POTENTIAL OF U.S. CONSTRUCTION MARKET FOR JAPANESE CONSTRUCTION FIRMS

by

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ABSTRACT

Comparative study of the U.S. and Japanese construction industries was carried out. First, the reasons why Japanese construction firms have not penetrated foreign construction markets although Japanese goods have been very successful recently were discussed. Then, the construction industry in both countries were compared thoroughly on the assumption that Japanese construction firms will enter the U.S. construction market. This comparison revealed facts which formed the basis of the discussion of how Japanese construction firms might enter the U.S. construction market.

Areas of special interest include characteristics and differences of the construction industries and firms in both countries, advantages and disadvantages of such characteristics and differences for Japanese construction firms in entering the U.S. construction market, barriers and incentives for Japanese construction firms, strategies and methods to be employed by Japanese construction firms, and implications of the involvement of Japanese firms for both the Japanese and U.S. construction industries.

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Table of Contents

Chapter 1

Introduction

1.1 Purpose and Scope

Until its upward climb was halted by the oil crisis of 1973, Japan's real gross national products (GNP) had been growing at an average annual rate of 10% since the early 1950s. Even though Japan's economy was damaged significantly and its forward momentum was weakened by this crisis, Japan eventually succeeded in pursuing its economic achievement. As a result, in the 1980s Japan, with a population only half as large as that of the United States, has been producing almost as much steel and as many automobiles as the latter, and innumerable Japanese products and goods have been flooding world markets.

Japan has also succeeded in penetrating the U.S. markets for automobiles, cameras, calculators, TV sets, video recorders, semiconductors, microchips, and many other products. Compared to the tremendous amount of export products, the export of services has been at quite a low level.

One typical example of such services is construction. Construction firms, especially general contractors, sell knowledge and skills for developing projects of buildings and facilities, rather than provide manufactured products. In comparison to $64 billion in commodity export to the U.S. in 1984, Japan's construction export to the U.S. amounted only $0.6 billion.

One of the goals of this thesis is to analyze the reason why Japan could penetrate the U.S. markets with its products and goods, but not with services, especially, construction. The study will be based on a historical analysis of Japan's entire industrial structure. This background will provide the perspective for the main goal of this study, an analysis of the fundamental conditions which have shaped Japan's construction industry.

Before clarifying the main goals of this study, it is useful to review briefly the position of the construction industry in Japan's economy.

Japan's domestic construction industry has been a cornerstone of its national economy. Growing along with the rapid expansion of its national economy, Japanese construction almost equalled the amount of new construction put in place in the U.S. in 1980. However, since the second oil shock in 1980, Japan's construction industry has fallen into the doldrums. The value of total construction has been decreasing even in nominal terms. For this reason, Japanese construction firms began to search quite seriously for markets in overseas.

Originally, Japan's major overseas construction arena was located mainly in South East Asia and the Middle East. However, the steep downturn in oil prices and demands forced OPEC countries to abandon many new projects. This caused an abrupt shrinkage in the Middle East construction market.

Furthermore, the shrinkage in the Middle East market also forced other international contractors into the South East Asian market, the traditional arena for Japanese contractors. This exacerbated competition in South East Asian countries.

Accordingly, Japanese firms had to find new markets in areas other than the Middle East and South East Asia. The United States, Australia, and China recently were perceived as promising markets by Japanese general contractors. The U.S. construction market was especially attractive because it is one of the world's largest and healthiest markets.

In 1984, the U.S. became the most important country in terms of the amount of construction contracts won by Japanese contractors, jumping up from the seventh place in 1982 and the fifth place in 1983. However, because of the relatively small amount of overseas construction performed by Japanese contractors compared to the amount of domestic construction performed in Japan, the value of the contracts won in the U.S. still remained below $700 million in 1984.

This study compares the U.S. and Japanese construction industries to determine the potential of the U.S. construction market as a possible main arena for Japanese general contractors through the end of this century.

In this context, some of the most important questions include: What are the characteristics of each country's construction industry? How do they differ? How would these characteristics and differences affect Japanese contractors entering the U.S. construction market? Would they be advantages or disadvantages for the Japanese contractors? What factors in the U.S. construction market would be either barriers or incentives? What would be available and not available there? All of these issues will be considered in light of the fundamental fact that up to the present, Japanese contractors have not penetrated the U.S. market.

1.2 Thesis Layout

In Chapter 2, the overall structure of Japan's industry will be discussed at the macro-level, in order to identify the underlying reasons why the Japanese construction industry, as well as other service industries, has not penetrated foreign markets, including the U.S. market so far. The fluctuations of industrial development in Japan will be reviewed historically in relation to Japanese government policies, patterns of growth, and industrialization. Also, in support of this analysis, historical changes in Japan's trade structure and in the financial structure of firms in each industry will be discussed. During this argument, not only will the underlying cause of why Japanese construction industry has not penetrated foreign markets be investigated but the position of the Japanese construction industry in Japan's entire industrial structure will also be identified.

In Chapter 3, the construction industries of the U.S. and Japan will be closely reviewed from a micro-economic point of view. Their compositions, markets and financial structures as well as cost structures will be examined in a comparative manner.

Next, other independent issues which may possibly become barriers or incentives to the entry of Japanese contractors into the U.S. construction market, such as the labor unions, bidding system, subcontract system, coverage of services, characteristics of management styles will be considered.

