

of spinning capital may be cited: first, the political instability on the mainland; and second, the vacuum in the Taiwan clothing market. A chief aim of imported capital was to fill up this vacuum, which had hitherto been monopolized by Japanese spinning capital.

In June 1949, currency denomination was carried out (at the rate of 1 New Taiwan yuan=40,000 Old Taiwan yuan) in order to bring to a halt Taiwan's galloping inflation. Concurrently, the 37.5% Farm Rent Limitation Program was carried out as the first step in the land reform. These policies simultaneously put a full stop to the economic confusion of the latter half of the 1940's, and laid the foundation for the progress of industrialization in the 1950's.

(b) The Relatively Stabilized Period

The following three policies provided guide-lines for industrialization during this period. First, U. S. aid to Taiwan was resumed in 1951; second, the land reform was completed in 1953 and included the reversion of the four major public corporations to private management; and third, the first four-year plan for economic construction was begun in 1953.

U. S. economic aid, which was provided under the auspices of Public Law 480: Surplus Agricultural Commodities, facilitated the economic stabilization of Taiwan, and had essentially three economic functions. First, it helped rectify Taiwan's adverse international balance of payments; second, it made up the government deficit; and third, it checked and removed the sources of inflation due to releasing of surplus agricultural goods on the domestic market and withdrawing currency. These three functions are, of course, just different aspects of the same thing. A more important factor is that U. S. aid was actually invested in construction and industrial investment, regardless of whether this was in the form of material goods or hard currency.

Next, the transfer of the four major public corporations to private management provided an opportunity for the rise of private enterprise. Among the four major corporations, the Taiwan Cement Corporation shouldered the burden of the rapid subsequent development of cement production; while the Taiwan Paper and Pulp Corporation played a similar role in the paper industry. The Taiwan Agricultural and Forestry Development Corporation's Canned Pineapple Division became a major export industry. The Taiwan Industrial and Mining Corporation was active in such fields as iron and steel, machinery, coal and spinning, and as one of the leaders among private enterprises.

The Four-Year Plan for Economic Construction of Taiwan, which is now in effect, has played a major role in directing the course of industrialization from the second stage.[22] This Economic Construction Plan has placed emphasis on investment in the development of the electric power and fertilizer industries, in compliance with U. S. aid. In addition, with the issuance of the government's economic policy based on this plan, the guiding role of the government in industrial investment activity has been intensified. Concomi-

22 Kowei Chang, *Taiwan tchinchī fātchan* (Economic Development in Taiwan), Tcheng Tchuong, 1967.

tantly, government protection and guidance has also been directly related to intensified government intervention in industrial investment and entrepreneurial activities. Using the massive quantities of U. S. aid and the enormous public enterprises as a lever, the government has pushed industrialization plans and its aims have been steadily achieved.

Thus, during the second stage industrialization was developed through concentration on remarkable growth in such public enterprises as fertilizers and electric power, and such private enterprises as spinning, cement, and the processing of agricultural products. However, it cannot be said that industrialization during this stage proceeded entirely without difficulties. In the former half of the 1950's, aftershocks from inflation still remained, and production in all industries with the exception of spinning was unsatisfactory. In particular, there was a conspicuous business slump in the four major public corporations which had just been transferred to private management. Stock prices plummeted, industrial production stagnated, and there was a lack of export goods for foreign trade with the sole exception of agricultural products. As background for this industrial stagnation, we reiterate that, aside from the fact that investment in industry was slight, the population explosion of this time and the burden of sizeable military expenditures were a tremendous fetter to industrialization. Such circumstances as these also form the background for the necessity of dependence on U.S. aid. But with continued injections of U. S. aid and with the advances in the development of agricultural production in 1956, these adverse conditions were gradually resolved and industrialization from the latter half of the 1950's was able to get moving quickly.

