WAGES AND LABOR PRODUCTIVITY IN THE COTTON SPINNING INDUSTRIES OF JAPAN, KOREA, AND TAIWAN

Ki Do WOO

I. PREFACE

THE WAVE of "industrialization" has penetrated every corner of the world, and it is barely possible to find a country that does not have an industrial development plan whether designed regionally or on a nationwide scale. The word "industrialization" especially is most frequently used in the developing countries as a highlight for important documents and it is firmly believed that "industrialization" is the only way to end the "vicious circle of poverty" which will enable them to enjoy the living standard of the advanced countries. Now, looking at the industrialization process of the present developed nations, there are two initial approaches to "industrialization," one is that of the textile industry the other of the food and beverage industry [6, p. 111].

Historically, the former took place in England and Japan, and the latter in New Zealand. Today, Japan has gone ahead in the group of these countries to be discussed, and is widely known as one of the world's economic superpowers. In Japanese industrialization, the growth of cotton spinning in the Meiji era (1868–1912) played a dominant part and both Taiwan and Korea are, in a sense, following the Japanese path to economic development. The fact that both Korea and Taiwan have successfully reached the semi-developed stage seems due to effective development strategies, centered on textiles particularly cotton spinning. The historical role of cotton in both Britain and Japan may well be operating again in Taiwan and Korea. If this is the case, we should turn our attention to the development of Japan's cotton industry and compare it with the development of the industry in Taiwan and Korea from the viewpoint of international competitiveness. However, a wide variety of factors are at work to determine the competitive ability of any commodity in the world market. In particular, trends in wages, labor productivity, and wage costs and their correlations with export expansion in the cotton spinning industries of Japan, Taiwan, and Korea should be observed empirically, and on the basis of such an analysis it is desired to show the perspectives of international competition of cotton products among them.

I would like to express my grateful appreciation for the 1976 grant from the Korean Traders Scholarship Foundation which allowed me to complete the writing of this paper, and also for the kind cooperation in the work on regressional analysis by Mr. Tōru Yanagihara of the Institute of Developing Economies, Tokyo, Japan.

In this analysis, it is simply assumed that the competitive ability of the cotton industry depends upon the difference of wage cost which is mainly determined by the levels of nominal wage and labor productivity and by changes in the foreign exchange rate. Four premises are presented below on which the analysis of international competitiveness chiefly depends [1, p. 258].

(1) Cost of raw cotton is equal for each country—Freight and other expenses are very low because cotton is a common international commodity. But, there may be significant price differentials if the cotton industry in a certain country depends wholly upon its own domestic supply.

(2) Costs of equipment and machinery are uniform for each country—Because of the fierce export competition in textile machines between nations specializing in machinery production, prices tend to equalize with hardly any significant differential in cost.

(3) Cost differentials in land and buildings may be regarded as negligible—In this respect there will be international disparity in costs to a considerable degree. However, when allowances are made for longer durability of land and building than for machinery and equipment, it may be judged that the effects of cost differentials in land and building on production cost are negligible.

(4) There are no tariff or other external disturbing factors (in other words, a strictly pure free trade).

With these premises, the key element in deciding the cost differential per product unit turns out to be wage cost in which wage, labor productivity, and exchange rate are included.

II. BACKGROUND AND RECENT DEVELOPMENTS

The motive for selecting these three nations is that competition in the export of cotton products between them has been recently intensified in world markets especially that of the United States. Today the competitive power of Taiwan and Korea appears as a great menace to Japan.

As shown in Table I, in terms of total export of cotton yarn, Korea topped the three countries in 1975 and its exports sharply increased 5.76 times from 1970, and during the same period, both Taiwan's and Japan's rise in exports was very slight compared with Korea's. Even more striking is that in 1970 the quantity of cotton yarn exported by Korea was far less than that by either Japan or Taiwan. While Table I shows how export of cotton yarn by the three nations progressed from 1970 to 1975, Table II shows the severity of cotton products export competition in the U.S. market. It is evident, first of all, from Table II that both Taiwan and Korea have continued to increase the percentage of exports during the period notwithstanding the oil crisis at the end of 1973. Only for a short period during 1973 did Korea suddenly concentrate its exports of cotton products on Asia. Japan's exports were clearly on a downward trend from 1970 to 1975. Second, in 1970 both in quantity and proportion of cotton products exported to the United States, Japan was far ahead of the other two. But in the very short period from 1970 to 1975 Japan's export quantity had decreased by

TABLE I

EXPORTS OF COTTON YARN

(Tons)

	Korea		Taiwan		Japan	
	1970	1975	1970	1975	1970	1975
Asia	3,855	25,604	5,157	8,842	4,021	3,269
Europe	401	1,836	4,456	586	163	557
Africa	510	118	512	1,328	1,867	1,656
North America	n.d.	21	5	33	n.d.	136
Central and Southern America	6	n.d.	n.d.	131	110	n.d.
Oceania	n.d.	153	131	n.d.	619	121
World total	4,854	27,987	10,209	11,088	7,115	9,952

Sources: Korea—1970–73 from [21], and 1974–75 from [10]. Taiwan—1970–72 from [21], and 1973–75 from [17] which include cotton sewing thread. Japan—1970–73 from [21], and 1974–75 from [7].
Note: n.d. means no data.