Finally, issues of technology and research and development will be reviewed. Because these issues are the keys to the future of the construction industry in both countries, a comparative analysis will be made of the construction industry and other industries as well as of the U.S. and Japanese construction industries.

On the basis of the foregoing findings, Chapter 4 will analyse the feasibility or conditions for feasibility for Japanese contractors to seek constructions market in the U.S.. Then, based on this analysis, some points of strategic planning for Japanese contractors to penetrate the U.S. construction market will be suggested.

First, general entry modes and strategies will be outlined, depending upon types and characteristics of industries and economic situations surrounding the industries.

Next, after summarizing the advantages and disadvantages of Japanese firms compared to their U.S. counterparts and also looking briefly at inroads made so far by Japanese firms in the U.S. construction industry, analysis will be made of the most reasonable and appropriate entry strategies and modes on a segment-by-segment base of the market. Then, recommendation will be made based on this analysis.

Chapter 5 will summarize the findings and conclusions, then consider the implications of Japanese involvement in the U.S. construction market from the points of view of both U.S. and Japanese construction industries. Finally, points for further study will be suggested.

1.3 Note of Caution

Because of the comparative nature of this thesis, it is very useful to state all values in one monetary term, e.g. in the U.S. dollar. However, it is quite difficult to translate Japanese Yen to U.S. Dollar due to the fluctuations in the Yen-Dollar exchange rate since it moved into the floating system in 1970.

In order to cope with this problem, the following measures were taken in this study rather than leaving Japan's various values in Yen terms;

1) Although there has been much controversy over what is the most appropriate rate in evaluating the value of Yen

against the U.S. Dollar, the rate of $1=Y220.54 was taken in this study. This rate was the average of the exchange rates in 1981 according to Economic Planning Agency of Japan and was used in Survey of Construction Statistics 1985 by the Ministry of Construction, Japan.

Furthermore, because this exchange rate is located nicely at the point of mean value in the historical time series of the Yen-Dollar exchange rates after 1970, it does translate value in Yen term to values in Dollar term precisely enough as a whole.

2) During the course of completing this thesis, there occurred a dramatic change in the Yen-Dollar exchange rate, that is, the appreciation of the value of Yen as well as other currencies against the U.S. dollar, triggered by the September 22, 1985 decision of the major industrialized countries to intervene in currency markets against the dollar. This measure was generally seen as a temporary measure to defuse protectionist sentiment. At present, with the continuing movements of appreciating Yen against Dollar, the rate is approaching $1=Y170 as of the end of March, 1986, a big movement, compared with $1=Y205 as of September 22, 1985.

However, because of uncertainty in the future movement of the exchange rate and the difficulty of deciding the truly appropriate exchange rate, this recent development will be neglected here. The aforementioned exchange rate of $1=Y220.54, that safely translates values, will be used.

CHAPTER 2

Japan's Industrial Structure Analysis

The purpose of this chapter is to analyze the position of the Japanese construction industry in Japan's industrial structure and, by doing so, to provide the basis for the main points to be made in the following chapters.

The first half of this chapter will be devoted to analyzing the reasons why the Japanese construction industry has not penetrated overseas markets while Japanese manufacturers have been successful in doing so. Answering this question will establish the characteristics of Japan's industrialization and explain the accompanying fluctuations of Japanese industries after World War II. Based on this information, the latter half of this chapter will provide clearer pictures of the changes in Japan's industrial structure, and to identify the position of construction industry in it.

2.1 Why Japanese General Contractors Have Not Penetrated Overseas Markets

One of the best ways to understand why Japanese general contractors have not penetrated overseas construction markets, including the U.S. construction market, is to review the history of Japan's industrial evolution since slightly before World War II from a macro-economic point of view.

It is necessary to go back so far first because the economic system which was created during the pre-war and wartime eras was directly transferred to the postwar economic system and wartime technology was reborn in the postwar industries.

Secondly, the Japanese government did recognize manufacturing industries as Japan's future leading industries through export immediately after World War II and this recognition determined the direction of Japan's industrial policies as well as the role of the construction industry as the supporter of manufacturing industries in Japan's domestic economy. That is, the government perceived that the market for the construction industry would be only in Japan. This perception was also common among Japanese people and firms. The fact that the construction industry has not been involved in the main stream of the government's industrialization policy was one of the reason why Japanese contractors have not penetrated overseas markets.

In addition to this, a couple of other explanatory factors may be considered. First, Japan experienced significant destruction of people's dwellings in the major cities and of the nation's infrastructure during World War II. To large extent, this determined the course taken by Japan's post-war construction industry, which was focused on immediate reconstruction of the nation. In addition, the size of the pie and growth in the size of that pie representing the domestic market was enough for Japanese contractors to prosper in the domestic market. Furthermore, the nature of Japanese contractors as building, civil, or building-civil contractors, not as plant constructors, restricted their capabilities in gaining overseas market because many overseas projects fell in plant construction.

Lastly, the delay in finding their way in overseas markets because of the aforementioned reasons made Japanese contractors fall behind other countries' contractors in forming the capacities needed for the overseas market, e.g. accumulating knowledge and experience, establishing a system of collecting information, fostering capable managers and management techniques, cooperating among contractors themselves and with subcontractors, financial institutions, and government organizations.