(c) The Development Period

During this period, industrialization developed rapidly through its close connections with the international economy, focusing concretely on the development of foreign trade and the introduction of foreign capital and technology in private enterprises. In the early part of the 1960's, the inducements for foreign capital to investment in Taiwan lay in the growth of Taiwan's economy, price stabilization, low-wage labor, and a series of government policies for the reordering of the investment climate. During the three years from 1963–65, foreign capital imported into Taiwan, including investment and loans, amounted to $42 million, accounting for 55.4% of the total foreign capital of $75.6 million brought into Taiwan during the period from 1952 to June of 1966. Although this is referred to as foreign capital, it is chiefly composed of American and Japanese capital plus overseas Chinese capital. The characteristic functions of this foreign capital, broken down according to source, may be summarized as follows. A major portion of American capital cooperated with the capital goods industries of the public enterprises. Investment from Japan was comprised chiefly of extending technological cooperation to consumption goods industries. Investment from overseas Chinese merchants consisted of participation in local production of a general nature. In this sense, American capital supported Taiwan's basic industries, Japanese capital

shouldered part of the development of import substitution industries, and overseas Chinese capital was in a position to compete with domestic capital. Despite this, during this period many of joint-management enterprises were established, and as if to counter this, Taiwan's industrial production advanced and diversified. In particular, there was remarkable development in such industries as petrochemicals (plastics, urea fertilizers) and light electrical goods (household appliances) which were closely related to induction of capital and technology.

Next, we may turn to an examination of the circumstances surrounding the progress of industrialization during this period from the point of view of foreign trade. Ever since 1960 and especially from 1963–64, the expansion of Taiwan's foreign trade has been striking, and both agricultural products and processed foods as well as industrial exports have displayed noteworthy growth. The context of this growth may be examined from the point of view of both domestic and international economic factors. First, domestic factors include progress of both diversification of agricultural production based on labor-intensive investment in agriculture, and the trend toward commodity export. In particular the export of such horticultural products as bananas, pineapples, mushrooms and asparagus, etc., were sustained by a comparative cost advantage, and greatly expanded. As for industry, the overproduction of light industrial goods as import-substitutes directed at the domestic market (such as spinning, cement, lumbering, processed foods, etc.) maintained Taiwan's low wages and low commodity prices, and grew to the point where production was able to hold a competitive international position. Second, international factors including special procurements for Vietnam, Japan's trade liberalization, and prosperity in the U.S.A. and the EEC, benefitted Taiwan's exports. Sustained by such domestic and foreign factors export items were diversified, and the value of exports increased remarkably.

The characteristic composition of exports according to market may be clearly seen from the following examples. To developed countries, exports of agricultural and processed agricultural goods expanded, leaving aside exports of cotton textiles to America. To underdeveloped countries, and in particular Southeast Asia, the export of industrial goods such as metal products, machinery and cement, etc. expanded. That is to say, this period witnessed the formation of a dual export system. The growth of exports of industrial goods to Vietnam certainly provided an opening for a break-through in industrial development. On the other hand, the growth of exports of agricultural and processed agricultural goods to developed countries sustained domestic prosperity and is directly and indirectly related to factors bringing expansion of the domestic market for industrial products. With the processing of imported semi-finished goods, production of re-exported goods and processed exports was introduced in 1965, thereby increasing the possibilities for industrial exports to developed countries. The establishing of the Kaushiung Export Processing Zone in 1965 is an example.

Taiwan's low-wage labor force is often cited as the primary reason for

the sustained growth of export production, industrial development, and the induction of foreign capital during this period. This is a matter in which it is necessary to exercise caution. The large labor population, with its low standard of living as expressed in the current phrase "cheap labor force," provided a major inducement for the pursuit of profits by foreign capital, and the source of surplus profit for newly developed industries. Moreover, it sustained the competitive ability of Taiwan's industrial products in the foreign market. These particular characteristics of the nature of Taiwan's labor force are worthy of note in regard to the industrialization of Taiwan.