TABLE II

EXPORTS OF COTTON PRODUCTS TO THE UNITED STATES, 1970–75

(Converted into 1,000 yds² of cloth)

	1970	1971	1972	1973	1974	1975
Taiwan	65,618	73,509	92,825	78,409	86,254	92,668
	(4.2)	(4.5)	(4.7)	(4.8)	(5.8)	(7.1)
Japan	330,640	284,873	314,061	156,175	87,703	58,437
	(21.0)	(17.0)	(16.0)	(9.0)	(5.0)	(4.0)
Korea	39,078	41,325	51,319	39,006	44,123	48,443
	(2.5)	(2.5)	(2.6)	(2.4)	(3.0)	(3.7)

Source: [13, No. 357/1976, p. 18].
Note: Figures in parentheses are the countries' annual percentage share of U.S. import of cotton products.

more than four-fifths and in share by a little less than four-fifths. As a result, in 1975 Japan was greatly behind Taiwan and an almost equal levels with Korea. In order to shed light on the causes of this drastically changed competitive position, it would be necessary to make a separate examination of the process of development of each nation's spinning industry not only for the period from 1970 to 1975 but also for the time before that, since the possibility of change in competitive ability had been perceived long before 1970.

1. *Japan*

Japan has a much longer experience in the development of a modern cotton industry than either Korea or Taiwan. Japan's first modern spinning factories Sakai and Kashima were established in 1875. And with the import of raw cotton and these private spinning mills Japan was able to meet its domestic demand for cotton yarn. Once wholly dependent on the domestic supply of raw

cotton Japan began to shift over to overseas supplies around 1887 and then started to rely on imports, mainly Indian raw cotton from then on. The period from 1868 to 1886 was the inaugurate stage and from 1887 to 1893 was the rising stage in terms of the development pattern of the cotton spinning industry [11, p. 79]. After going through the initial stages, Japanese spinners on the whole underwent many twists and turns in business through frequent production curtailment measures used during economic recession.

The ups and downs of the Japanese cotton textile industry from the 1880s to 1945 are shown in the fact that there were ten production curtailments and after World War II the industry was several times compelled to resort to similar measures under the name of "cartels." While going through this difficult course from 1920s to 1930s the competitive strength of Japan's cotton industry had been rapidly enhanced vis-à-vis its chief rival England thanks to the spinners skilful buying and selling of raw cotton, success in raw cotton mixing technology, improvements in labor productivity, and the use of cheap labor. As a result, Lancashire was nudged out of its top position as top exporter of cotton cloth in 1933. After the war, Japan again reached first rank in the world in 1951, and despite Japan's cotton industry being in the greatest difficulties it has ever faced, in numbers of spindles it was in fifth place as of December 1975. However, examining the development process closely, it can be easily seen that the cotton spinning industry now has fallen into situation different from the past when economic difficulties due to the business cycles could be avoided by curtailment measures. The structural changes in the textile industry were brought about by a postwar industrialization which leaned heavily on chemical plants and heavy industry, and also by the export competition with developing countries.

In this connection, Table III shows more dramatic results than the others, since it was drawn up by using an index while Tables I and II used actual figures. Table III shows that Korea and Taiwan have surpassed Japan in export volume of cotton yarn, while Japan's exports of cotton cloth have decreased markedly in contrast to the conspicuous increase by Taiwan during the period. Growth in Korean exports of cotton yarn was indeed remarkable. Thus, as developing countries, such as Taiwan, Korea, and Hong Kong, rapidly became powerful competitive exporters of cotton products, Japan's share in the world market has

TABLE III

INDEX OF COTTON YARN AND COTTON CLOTH EXPORTED BY THE THREE COUNTRIES

(Japan's quantity for 1970=100)

	Japan		Korea		Taiwan	
	1970	1975	1970	1975	1970	1975
Cotton yarn (world total)	100	140	68	393	143	156
Cotton cloth (world total)	100	66	33	30	73	92

Source: [13, No. 361/1977, p. 42].

been reduced. Secondly, the domestic factor should also be considered here; due to heavy industrialization which continued up until the oil crisis in 1973, it became difficult for Japan's cotton textile industry to obtain the necessary manpower at the same pay as before because the flow of the labor force shifted to higher productivity sectors and wage costs for textile mills were forced up sharply throughout the high growth period. However, detailed explanation should be given to avoiding the popular misunderstanding that Taiwan and Korea's low wages are the complete answer to why Japan's textile industry has recently been on the wane. Japan's rapid move from behind to surpass England's textile industry in the 1920s and 1930s was misunderstood, and must not be repeated in understanding Japan-Taiwan-Korea export competition.