These factors combined to creat a situation in which Japanese general contractors did not quickly enter overseas markets, but stayed in the domestic market. Later when they desired to compete in the foreign markets, they had already fallen into the situation that precluded their involvement. In this chapter, these issues will be reviewed in detail.

2.1.1 Reason 1: Recognition that Manufacturing Industries were the Key Industries for Japan's Economic Recovery

Transfer of Bureaucratic Control to The Post-War Era

Japanese government's authority over the industries was established in wartime and continued into the post-war era, mainly under the control and guidance of MITI (Ministry of International Trade and Industry). Following the February 26 Incident of 1936 (1), there was no political power in the government strong enough to question or oppose the Army in Japan and the Army gradually increased its control over the entire economy by enacting several measures before taking complete control between 1940 and 1945.

In 1937, the Temporary Capital Adjustment Act and the Temporary Export-Import Commodity Measures were approved. The former law imposed controls on the establishments of firms, capital increases, payments, bond flotations and the borrowing of long-term funds in an effort to direct them on a priority basis into munitions industries. The latter enactment gave the government the authority to control the production, processing, trading, holding, and consumption of commodities and raw materials related to imports and exports.

Furthermore, in 1938, the National General Mobilization

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1. The coup d'etat attempted by a right-wing army group. In the course of suppressing this attempt, the army seized control of the government, then of Japan entirely.

Law was passed, ordering the conscription of labor, determining wages and other working conditions, and directing the production and distribution of goods.

The Army-controlled government had two major organizations to perform actual control over the entire economy. Controls over industries were performed by the Commerce and Industry Ministry (corresponds to MITI in the post-war period) and control over financial institutions weas performed by the Bank of Japan. These two institutions played remarkable roles in performing the industrialization of Japan.

Through legal means and through industrial and financial controls by bureaucratic organizations, the army-controlled government turned the industrial capacity of the entire nation towards military purposes though eventually defeated. Small Japan felt itself capable of fighting with the giant United States in a very short period. This wartime experience convinced the government that bureaucratic control of industry could effect the post-war reconstruction of Japan's entire economy.

Post-War Government's Recognition of Industries

Although light industries, such as spinning and textiles, supported Japan's economy in the 1930s, the foundation of Japan's heavy and chemical industries were established in the course of developing the munitions industries prior to and during World War II. Following the war, the government realized that Japan was so resource-poor that industrialization would be crucial and that the focus of the economy would have to be shifted away from the light industries to heavy and chemical industries.

However, because the large portion of the industrial facilities located in major cities were destroyed by air raids in 1944 and 1945, the post-war government's most urgent goal was to reconstruct them destroyed as quickly as possible while using the surviving facilities. The government recognized that the important task of reconstructing the nation's facilities would depend on the construction industry. Therefore, this government policy can be expressed as industrialization through manufacturing industries, with the support of the construction industry. This manufacturing-oriented policy remained the fundamental perspective throughout the postwar period regardless of what manufacturing industries were most important at any given time.

Government's Manufacturing-Oriented Policy

Until now, only manufacturing industries have been recognized as a driving force in Japan's economy. In addition, with the increasing importance of export-oriented industries, the fostering of manufacturing industries which sell commodities has been recognized as the government's main objective. The construction industry, which sells services, has never recognized as an exporting industry by the Japanese government or MITI.

Government's (MITI's) policies and structural changes in Japanese industry after World War II fall into the following four periods.

Phase 1 (1945-1954) was the period of reconstruction of Japan's economyusing the surviving industrial facilities. Simultaneously, MITI developed its manufacturing-oriented policies.

Phase 2 (1955-1964) was the period of initial rapid growth after post-war reconstruction. This was the period of widespread innovation, in which MITI encouraged the building of plants for raw material processing industries such as steel and chemicals, and basic industries to support them such as power supply, coal, and marine transportation.

Because these industries were fundamentally capital intensive, MITI's implementation of large-scale of capital investment used means such as 1) special tax measures, 2) low interest loans by quasi-governmental financial institutions (Japan Development Bank, Japan Export Import Bank), 3) import restrictions through duties and non-tariff barriers, 4) coordination of investment in plants and equipment, and 5) promotion of economies of scale and improvement of production efficiency through mergers and other combined production.

Phase 3 (1965-1973) was the period of composite structural changes. During the first half, machine industries (broadly defined to include transportation, electrical, and all other types of machinery and equipment) began to form the core of Japan's industrial structure. Foreseeing this movement, MITI implemented the Machinery Industry Promotion Provisional Measures and the Electronic Industry Promotion Provisional Measures. These two laws were issued in late 1950s and divided the basic machinery, common parts, and export machine industries. These industries were supplied with special funds by the Development Bank.

The second half of Phase 3 saw changes induced by efforts of the business world to solve environmental problems by relying on technological progress acheived by machine industries.

Phase 4 (1974-present) has been the period in which rapid progress is being made toward becoming a less energy-consuming, more high-tech-oriented society. This shift was prompted by the oil crisis and by significant advances in electronics and other high technologies. To support this change, MITI established the Special Electronics Industry and Special Machinery Industry Provisional Measures in 1971 and the Special Machinery Information Industries Promotion Provisional Measures in 1978.

All of these measures as well as various governmental means of promoting exports in Japan were intended to support Japan's economic advances and to construct comparative advantages over foreign competitors through the export of specific manufactured commodities at different times.

Although in this period service industries have been emerging as an equally important economic power since the late 1960s, this phenomenon will be detailed later in this Chapter.