We may note the progress of industrialization in Table 1 below. The figures in the table which indicate most clearly this progress are the trend toward expansion of the industrial sector in "composition of net domestic product"; the figures for industrial products in "composition of exports"; and the remarkable expansion of imports of capital goods in "composition of imports." One problem concerns the relatively slow-paced increase of the industrial sector under composition of employment. If we glance at the growth of employment in the thirteen-year interval from 1952–65, industrial employment increased by only 177,000, while in contrast agricultural employment increased by 225,000 and remaining employment increased by 417,000.

How is the relatively slow increase in industrial employment to be related to industrial development which utilized a low-wage labor force? Again what was the economic structure and how did it develop during the stages

Table 1. Indices of Industrialization of Taiwan

	Composition of Net Domestic Product			Composition of Employment[2]		
	Agriculture	Industry[1]	Others	Agriculture	Industry	Others
1952	35.7	17.9	46.4	61.0	9.3	29.7
1955	32.5	20.9	46.6	59.9	9.8	30.3
1960	32.5	24.7	42.8	56.1	11.3	32.6
1965	26.9	26.6	46.5	53.7	12.0	34.3
1967[3]	24.4	28.4	47.6	53.0	12.3	34.7

	Composition of Exports				Composition of Imports		
	Agricultural Products	Processed Agricultural Products	Industrial Products	Others	Capital Goods	Agricultural and Industrial Raw Materials	Consumption Goods
1952	26.9	68.3	3.6	1.2	13.1	74.2	12.7
1955	29.5	62.8	6.1	1.6	18.6	71.2	10.2
1960	10.7	55.4	31.9	2.0	27.5	63.0	9.5
1965	23.4	30.7	41.8	4.1	29.5	62.7	7.8
1967[3]	18.0	22.0	53.4	6.6	37.6	55.1	7.3

Notes: 1. Industry includes mining, manufacturing, electricity, and construction.
2. Age of 12 and over
3. Estimate

Source: *Taiwan Statistical Data Book 1968.*

of industrialization outlined above? It is from the point of view of these questions that the economic structure of industrialization will be examined below.

III. THE ECONOMIC STRUCTURE OF INDUSTRIALIZATION

1. The Actual Situation in Key Industries

Needless to say, it has been more effective and advantageous for Taiwan's industrialization, which is based on surplus labor and capital shortage, to have moved in the direction of industries which are more labor-intensive and more capital-saving. Therefore, if we grant that in fact Taiwan's industrialization did develop centering on labor-intensive industries, then the increase in industrial employment should be much greater. However, industrial employment during the thirteen-year period, as shown in Table 1, only increased by 177,000, not even half of the 417,000 increase in the tertiary industries. If we suppose that this stationary figure represents the reality of Taiwan's rapidly progressing industrialization, then the following interpretation may be suggested: that is, that industrialization in Taiwan may not necessarily have developed through concentration on only labor-intensive fields of activity. An examination of the labor and capital composition of the major industrial fields which led industrialization will make this clear.

As is shown in Table 2, the twelve key industries during 1965 were canned goods, lumber, spinning, paper, sugar, cement, fertilizers, petroleum refining, electric power, plywood, plastics, and electrical appliances. These industries, besides having a higher numerical value than other industries in terms of employment and output, are also those ranking high in growth in the process of postwar industrialization and moreover are those which led Taiwan's industrialization. Table 2 presents a breakdown of selected industries classified according to historical background and nature of technology, according to capital intensity (K/L) and employment effect of capital (L/K). As a result it is possible to recognize three basic types among the twelve key industries; namely, industries which are labor-intensive and capital-saving; industries which are capital-intensive and labor-saving; and industries which utilize both labor and technology. Let us refer to these categories as the *L* type, *K* type and *T* type, respectively.