2. *Taiwan*

When World War II ended, Taiwan had 8,268 spindles and 428 weaving machines, which had been used during Japan's colonial administration, and could do nothing else but depend wholly on imports to satisfy the demand for cloth during the postwar years [13, No. 346/1975, p. 4]. But despite this meagre start she has made truly great strides in developing the textile industry in such a short period. It has taken about thirty years to arrive at the present 3,130,000 spindles as of the end of 1976 which was a greater number than Korea's. Table IV is useful for an understanding of how fast the cotton industry in Taiwan has developed. Table IV shows the astounding increases that have taken place in Taiwan's textile facilities during the 1945 to 1976 period and what is more noticeable is that for both the 1965–70 and 1970–74 periods, the number of spindles nearly doubled. Table V in relating to the production of cotton yarn and cotton cloth seems to be helpful in understanding how remarkable the development of Taiwan's textile industry has been.

Compared with the century-long history of Japan's textile industry, the achieve-

TABLE IV

NUMBER OF SPINDLES AND WEAVING MACHINES IN TAIWAN, 1945–76

Year	Spindles	Weaving Machines	Number of Enterprises*
1945	8,268	428	
1950	56,020	3,328	
1955	207,140	12,000	16
1960	346,750	5,078	24
1965	587,918	8,720	30
1970	1,083,734	13,795	67
1974	2,013,588	29,327	118
1975	2,920,000		
1976	3,130,000	52,792	120

Sources: For 1945 to 1974, refer to [13, No. 346/1975, p. 6]; for 1975–76, from the data presented to 9th Joint Committee of Korean and Republic of Free China Textile Industries.

* Enterprises registered by the Taiwan Cotton Spinner's Association.

TABLE V

TRENDS IN THE QUANTITY OF COTTON YARN AND CLOTH PRODUCED IN TAIWAN ANNUALLY

Year	Cotton Yarn (m.t.)	Cotton Cloth (1,000m)
1963	45,894	221,056
	(100)	(100)
1965	54,420	268,018
	(119)	(121)
1970	104,809	527,836
	(228)	(239)
1974	111,208	630,776
	(242)	(285)
1975	130,884	760,765
	(285)	(344)
1976	147,477	811,233
	(321)	(367)

Sources: For 1963–74 figures, [18, July 1975]; for 1975–76, [9, 1977].
Note: Figures in parentheses are index figures with the base year of 1963 at 100.

ments in Taiwan may be regarded as a most significant event, for they were accomplished only thirty years after the textile industry was begun.

3. *Korea*

Korea established its first cotton mill as early as in 1920s using its own people and capital to supply clothes [5, p. 207] despite Japanese colonial policies making it difficult for Koreans to set up joint-stock companies in the manufacturing sector. Around the same time the first local mill was established, Japanese capital was beginning to enter cotton industries in Korea. After the initial stage, expansion has been continuous, Korea being an important supply source of cloth to Japanese people in peace time and also during the war period.

Before the war, 1938 was the peak year of cotton mill operation in Korea, with 213,800 spindles and 7,800 weaving machines. However, because of World War II and even worse the Korean War, the Korean textile industry was severely damaged. Table VI indicates the ups and downs in Korea's textile plant and equipment due to these causes and the export drive policy now in progress.

Table VI shows that the expansion of facilities for 1970–75 was greater than for any other period, because spindles increased 2.15 times and weaving machines by nearly 1.5 times for the same period, and such fast expansion did not occur before 1970. If the weaving machines owned by textile manufacturers not affiliated with the spinners' association are added to the above figures, those for 1975 would rise to 40,834 and the increase would be about 4.05 times for 1970–75. Although there were a variety of reasons why textile mill facilities in Korea expanded so rapidly, for one, a more export-oriented policy dominated

TABLE VI

SPINDLES AND WEAVING MACHINES IN KOREA'S TEXTILE INDUSTRY

Year	Number of Spindles	Number of Weaving Machines
1945	253,884 (143.0)	8,640 (226.0)
1950	316,572 (178.0)	9,075 (237.0)
1953	177,432 (100.0)	3,822 (100.0)
1960	474,848 (267.6)	10,054 (263.1)
1965	628,928 (354.4)	11,428 (299.0)
1970	901,688 (508.1)	10,083 (263.8)
1975	1,939,692 (1093.2)	14,854 (388.6)
1976	2,090,688 (1178.3)	17,078 (446.8)
1977	2,317,308 (1306.0)	18,153 (474.9)