2.1.2 Reason 2: Construction Industry as the Reconstructor of the National Economy, the Nation's Infrastructure and the People's Welfare

Japan experienced the destruction of residences and businesses, factories and facilities, and of its infrastructure, e.g. roads, railroads, power systems, port facilities. Rebuilding all of these was the immediate task of the construction industry.

However, Japanese government also perceived that the infrastructure in Japan originally was much poorer than that of other advanced countries. The next task, after reconstruction the destroyed facilities, was to rebuild nation's infrastructure.

These tasks directed by government policy inevitably determined the structure and function of the postwar construction industry to large extent. The volume of the tasks was so large that the construction industry grew at much higher rate than GNP for a long time. The construction industry did not need to look into overseas markets until Japan's economic growth was weakened following the oil crisis of 1973.

During these periods, the state of the Japanese economy shaped the construction industry in several ways. Following the turbulent reconstruction period immediately after World War II, Japan's economy experienced the so-called "Iwato Keiki" (Iwato Economic Boom) (1), a big economic advance between 1958 and 1961. During this time, a significant amount of technology was introduced from advanced countries into Japan. Large-scale investment in of plants and equipment were made. Figure 2.1 shows the steep upward curve of construction contracts for manufacturing industries around this period.

Although plant and equipment investment became dull for a while after 1962, due to a superfluity of industrial facilities, a large-scale public construction investment,

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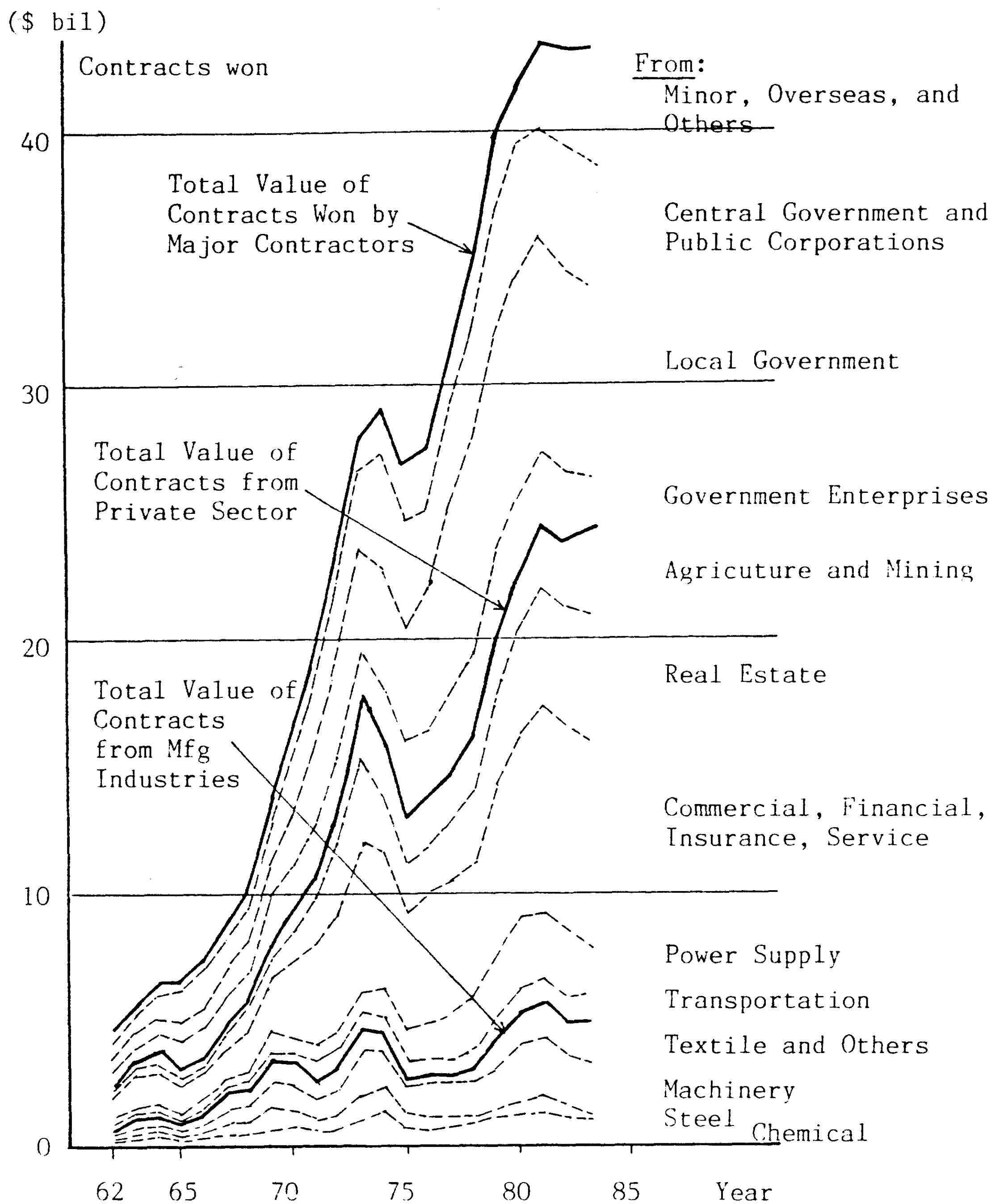
(1) This economic boom lasted from July 1958 to December 1961. The economic boom originated from plant and equipment investment. People called the period, "Steel calls steel", or "A boom calls a boom". The word "Iwato" came from the name of a god in Japanese ancient myth. The implication of "Iwato" was that the boom was larger than "Jimmu Keiki", prior economic boom of 1945-1957, named after the first emperor. (Source: 50)

(2) This policy, offered by the Ikeda Cabinet in early 1960s, was attempt to double people's income in ten years by maintaining an annual growth rate of GNP of 7.2% between 1961 and 1970. (Source: 50)

Figure 2.1: Contracts Won by 43 Major Japanese Contractors (by Type of Owners)



Note: Statistics are based on the major 43 contractors picked up by Ministry of Construction.
$1 = Y220.54 was used as the exchange rate.