Canned goods, lumber, spinning, and paper may be appropriately categorized as *L* types as their capital intensity (total capital employed per number of employees) is, respectively, N. T. $60.9 thousand, $64.9 thousand, $129.5 thousand and $188.3 thousand, in each case being less than the all-industry average of N.T. $197.2 thousand. Sugar, cement, fertilizers, petroleum refining and electrical power may be categorized as *K* types as their capital intensity is, respectively, N.T. $335.6 thousand, $490.0 thousand, $708.6 thousand, $403.6 thousand, and $1,588.0 thousand, in each case being clearly large scale. Finally, plywood, plastics, and electrical appliances may be categorized as *T* types as their capital intensity is respectively N. T. $115.0 thousand, $150.5 thousand and $166.7 thousand. Differential among each category, as may

Table 2. Structure of Taiwan's Key Industries (December, 1965)

		Employees (Persons) (A)	Production Value (B)	Net Value Added (C)	Total Capital Employed (D)	Total Fixed Assets (E)	Total Capital Employed/ Number of Employees (D/A) (N.T. $1,000)	Total Fixed Assets/Number of Employees (E/A) (N.T. $1,000)	Employment per N.T. $10 Million of Capital Funds (Persons)	Net Value Added/Number of Employees (C/A) (N.T. $1,000)	Production Value/Total Capital Employed (B/D) (N. T. $1)	Wages & Salaries/ Total Cost (%)
Labor-Intensive Industries (*L* Type)	Canned Food	21,416	2,066	543	1,304	491	60.9	22 9	164.3	25.4	1.58	5.0
	Sawmills	11,500	1,479	769	747	500	64.9	45 0	154.0	66.9	1.98	16.6
	Textiles	66,421	6,682	1,881	8,636	4,348	129.5	65 5	77.3	28.2	0.77	9.5
	Paper & Pulp	9,644	1,541	452	1,738	1,224	188.3	126.9	53.1	49.0	0 89	10 2
Capital-Intensive Industries (*K* Type)	Sugar	20,137	3,213	2,131	6,758	7,922	335.6	393.4	29.8	105.8	0 48	8 8
	Cement	5,241	1,750	827	2,617	2,213	490.0	422.2	20.4	154.9	0.67	5 8
	Chemical Fertilizers	6,689	3,145	1,290	4,740	5,239	708.6	783.2	14.1	192 8	0 66	7.7
	Petroleum Refining	8,785	3,200	1,460	3,546	3,173	403.6	361.2	24.8	157.5	0.90	7.7
	Electricity	9,420	2,994	2,063	14,959	18,046	1,588.0	1,915.6	6.3	219.0	0.20	1.1
Labor-Technique Combined Industries (*T* Type)	Plywood	9,341	1,513	374	1,063	594	115.0	63.5	87.0	40.5	1.42	8.2
	Plastics	10,008	1,567	585	1,501	693	150.5	69.3	66.4	58.7	1.04	7.9
	Electric Machinery & Appliances	12,011	1,746	739	2,002	733	166.7	61.0	60.0	61.5	0.87	10.6
	Total	190,613	30,896	13,114	49,611	45,176						
	All Industries	343,575	47,619	18,820	67,743	54,586	197.2	158.9	52.3	54.8	0.70	10.5

Note: Total Fixed Assets include Cumulative Depreciation Reserve.

Source: Ministry of Economic Affairs & Council for International Economic Cooperation and Development Executive Yuan, *Report on Industrial Surveys in Taiwan 1965, Series No. 5.*

be seen in Table 2, is greater in terms of total fixed assets per number of employees than in terms of capital intensity. The differential is generally proportionate to the differential in technology and inversely proportionate to the differential in number of employees. However, the above categorization is for the sake of convenience. Strictly speaking, sugar refining belongs in both industrial and agricultural sectors. In terms of ove-all employment effect, if we include in the sphere of sugar refining those employed in the agricultural sector, sugar refining is actually more of a labor-intensive industry and might be categorized as an *L* type; but for the time being it has here been categorized as a *K* type.