Notes:
1. The figures for 1945 indicate the situation just before the end of World War II.
2. The figures for 1950 indicate the situation just before the outbreak of the Korean War.
3. The figures for 1953 to 1976 are those for the end of each year, and the figure for 1953 explicitly show the damage resulting from the Korean War.
4. The figures for 1977 are for August 1977.
5. Figures in parentheses represent index numbers with the base year of 1953 as 100.

almost all sectors in the Third Economic Development Plan period (1972–76). In line with the plan a great deal of foreign credit and loan were used for the textile industry to modernize and expand facilities under the Provisional Act for Textile Industry Equipment. Thus the government's export drive was one of the important factors responsible for the enormous growth in textile plant and equipment from 1970 to 1975. In addition, the sharply increased demand for Korean textiles in the 1970s has prompted many spinners to enlarge facilities and improve productivity leading to build-up of competitive ability abroad. In this connection, the trends in machinery and equipment per employee as shown

MACHINERY AND EQUIPMENT PER EMPLOYEE IN THE KOREAN COTTON INDUSTRY, 1970–75

(1,000 won)

1970	1971	1972	1973	1974	1975
681.7	1,124.6	1,126.1	1,225.3	1,550.4	2,398.1

PRODUCTION OF COTTON YARN AND COTTON CLOTH IN KOREA, 1970 AND 1977

	Average Monthly Quantity Produced for 1970	Quantity Produced in October 1977
Cotton yarn	8,617 m. t. (100.0)	24,167 m. t. (281.0)
Cotton cloth	17,734 km (100.0)	44,241 km (249.4)

below indicates the foundation for the continuous expansion of labor productivity in textiles.

The growth of production for 1970–77 is most conspicuous. Furthermore, the share of exports increased. The percentage shares of domestic demand and exports for cotton yarn and cloth in 1970 were 71:29 and 33:67, respectively. However, in 1976 these same figures became 28:72 and 6:94, a point at which it is necessary to find out what the reasons are for such drastic change in such a short period. There are contentions that the limit to domestic demand had already been reached and that the expansion of cotton facilities for satisfying increased requirements from abroad brought about a biased expansion toward exports. In my view, the contention that the domestic consumption of cotton yarn and cloth has reached its limit seems to have committed the mistake of neglecting the effects of a strong export drive on domestic demand. For instance, the differential pricing policy in favor of export and the export quota assigned to spinners by the administration must have worked to prevent Korea's textile industry from normally growing in domestic consumption.

III. TRENDS IN WAGES, LABOR PRODUCTIVITY, AND WAGE COSTS

What has been said so far may be sufficient to grasp the brief history of cotton textile industries in Japan, Korea, and Taiwan. Turning to trends on wages, labor productivity, and wage costs forming the background for international competitiveness, there seem to be three determining factors: price factor, non-price factor, and economies of scale. And, in relation to labor productivity, economies of scale must yield direct influence. Therefore, in so far as economies of scale have a strong effect on commodity competitiveness, this point should be examined before we undertake analyses of wages and labor productivity, etc.

A. *Economies of Scale*

In evaluating economies of scale, it is necessary to investigate how the structures of plants in the textile industries in Korea, Taiwan, and Japan appear when compared with each other.

Table VII, first of all, shows that all sixteen firms member to the Spinners and Weavers Association of Korea have more than fifty thousand spindles making these mills what is known internationally as optimum scale mills, whereas both Japan and Taiwan have many small-scale mills of under fifty thousand spindles. Secondly, Korea's cotton spinning mills on the average are of the largest scale in numbers of spindles per mill and Korea also has the smallest number of firms. In view of economies of scale in numbers of spindles per firm the labor cost advantage was demonstrated not only by the empirical studies of Keizō Seki [14, p. 204] and others, but also proved undeniably through the daily experiences of the spinners.

B. *Wage Trends*

Making an exact comparison of wages in the cotton industries of Japan, Korea,

TABLE VII

FIRM STRUCTURE BY SIZE

Size Group by No. of Spindles per Firm	Taiwan			Korea			Japan		
	No. of Firms	No. of Spindles	%	No. of Firms	No. of Spindles	%	No. of Firms	No. of Spindles	%
Over 100,000	3	468,424	17.1	11	1,920,852	86.3	19	7,274,767	74.9
50,000–100,000	5	292,936	10.7	5	307,512	13.7	20	1,371,948	14.1
30,000–50,000	14	571,800	20.9				13	538,235	5.5
20,000–30,000	30	688,908	25.1				10	242,348	2.5
10,000–20,000	45	605,902	22.1				16	231,900	2.4
Under 10,000	23	112,283	4.1				11	58,240	0.6
Total	120	2,740,253	100.0	16	2,228,364	100.0	89	9,717,438	100.0
Average per firm		22,835			139,272			109,184	

Sources: [13, No. 346/1975] for Taiwan; [16, No. 3/1977] for Korea; and [4, 1977, 1st Half Term] for Japan.