Source: 48

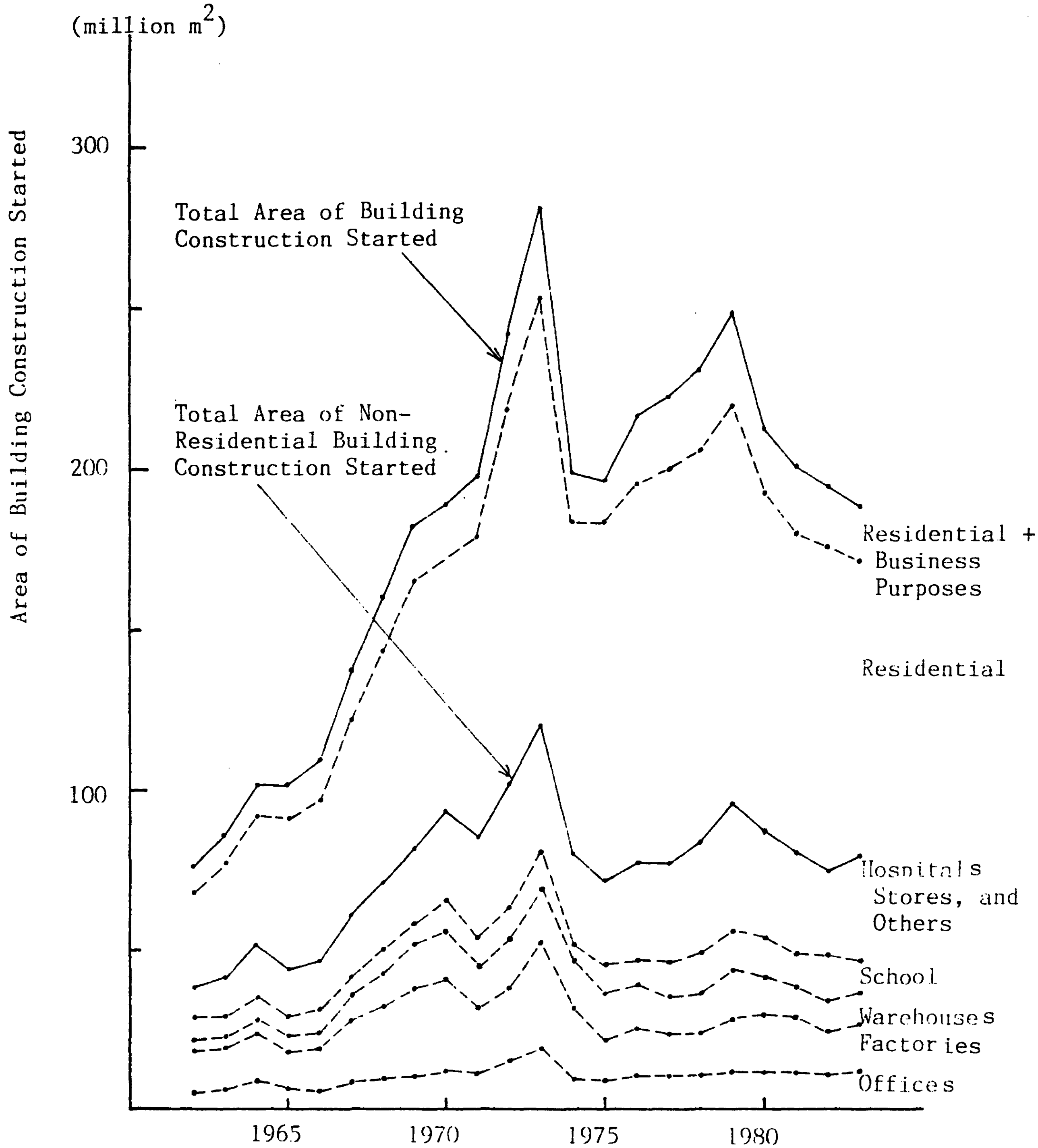
was made. In equipping facilities and infrastructure related to the Tokyo Olympics of 1964. Simultaneously, the "Income Doubling Plan" (2) stimulated the economy and as a result, considerable construction investment was made by non-manufaturing industries in the form of investment in offices, stores, and amusement facilities, and by private households. (See Figures 2.1 and 2.2)

During this period, construction investment from non-manufacturing industries had already surpassed that from manufacturing industries. For example, in 1964, the former investment was more than double the latter. Housing investment in 1965 was more than 50% about that in 1963 (See Figure 2.1).