Among the four *L* type industries, canned goods, lumber and paper and traditional industries based on utilization of locally available resources such as agricultural raw materials or timber. In particular, the capital intensity is low for both canned goods and lumber, while employment effect is highest of any of the industries. The capital intensity for paper is generally low with the exceptions of the big three firms, and intensive use of labor is a pronounced characteristic. With the transplanting of the spinning industry from the mainland in the latter half of the 1940's, the level of production of spinning greatly surpassed that of sugar and attained a striking growth even while being dependent on raw cotton imported via U.S. aid. Total employment for spinning was 66,421, accounting for 20% of over-all industrial employment. The spinning industry has been both a pivotal activity for the process of industrialization, and the most typical labor-intensive industry.

L type industries are technologically low level, and therefore chiefly use unskilled labor. Employment of women and children from agricultural villages provides the major portion of the labor force for the canned goods and spinning industries in particular. Thus the industrialization of Taiwan during the 1950's developed centering on sugar, spinning and processed foods. This demonstrates the fact that the chief axis along which industrialization in Taiwan progressed was labor-intensive industry. However, it cannot be overlooked that investment in capital-intense industry was also undertaken by basic industries of capital goods.

Let us look next at the various industries belonging to the *K* type. In contrast with sugar and cement, which are traditional industries focusing on the utilization of locally available raw materials, petroleum refining, electrical power and fertilizers are newly introduced industries which developed sustained by American capital investment during the post-war period. The facilities for the sugar and cement industries had existed from before the war. Though these industries are capital-intensive, in fact they have not been a heavy burden to capital investment in the postwar allocation of resources. In contrast, fertilizers and petroleum refining are modern process industries which were in the vanguard of technological innovation and, with electricity, are activities which place importance on high-level technology and massive capital investment. Therefore, in capital-poor Taiwan, dependence on American capital for investment in these three industries can only be said to be

rational from the viewpoint of the strategy of economic development. Taiwan's private enterprises still are not capable of this kind of massive induction of foreign capital and sizeable investment, and therefore of the five industries classified as *K* types, four, excluding cement, are operated as public enterprises. These basic industries are characteristically 1) publicly managed, 2) sustained by investment of American capital, and 3) shouldering a portion of industrialization.

Because *K* type industries are capital-intensive, they are more economical in terms of labor. A major portion of their labor force is composed of skilled or semi-skilled labor. Moreover, if we examine the employment effect of *K* type industries in terms of the relationship between capital investment and employment effect, the proportion of total capital employed by all industries accounted for by the five *K* type industries is 65.8% while in contrast, the proportion of number of employees accounted for by these five industries is 14.3%. The proportion of fixed assets is 81.0%, and this gap is gradually widening. Again, if we look at only fertilizers, petroleum refining and electricity, the proportion of total capital employed for all industries accounted for by these three is 46.6%, while in contrast, the proportion of number of employees is a scant 7.2%. Moreover, when we compare output to ratio of employees, the proportion of output for the five *K* type industries in terms of total industrial output is 30.0%. In particular, if we look at the figures for total production value added which relate to capital formation, these five industries account for 59.2% of the total. In general, employment effect for the *K* type industries is relatively small in comparison with investment and production. But, it is a fact that great quantities of capital have been invested in the *K* type industries, especially fertilizers, petroleum refining and electricity, during the process of Taiwan's industrialization. Such an economic structure—where industrial employment does not expand so rapidly compared with the progress in expansion of capital investment and production—constitutes a reply to the question which was pointed out earlier.