Note: Since figures for Taiwan are those as of July 1975, and for Japan and Korea as of June 1976, it may be difficult to compare them each other in the strict sense. But, as of December 1976, the total numbers of firms for Taiwan were exactly the same as in July 1975 and the numbers of spindles were 3,000,000; about 260,000 spindles were added during the period from July 1975 to December 1976.

and Taiwan is not easy in view of their differing labor practices, but particularly because of the lack of time-series wage data for Taiwan. Before 1973, Taiwan's textile industry categories were not subdivided for wage statistics, so figures for wages in the entire textile industry have to be relied on. Making things worse is that statistics on labor productivity have not been available. With due regard to the difficulties mentioned above, the picture on wage trends in the cotton mills are shown in Table VIII.

As clearly shown in Table VIII, Japan had the highest annual increase rate of wages during 1965–76. However, for 1973–76, Korea's per annum increase was about 25 per cent, higher than Japan's by 11 per cent and greater than Taiwan's by 4 per cent. Therefore, around the time of the 1973 oil crisis, the competitive strength of cotton textile industries changed considerably in accordance with the drastic fluctuation in wages. In a word, it was expected that

TABLE VIII

COMPARISON ON TRENDS IN DAILY WAGES IN THE COTTON TEXTILE INDUSTRIES OF TAIWAN, KOREA, AND JAPAN, 1965–76

(U.S. $)

Year	Taiwan	Korea	Japan
1965	0.84	1.02	2.46
1966	0.90	1.04	2.64
1967	0.95	1.33	2.91
1968	1.11	1.59	3.48
1969	1.08	1.93	4.05
1970	1.40	1.97	4.77
1971	1.59	2.04	6.27
1972	1.81	2.04	7.48
1973	2.32	3.02	10.62
1974	3.05	3.64	12.09
1975	3.32	4.91	12.94
1976	4.14	5.83	14.64
Average annual increase rate, 1965–76 (%)	15.6	17.2	17.6

Notes:
1. Sources on wages for Taiwan, Korea, and Japan are [19] [3] [4]. Monthly earnings or wages were converted into daily wages by assuming a month to be twenty-five work days. Wages here indicate the average for both sexes.
2. For conversion into U.S. dollar the exchange rate for each of the three countries is listed in Appendix Table I.
3. Taiwan figures prior to 1973 comes from [20], but in calculating the wages in cotton textiles wages as a whole plus 5.3 per cent for each year are presented here considering that there is a 5.3 per cent wage differential between cotton and other textile industries annually throughout 1973–75 as shown in [19].

Korea's cotton industry would be in a worse position because of the rapid increase in wages after the oil crisis. However, thanks to more rapid improvement in labor productivity, Korea not only covered the disadvantages coming from larger wage increase but also brought it on a more favorable footing than Japan.

C. *Labor Productivity*

Considering that recent equipment modernization and large-scale investment have certainly been the most powerful factors in improving labor productivity in the cotton textile industry, values of tangible fixed assets per employee and liabilities and net worth per employee in each country should be explored. But, due to data difficulties, only a comparison between Korea and Japan is possible (Table IX).

TABLE IX

COMPARISONS ON TANGIBLE FIXED ASSETS, AND LIABILITIES AND NET WORTH PER EMPLOYEE, BETWEEN KOREA AND JAPAN (U.S.$)

Year	Tangible Fixed Assets per Employee		Liabilities and Net Worth per Employee	
	Korea	Japan	Korea	Japan
1970	3,803	4,433	7,025	16,855
1971	4,426	5,410	8,876	21,050
1972	4,250	6,043	9,623	24,324
1973	5,037	6,889	16,639	31,682
1974	6,276	8,700	16,922	37,425

Sources: [2] [9, 1977].
Note: The same exchange rates as in Table VIII are used for conversion into U.S. dollar.

The two indicators relevant to productivity indicate that both Japan and Korea went in the same direction at almost an equal pace for the 1970–74 period. However, due to fluctuations in employment and spindle numbers in both countries during that time, their different patterns of investment are easily perceived. In a word, investment of the labor-saving or capital-intensive type and equipment modernization has been dominant in Japan and the investment for expansion or the capital expansion type has been dominant in Korea.

There are probably two underlying facts in the above hypothesis. First, employment in Korean cotton textile mills increased from 27,532 workers in 1970 to 39,569 in 1976 in contrast to decreases from 96,029 to 68,521 in Japan. Second, the 901,688 spindles in 1970 were increased to 2,090,668 in 1976 for Korea, and spindles declined from 9,366,024 to 9,312,252 in Japan [4, 1977, 1st Half Term]. Accordingly, investment was different in character in Japan and Korea and economic motivation was different, though the investment served much the same purpose by increasing labor productivity in the long run.