In the period of recession around 1965, investment in housing and public investment works sustained the entire construction industry. The public investment was especially significant, accounting for 38% of the entire construction investment compared to 22% in 1963. (See Table 2.1 and 2.2)

The total amount of construction in 1973 was 4.2 times as large as the level of 1966. Instead of manufacturing industries, public and private sector investment activated the national economy and construction investment in this period facilitated by the government policy of "The Land Re-development Plan". Among the private sectors, steel, chemical, and automobile, and private households especially

Figure 2.2: Area of Building Construction Started (by Type of Buildings)



Source: 48

Table 2.1: Construction Investment in Japan, 1960-1983

($ billion)

Year	Total Const. Invest.	Public Const.	Priv. Const.	Civil Const.	Bldg Const.	House Const.	Non-House Const.
1960	11.37	3.92	7.45	4.38	6.99	3.20	3.79
1963	20.39	7.81	12.58	8.22	12.18	6.10	6.08
1964	24.83	8.76	16.06	8.73	16.09	7.60	8.49
1965	27.07	10.38	16.68	10.13	16.93	9.24	7.69
1966	30.75	11.81	18.94	11.93	18.83	10.70	8.13
1967	38.51	13.68	24.83	13.84	24.67	13.54	11.13
1968	46.21	16.00	30.21	16.41	29.80	16.30	13.50
1969	56.79	18.38	38.41	19.60	37.19	20.28	16.91
1970	66.36	22.26	44.10	22.29	44.06	23.70	20.36
1971	75.62	28.14	47.47	28.08	47.53	25.81	21.73
1972	97.32	34.50	62.82	36.26	61.06	34.00	27.06
1973	129.99	39.35	90.64	43.58	86.41	46.96	39.46
1974	133.28	47.38	85.90	49.96	83.32	47.12	36.20
1975	143.39	53.78	89.62	53.80	89.60	54.14	35.46
1976	155.06	55.38	99.68	57.25	97.81	59.75	38.06
1977	175.93	68.25	107.68	71.05	104.87	63.48	41.39
1978	193.55	79.72	113.83	79.30	114.25	67.53	46.72
1979	217.29	85.16	132.13	85.79	131.50	74.67	56.83
1980	224.34	88.95	135.39	91.85	132.49	72.63	59.86
1981	227.71	92.01	137.70	96.31	131.41	71.22	60.19
1982	227.03	91.94	135.08	97.38	129.65	72.98	56.67
1983	217.56	88.65	128.91	93.00	124.56	67.02	57.54

Source: 48

Table 2.2: Construction Investment in Japan, 1960-1983
(Percentages of Components)

(Percent)

Year	Total Const. Invest.	Public Const.	Priv. Const.	Civil Const.	Bldg. Const.	House Const.	Non-House Const.
1960	100.0	34.5	65.5	38.6	61.4	28.2	33.3
1963	100.0	38.3	61.7	40.3	59.7	29.9	29.8
1964	100.0	35.3	64.7	35.2	64.8	30.6	34.2
1965	100.0	38.4	61.6	37.4	62.6	34.1	28.4
1966	100.0	38.4	61.6	38.8	61.2	34.8	26.4
1967	100.0	35.5	64.5	35.9	64.1	35.2	28.9
1968	100.0	34.6	65.4	35.5	64.5	35.3	29.2
1969	100.0	32.4	67.6	34.5	65.5	35.7	29.8
1970	100.0	33.5	66.5	33.6	66.4	35.7	30.7
1971	100.0	37.2	62.8	37.1	62.9	34.1	28.7
1972	100.0	35.4	64.6	37.3	62.7	34.9	27.8
1973	100.0	30.3	69.7	33.5	66.5	36.1	30.4
1974	100.0	35.6	64.4	37.5	62.5	35.4	27.2
1975	100.0	37.5	62.5	37.5	62.5	37.8	24.7
1976	100.0	35.7	64.3	36.9	63.1	38.5	24.5
1977	100.0	38.8	61.2	40.4	59.6	36.1	23.5
1978	100.0	41.2	58.8	41.0	59.0	34.9	24.1
1979	100.0	39.2	60.8	39.5	60.5	34.4	26.2
1980	100.0	39.7	60.3	40.9	59.1	32.4	26.7
1981	100.0	40.4	59.6	42.3	57.7	31.3	26.4
1982	100.0	40.5	59.5	42.9	57.1	32.1	25.0
1983	100.0	40.7	59.3	42.7	57.3	30.8	26.4

Source: 48

Table 2.3: Construction Investment, Gross National Expenditure, and Private Consumption Expenditure in Japan

Year	(Value, $ billion) CI	GNE	PCE	(Growth Rate, percent) CI	GNE	PCE
1960	11.37	-----	40.01	-----	-----	-----
1961	-----	-----	45.82	-----	-----	14.54
1962	-----	-----	53.26	-----	-----	16.24
1963	20.40	-----	62.43	-----	-----	17.21
1964	24.83	-----	72.67	21.72	-----	31.49
1965	27.07	152.55	82.09	9.02	-----	13.70
1966	30.75	179.33	93.34	13.62	17.56	14.42
1967	38.51	209.88	106.81	25.23	17.04	15.89
1968	46.21	248.68	123.77	20.00	18.48	14.74
1969	56.79	294.83	142.02	22.89	18.56	15.88
1970	66.36	320.61	164.56	16.84	8.75	13.61
1971	75.62	359.44	186.96	13.96	12.11	14.50
1972	97.32	411.04	214.06	28.70	14.53	14.50
1973	129.99	503.72	257.22	33.56	22.55	20.16
1974	133.28	600.17	317.29	2.54	19.51	23.35
1975	143.39	660.44	374.02	7.59	10.04	17.88
1976	155.06	745.53	423.73	8.14	12.88	13.29
1977	175.93	835.98	479.68	13.46	12.13	13.21
1978	193.55	918.14	525.57	10.02	9.95	9.57
1979	217.29	992.54	576.16	12.27	7.98	9.62
1980	224.34	1,069.35	623.28	3.24	7.74	8.18
1981	227.71	1,142.15	658.03	1.51	6.85	5.58
1982	227.08	1,200.99	705.13	-0.30	5.11	7.16
1983	217.56	1,247.98	740.65	-4.17	3.91	5.04