Let us now turn to an examination of the *T* type industries, namely, plywood, plastics, and electrical appliances. From the point of view of technology, these industries would seem to require a high level of capital intensity. But as has been pointed out in Table 2, total capital employed and total fixed assets of these industries in Taiwan is lower than the average value for all industries, and in fact these are decidedly labor-intensive industries. Regardless of this, however, these newly-developed industries have grown remarkably since 1960, with the cooperation of foreign capital through induction of foreign technology. Plywood, which is dependent upon imports for the majority of its raw materials, exports 90% of its products. Plastics, which likewise imports part of its raw materials, is an import-substitution industry whose products are aimed chiefly at the domestic market. Recently, with the cooperation of foreign capital and technology, electrical appliances have achieved a steady rate of development and, sustained by growth in the domestic market, production has advanced remarkably. The majority of *T*

type industries are labor-intensive and have actively adopted Japanese technology.[23] This is in great contrast to the *K* type industries of their relationship to American capital. As is clear even from the state of capital intensity, the technological level of *T* type industries is not at all advanced. These require a diversified labor force composed of unskilled laborers who perform simple assembly operations and skilled laborers who can operate machines. Therefore, the introduction and growth of *T* type industries has had an enormous impact on the development of Taiwan's labor force, leading to friction of supply and demand in the labor market, with a surplus labor force on the one hand and a lack of skilled laborers on the other. In any event, the rapid development of the *T* type industries through the positive combination of foreign technology and the indigenous labor force, from 1960 on, is yet another characteristic of Taiwan's industrialization.

2. *A Comprehensive Examination*

When we review the above analysis the following points become clear. *L* and *T* type industries (labor-intensive and capital-saving) and *K* type industries (capital-intensive and labor-saving) developed together in the industrialization of Taiwan. *K* type industries account for 30% of total production, 59.2% of production value added, 65.8% of total capital, and 81.0% of fixed assets, but for only 14.3% of total employment. Investment at a high rate in these industries has been a relative impediment to increased employment.

However, this does not mean that industrialization has been obstructed on this score. If we look at the source of capital of *K* type industries, sugar and cement inherited already existing facilities from the prewar era while investment in fertilizers, petroleum refining, and electricity depended chiefly on American capital. Therefore, *K* type industries, rather than being a major burden to Taiwan herself in terms of investment, became key industries for the production of capital goods, and as pillars in the development of Taiwan's industrialization, investment in these industries was not neglected.

Production for the remainder of the labor intensive industries accounts for 70.0% of the total and, if sugar is included, the percentage amounts to 76.3%. Speaking on the basis of this percentage, the industrialization of Taiwan may be said to have developed centering on labor-intensive industries. For Taiwan, who is poor in capital and has a surplus of labor, this was probably a natural conclusion. But in actuality, whether it would be more advantageous for industrialization to be labor-intensive or capital-intensive in terms of investment is a matter which must be examined from the points of view of labor productivity and capital efficiency.

If we look at Table 2, labor productivity value added in the *K* type industries far exceeds that in the *L* and *T* type industries. That labor productivity of *K* type industries is high is due to high capital intensity goes

[23] Regarding technical cooperation between Taiwan's and Japan's enterprises, see Japan: Japanese Embassy to Taiwan, *Nihon no Chūkaminkoku ni taisuru keizai kyōryoku gaikyō* (An Overview of Japan's Economic Cooperation with the Republic of China), 1965.

without saying. However, on the other hand, if we look at output-coefficient of capital (cf. Table 2) the numerical value of L and T type industries is clearly higher than that of K type industries. Looked at from this point of view, it may be seen that industrial investment is more efficient in labor-intensive industries than in capital-intensive industries.

Even if capital-intensive industries rank higher in terms of labor productivity, the fact that labor-intensive industries rank higher in capital efficiency means that investment in labor-intensive industries is more effective for industrialization. Thus the fact that labor-intensive industries have become the chief axis for Taiwan's industrialization is in itself rational. It is moreover significant that the industries which are so characterized, namely the L and T types, are chiefly operated as private enterprises. As has been stated earlier, the commencement of Taiwan's industrialization was undertaken by the public enterprises, but in the process of development, private enterprises came to carry more of the burden. Again, both L and T type industries, but of late more especially the T type which has been growing rapidly, have been characterized by the joint-management of Taiwan's private enterprises equipped with Japanese technology.