Table X shows the trends of labor productivity in Korea and Japan. The question arises of how Korea's cotton textile mills increased labor productivity and improved employment. First of all, Korea was able to enjoy the advantages of late development by introducing modern machinery and equipment to install

TABLE X

LABOR PRODUCTIVITY OF COTTON SPINNING INDUSTRY IN KOREA AND JAPAN, 1965–76 (person)

Year	Japan	Korea
1965	5.28	8.76
1966	5.03	8.53
1967	4.52	8.35
1968	4.37	8.80
1969	4.28	7.71
1970	4.13	6.85
1971	3.94	5.86
1972	3.68	5.46
1973	3.47	5.64
1974	3.71	5.96
1975	3.58	5.10
1976	3.05	4.88
Average annual increase rate for 1965–76 (%)	–4.87	–5.18

Source: [15, p. 499].
Note: Labor productivity here means number of workers needed per bale (181.44 kg) calculated in 20s count of cotton yarn.

in newly built cotton textile mills. Secondly, the continuous expansion of cotton textile exports supported by the government's export drive policy must have helped to raise labor productivity beyond the increase in employment. Consequently, Korean made the advantage of low wages available by keeping the increase in wage costs within certain limits despite the high wage increases shown in Table VIII. In this connection, Table XI may be useful in understanding the trends in wage cost per bale of cotton yarn.

There seem to be three factors behind the inter-country gaps in wage cost observed in Table XI and Figure 1, particularly the drastically widened gap between Korea and Japan after 1971. First, the increase in wages and labor productivity worked against Japan in wage cost change compared with Korea. Table XII and Figure 2 manifest these trends in wages, productivity, and wage cost taking 1965 as the base year.

Japan's cotton spinning industries have been more badly affected than Korea's by wage cost increase. Besides reasons given so far, the fact that wage levels in Japan have been far higher for many years than those in Korea should be taken into account, and this may have been a disadvantage for the international competitiveness of Japan's cotton spinning mills. For example, as of November 1976, the starting wage of a female high school graduate in the cotton spinning industry was ¥63,500 a month in Japan, and ¥11,294 in Korea.[1] Finally, the

[1] For Korea, refer to the 1976 Collective Agreement on Textile Workers and Wage Data issued by the Korean National Textile Labor Union, and for Japan the wage data pro-

TABLE XI

COMPARISON OF WAGE COST PER BALE IN JAPAN AND KOREA, 1965–76 (U.S.$)

Year	Japan (A)	Korea (B)	Difference (A)−(B)
1965	12.98	9.01	3.97
1966	13.27	8.96	4.31
1967	13.15	11.17	1.98
1968	15.20	14.06	1.14
1969	17.33	14.93	2.40
1970	19.70	13.54	6.16
1971	24.70	11.97	12.73
1972	27.52	11.16	16.36
1973	36.85	17.06	19.79
1974	44.85	21.73	23.12
1975	46.32	25.07	21.25
1976	44.65	28.46	16.19

Note: Wage cost is calculated by multiplying daily wage by numbers of workers needed per bale for each year. For conversion into U.S. dollar, same exchange rates were used as in Table VIII.

TABLE XII

INDICES OF NOMINAL WAGE, LABOR PRODUCTIVITY, AND WAGE COST IN COTTON SPINNING INDUSTRY, KOREA AND JAPAN, 1965–75

Year	Korea			Japan		
	Nominal Wage	Labor Productivity	Wage Cost	Nominal Wage	Labor Productivity	Wage Cost
1965	100.0	100.0	100.0	100.0	100.0	100.0
1966	118.9	102.6	115.8	107.0	104.9	102.0
1967	139.9	104.9	133.3	118.2	116.8	101.1
1968	176.9	99.5	177.7	140.7	120.8	116.4
1969	211.2	113.6	185.9	164.6	123.3	133.4
1970	237.8	127.8	186.0	193.0	127.8	151.0
1971	316.1	149.4	211.5	220.4	134.0	164.4
1972	341.1	160.4	212.6	251.5	143.4	175.3
1973	376.1	155.3	242.1	326.4	152.1	214.5
1974	406.1	146.9	276.4	401.8	142.3	282.3
1975	434.1	171.7	252.8	433.5	147.4	294.0

Sources: [4, 1976, 1st Half Term] [15] [16].

Notes: 1. Nominal wage is based monthly including regular or irregular allowances and bonuses.

2. Wage cost $= \frac{\text{Index of nominal wage}}{\text{Index of labor productivity}} \times 100.$

vided by Zensen Dōmei (Japan National Textile Worker's Union). In converting yen currency, 1¥=1.7 won was used, the exchange rate as of November 1976.