Note: CI indicates "Construction Investment".
GNE indicates "Gross National Expenditure".
PCE indicates "Personal Consumption Expenditure".

Source: 58

provided large scale investments in construction at this time. In one year, from 1972 to 1973, the growth rate in construction investment rose from 28.7% to 33.5% (See Table 2.3).

As a result, between 1960 and 1973, construction investment grew at an extremely high rate, 20% annually, compared with average annual rate of Japan's national expenditure of 15.9% and average annual rate of personal consumption expenditure of 15.1% (Table 2.3).

Until the oil crisis of 1973, the construction industry had, in the domestic construction market, more than enough jobs from different sectors as the economy developed. During these years, it was not necessary for general contractors in Japan to look into overseas markets at all. For this period, the volume of overseas construction was only $0.3 billion, less than 0.25% of the total domestic construction (See Table 2.4).

However, the oil crisis which occurred in November, 1973 and the subsequent government policy of controlling total demand had considerable effects on the construction industry.

At this point several energy-related factors sumultaneously came to bear on the construction industry: (1) stagnation in private-sector construction investment because of unforeseeable future, (2) a conspicuous cut in public sector construction investment, (3) significant rise in the cost of construction materials, (4) the subsequent

Table 2.4: Domestic Construction vs. Overseas Construction in Japan

	Total Overseas Construction ($ billion)	Total Overseas Construction as Percentage of Domestic Construction (%)	Total Domestic Construction ($ billion)
1973	0.33	0.25	129.99
1974	0.55	0.41	133.28
1975	1.51	1.05	143.39
1976	2.47	1.5	155.06
1977	1.87	1.06	175.93
1978	2.70	1.39	193.55
1979	2.84	1.31	217.29
1980	2.46	1.10	224.34
1981	3.97	1.73	227.71
1982	4.21	1.85	227.03
1983	4.78	2.20	217.56
1984	4.59		------

Note: $1 = Y220.54 was used as the exchange rate.
Total domestic construction does not include overseas construction.

Source: 47, 49

construction cost increase, and (5) tight control of the money market by the government. As a result, construction investment, both private and public, decreased in 1974 for the first time since World War II (See Figure 2.1 and 2.2).

Although the government offered a relatively large volume of projects in 1978 and 1979 in an effort to stimulate the economy, the upward trend was stopped again by the second oil shock in 1980.

After 1980, both public and private sector investment have slowly been on a downward trend. The structure of Japan's industry itself has changed since the oil shock. The key industries, such as steel, chemicals, petrochemicals, shipbuilding and other capital intensive industries which made large investments in the early 1960s and early 1970s became typical "structural depression" industries (Figure 2.1). Manufacturing industries which were still flourishing in this period were high-tech oriented and less capital intensive industries. They did not invest in construction as extensively as the key industries.

Furthermore, these industries began to make direct investments in foreign countries to maintain cost advantages and to cope with the protectionist measures of foreign government. Moreover, the entire economy of Japan has been shifting toward a more service-oriented society from which a large scale of capital investment may not be expected. The budget of the Japanese government has been very tight since the second oil shock. Also, the building of private residences was interfered by the hike in construction and land costs. The pie seems finally to have stopped growing. All of these factors have been constricting the domestic construction market day by day. Its prospects at te moment were dim. This situation has forced Japanese general contractors to seriously consider overseas markets. Foreign contracts have been increasing since 1974, and increased significantly after 1980 (Table 2.4). However, due to various obstacles to be mentioned in the next section, the amount of overseas contracts remains only 2% of domestic construction. Nevertheless, top management in Japanese contractors are aggressively looking at the world map and trying to determine the best possible overseas arena.

2.1.3 Reason 3: Characteristics of Japanese General Contractors

Although the characteristics of Japanese contractors will be reviewed in detail in Chapter 3, one of their unique features has a direct bearing on why they have not penetrated overseas markets.

In the Japanese construction industry, there has been a clear separation between the building of plant and industrial facilities and the main stream of Japanese construction. Construction in Japan traditionally has included only building construction and civil or heavy construction. Construction of plants or industrial facilities were performed by firms other than so-called construction firms. For example, oil refinery plants have been designed and constructed by engineer/constructors which originally were oil refinery firms. Similarly, chemical plants were designed and constructed by firms which were originally chemical firms, and offshore plants by shipbuilding firms and heavy machinery firms. Furthermore, due to the change in Japan's industrial structure, heavy electric and communication firms moved into the plant construction market as did the machinery and plant departments of general trading firms. General contractors in Japan have constructed only the building or heavy construction parts of plants. For example, in power plant projects, Japanese contractors have constructed only the containment facilities which surround the main power generating facilities. They have not been involved in the mechanical engineering parts of the power plants.