The basic reason behind the high efficiency of capital investment in labor-intensive industries in Taiwan lies in the relatively cheap cost of labor. One other point which should be noted in connection with this is the fact that in the process of industrialization labor-intensive industries have been the chief leaders in the production of exports.

The degree to which Taiwan's economy is dependent upon foreign trade is certainly high, and foreign trade accounts for 20% of gross national product. The success or failure of foreign trade plays a commanding role in Taiwan's economy. In addition, Taiwan, with a population of 13 million, provides a cramped market for industrial goods, and therefore must depend upon exports if her industry is to develop. In regard to competition on the export market, the comparative advantage of production costs is important. The reason why Taiwan's specifically labor-intensive industries, such as canned goods, textiles, paper, plywood, etc., have been able to stand up to international competition and make inroads into export markets lies chiefly in the fact that in international terms, Taiwan has a low-wage labor force.

So far as Taiwan's low-wage labor is concerned, we may suppose that the wage differential between Taiwan and other countries nearly counterbalances the differential in national income. If, for example, we compare Taiwan with Japan, we may note that in 1964 national income per capita in Taiwan was U.S. $167.5 while, in contrast, national income per capita in Japan was U.S. $577.4. Taiwan's national income corresponded to 29% of Japan's.[24] The wage differential between Taiwan and Japan displays almost the same ratio.

By looking at the percentage which employment costs occupy in the cost structure of each area of industrial activity, we may be able to understand Taiwan's low-wage condition. As may be seen in the final column in Table

24 *TSDB, 1966,* p. 175.

2, the percentage of cost of employment to the cost of total industrial goods in Taiwan including indirect taxes, averages 10.5% for all industries. In contrast, the corresponding figure for the key industries is in each instance lower than the general average; for example, 5.0% for canned goods, 9.5% for spinning, 8.8% for sugar, 5.8% for cement, 8.2% for plywood, etc. The figures for export industries are thus strikingly low. The low ratio of employment costs to production costs serves both as an advantageous condition for industrial capital formation within Taiwan, and as the basis for comparative advantage of production costs on the export market. It is also clear that the overpopulation, which has been sustained by accumulation in the agricultural sector, has in turn sustained the development of Taiwan's industrialization as a low-wage labor force.

IV. SUMMARY

The population explosion in postwar Taiwan was not necessarily a negative factor for industrialization; and U. S. aid was profitably digested by Taiwan's economic faculties, contributing to capital formation in Taiwan. Industrialization in Taiwan, with its basis in agricultural accumulation and given the condition of an abundant low-wage labor force, was able to proceed centering upon labor-intensive industrial activities. By the 1960's, Taiwan had arrived at the stage of development where she was manufacturing light consumption goods. In recent years, the importance of a high level of industrialization has been recognized and the problem of the introduction of heavy industry has been taken up. However, the introduction of heavy industry implies capital-intensive investment and, as we have seen in the analysis above, it is probably impossible to consider capital-intensive investment, ignoring the advantages of labor-intensive investment and the problem of employment.

Given the small scale of Taiwan's domestic market, it is improbable that the development of any industry would be accomplished without considering advances into the export market. Given this situation, an economic structure which is based on comparative advantage of production costs is important. But as may be seen in the above analysis, the practical use of low-wage labor (i. e., labor-intensive investment) is more capable of realizing development of export-oriented production than is enlargement of investment in plant and equipment (capital-intensive investment).

When we speak of labor-intensive industries we refer to both the L type, which are simple labor-intensive industries, and the T type, which combine technology and intense use of labor. From the point of view of the level of Taiwan's labor force and capital formation, the development of T type industries, which are directly linked to the introduction of foreign technology, will probably play the chief role in Taiwan's industrialization hereafter, leaving aside the question of the introduction of heavy industry. On the basis of cumulative development of T type industries, the path to heavy industry will open of its own accord.