Fig. 1. Comparison of Wage Costs Differentials between Japan and Korea per Bale of 20s

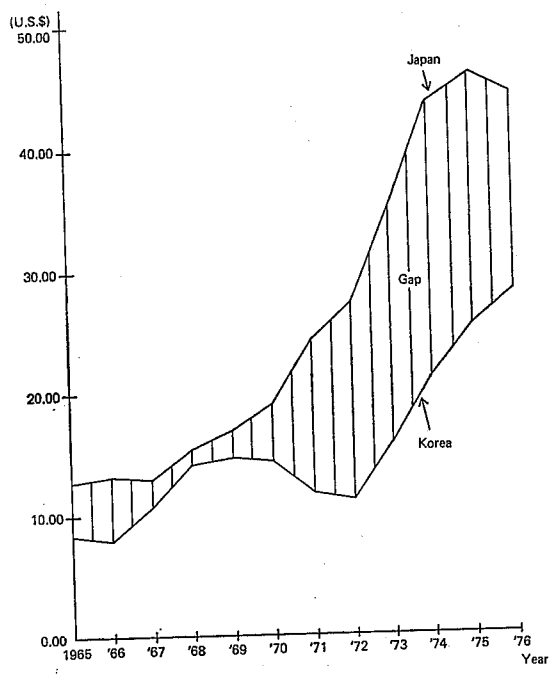
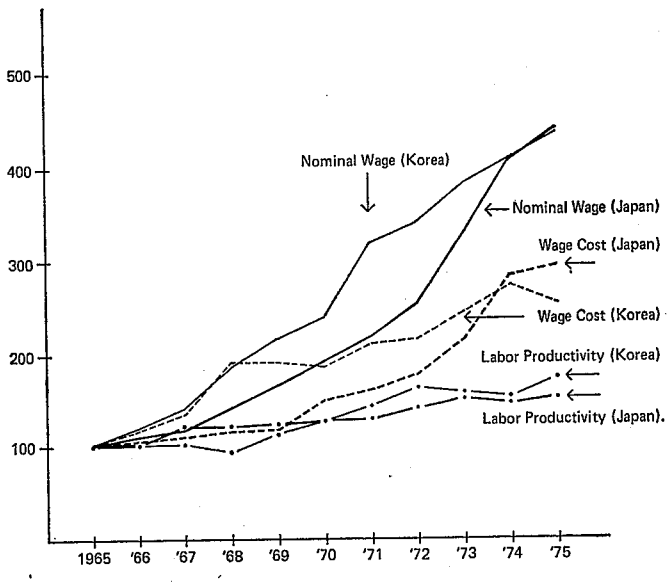


Fig. 2. Indices of Nominal Wage, Labor Productivity, and Wage Cost in Cotton Spinning Industries of Korea and Japan, 1965–75 (1965=100)



recent appreciation of the yen to the U.S. dollar must be counted as a serious factor pushing up Japanese wage costs, an unfavorable impacts upon her competitive strength in the world market. Under these circumstances as well, the gap in wage costs between Japan and Korea will widen.

In the 1920s and 1930s, Japan's cotton industry being able to catch up with England was achieved partially[2] through conspicuous improvement in labor productivity[3] even though the popular view at the time was that these increases were being achieved through social dumping. In the same way, the competitive position between Japanese and Korean cotton textiles has now been reversed. One may see some historical similarities between these two economic events, and it will be of interest to analyze its dissimilarities and similarities.

IV. CORRELATION BETWEEN WAGE COST AND EXPORT GROWTH

In the light of what has been said so far, no one could deny that there is some close relationship between increases in wage, labor productivity, and export. Using additional data presented in Appendix Tables I and II, a multiple regression analysis was conducted to test these correlations. Our hypothesis is that the difference in unit wage costs between the two countries largely determines the differentials in supply price and hence influences the amounts and rate of exports. More specifically, the logarithm of the ratio of Korean exports (XK= export of Korea) to Japan's (XJ=export of Japan) has been regressed on unit wage costs of these two countries ($UWCK$ and $UWCJ$ respectively). Giving the OLS estimates of coefficients with t-statistics in parentheses:

$$\ln\left(\frac{XK}{XJ}\right) = \underset{}{-4.035} \underset{(0.67)}{-0.034\ UWCK} \underset{(4.63)}{+0.112\ UWCJ}.$$

$$s = 0.496.$$

$$\bar{R}^2 = 0.871.$$

$$F = 38.09 \text{ (sample size 12).}$$

$$DW = 0.825.$$

It is clear that $UWCK$ and $UWCJ$, taken jointly, have a strong explanatory power over dependent variable, XK/XJ as indicated by the adjusted coefficient of determination ($\bar{R}^2$) or the F-statistic, although no adjustments were made to deal with autoregressive disturbances. However, separately, $UWCJ$ seems to exert much stronger influence over the relative export performances of the two countries than $UWCK$, the $UWCJ$ coefficient estimate, having the expected sign, is statistically significant. Computing a simpler equation, in which the difference between

[2] There are different opinions about what truly made Japan's cotton industry outstrip England's in the 1930s. However, it would be reasonable to suppose that improvement in labor productivity is one element which contributed to Japan's competitive ability, and in this sense the word "partially" is regarded as adequate.

[3] See [12, p. 26] for "Table-Hours of Work & Output per Worker in Principal Japanese Industries between 1922 and 1932."

UWCK and *UWCJ* is used as an explanatory variable:

$$\ln\left(\frac{XK}{XJ}\right) = \underset{(6.80)}{-3.254-0.151}\ (UWCK-UWCJ).$$

$$s=0.160.$$

$$\bar{R}^2=0.804.$$

$$F=46.25 \text{ (sample size 12).}$$

$$DW=0.857.$$

Thus, it appears that the effects of *UWCK* and *UWCJ* are likely to be asymmetric, but this could well be a statistical artifact due to specification error, for logically both should have similar parameters. So, in a certain sense further statistical research is required. In addition to this view, in order to obtain more interesting results Taiwan should be included in the analysis.

REFERENCES

1. ARITA, E. *Ajia no sen'i sangyō* [Textile industries in Asia] (Tokyo: Institute of Developing Economies, 1962).
2. Bank of Japan. *Shuyō kigyōkeiei bunseki* [Analyses of major business and management].
3. Bank of Korea. *Chaemu-bunsok* [Financial statements analysis].
4. *Bōseki jijō sankōsho* [Statistics on Japanese spinning industry].
5. HANABUSA, Y. "Kankoku menkigyō no yushutsu shinshutsu-katei to kigyō keiei" [Process of export development and business management in Korea's cotton spinning industry], in *Kankoku no kigyōkeiei* [Business management in the Republic of Korea], ed. M. Sumiya (Tokyo: Institute of Developing Economies, 1977).
6. HOFFMANN, W. G. *The Growth of Industrial Economies* (Manchester: Manchester University Press, 1958).
7. Japan, Ministry of Finance, comp. *Nihon bōeki geppyō* [Japan exports and imports], published by Japan Tariff Association.
8. Japan, Ministry of International Trade and Industry. *Nanajūnendai no sen'i sangyō* [Textile industry for 1970s] (Tokyo: Kompyūta-ēji-sha, 1974).
9. Korean Federation of Textile Organizations. *Somyu-kogop-tonggae* [Statistics of textile industry].
10. Korea, Republic of, Department of Customs Administration. *Muyok-tonggae-yonbo* [Statistical yearbook of foreign trade].
11. MATSUURA, S. *Nihon sen'i sangyō no hattenbunseki to tembō* [Development analysis and outlook of the Japanese textile industry] (Tokyo: Shiseidō, 1975).
12. MAURETTE, F. *Social Aspects of Industrial Development in Japan* (Geneva: ILO, 1934).
13. *Nihon bōseki geppō* [Monthly report of Japan Spinners' Association].
14. SEKI, K. *Nihon mengyōron* [The cotton industry of Japan] (Tokyo: Tokyo-daigaku-shuppankai, 1954).
15. Spinners and Weavers Association of Korea. *Taehan-bangch'ik-hyophae-samshinyonsa* [Thirty-year history of the Spinners and Weavers Association of Korea] (Seoul, 1977).
16. *Taehan-bangch'ik-hyophae worbo* [Monthly cotton textile].
17. Taiwan, Chinese Maritime Customs. *Trade of China, Taiwan.*
18. Taiwan, Council for Economic Planning and Development. *Industry of Free China.*
19. Taiwan, Directorate-general of Budget, Accounting and Statistics. *Monthly Bulletin of Labor Statistics, Republic of China.*

20. ————. *Statistical Yearbook of the Republic of China.*
21. United Nations. *Commodity Trade Statistics.*

APPENDIX TABLE I

EXCHANGE RATES

Taiwan (N.T. dollar per U.S.$)	1965–72	40.00
	1973–74	37.90
	1975–76	37.95
Korea (won per U.S.$)	1965	268
	1966	271
	1967	269
	1968	281
	1969	304
	1970	316
	1971	373
	1972	398
	1973	397
	1974	441
	1975–76	484
Japan (yen per U.S.$)	1965–70	360.00
	1971	350.74
	1972	302.00
	1973	280.00
	1974	300.95
	1975	305.15
	1976	293.00

APPENDIX TABLE II

EXPORT OF COTTON YARN, COTTON CLOTH, AND COTTON FABRICS BY KOREA AND JAPAN, 1965–76

(U.S.$ 1,000)

Year	Korea	Japan
1965	13,074	460,650
1966	15,693	456,158
1967	15,797	386,294
1968	16,667	391,055
1969	19,876	374,497
1970	32,180	325,916
1971	53,699	321,277
1972	83,654	355,235
1973	136,780	291,060
1974	172,287	335,309
1975	178,932	347,157
1976	319,188	463,180

Sources: For Korea, [9, 1977] [15]; for Japan, [4] [8].