In contrast, the top international contractors from other countries have developed expertise in the design, heavy and building construction and are also able to provide installation, start-up, and operation services for various plant facilities.

Unfortunately for Japanese contractors, foreign construction projects often have been most available in developing countries. Because these countries have been trying to industrialize, most of their projects have fallen into the area of industrial facilities construction. Typical examples include the numerous oil-related industrial facilities constructed in the Middle East in 1970s.

Japanese contractors have tried to remedy their weakness in plant engineering and construction by forming consortia with Japanese plant construction firms originating from heavy industry, but the result has been disastrous. They lost many opportunities in the overseas markets and acquired very few projects, compared to major international contractors from other countries.

2.1.4 Reason 4: Other Difficulties for Japanese Contractors in Entering into Overseas Markets

Because of the reasons stated in the previous three sections, Japanese contractors delayed entering overseas construction markets. The delay caused secondary problems compounding the difficulty of competition in that area:

1) Lack of experience delayed the accumulation of information and left Japanese contractors out of the network in overseas countries. Therefore, Japanese contractors accrued higher costs for investigation before submitting bids than did other international contractors.

2) The delay left Japanese contractors and financial institutions unprepared to cope with bonds. In international bids, several bonds are required, such as bid

bonds, performance bonds, advance payment bonds, and retention bonds, all of which are not common in the Japanese economic world. Because the total amount guaranteed sometimes reach 30 to 40% of the bid price, it is sometimes difficult for a contractor working alone to be given bonds from financial institutions. The Japanese government, financial institutions, and contractors have logged behind other advanced countries in cooperating to cope with this problem.

3) Similarly, the delay left contractors and financial institutions unprepared for the financial arrangements which are sometimes required in the bids submitted to developing countries.

4) The delay led Japanese contractors to neglect to foster management techniques or to develop personnel with the management cability for overseas construction. In addition to this, the genuine potential of Japanese engineers has been handicapped by their weakness in using English.

5) Usually, consultants play an important role in overseas markets. After finding a project, they may perform a feasibility study on it, develop a detailed evaluation for financing, then help clients to prepare a bid. In the U.S., engineer/constructors have played this role as well as performing the construction itself. As will be mentioned in Chapter 3, the power of consultants in Japan is generally very weak. Only a few are capable of working internationally. Furthermore, since Japanese

contractors are not closely allied to engineering, they are not able to function as U.S. engineer/constructors did.

Together, the above mentioned factors (2.1.1 through 2.1.4) reveal were mixed why Japanese contractors have not penetrated overseas markets.

2.2 Ups and Downs of Industries and Position of the Construction Industry

In the preceding section, the relationship between the evolution of manufacturing industries and the construction industry was discussed for the purpose of illuminating why Japanese general contractors have not penetrated overseas markets. In this section, fluctuations in the importance of Japanese industries will be reviewed to clarify the position of the construction industry at present in Japan's industrial structure as a whole. Positioning the construction industry in Japan's entire industrial structure is extremely important, because it will show the underlying potential of the construction industry and will provide a foundation for the discussion following this chapter.

In this discussion, changes not only in the structure of Japan's industrial outputs but also in the trade structure will be reviewed.

2.2.1 Ups and Downs of The Industries

World War II

Table 2.5, 2.6 and 2.7 show Japan's national efforts in military and other industrial production from the beginning of the war in 1941 to its conclusion in 1945. Table 2.5 describes the targets for the expansion of industrial capacity enacted in the late 1930s by the military-controlled government. Table 2.6 and 2.7 demonstrate the actual industrial production performed during the war.

Steel production peaked in 1943 and then began to decline. (See Table 2.7) Production of consumption goods, such as textiles, food products, and paper (including pulp) had already fallen to 60% of pre-war levels by the time Japan entered World War II; their subsequent decline was striking. Even agricultural production broke down in 1944. The war was begun and pursued at the expense of the people and national economy, and finally led to their destruction.

However, World War II left Japan with the important foundation for rapid post-war industrialization.
Table 2.8 presents data on production capacity, comparing plant and equipment capacities in 1937 with the capacities at the time of defeat. The chemical and heavy industries had far more plant and equipment capacity at the end than at the beginning of the war. The conspicuous reductions in light industry capacity, particularly textile, were due more

Table 2.5: Industrial Capacity Expansion Targets of The 1937 Five-Year Plan for Industries in Japan

	Production Target	Capacity in 1937	Rate of Expansion
Automobiles (1,000)	100	37	2.7
Machine Tools (1,000)	50	13	3.8
Steel Products (1,000 tons)	1,300	485	2.7
Oil (10,000 kl)	565	36.4	15.6
Coal (10,000 tons)	11,000	5,556	2.0
Aluminum (1,000 tons)	100	21	4.8
Magnesium (1,000 tons)	9	0.5	18.0
Electric Power (10,000 kw)	1,257	721	1.7
Shipping (10,000 tons)	93	50	1.9

Source: 50

Table 2.6: Military Production in Japan in World War II

Year	1941	1942	1943	1944	1945
Aircraft	6,174	10,185	20,185	26,507	5,823
Aircraft Engines	13,022	18,498	35,368	40,274	6,509
Naval Vessels					
# of Ships	48	59	77	248	101
Tonnage	200,860	230,724	145,760	408,118	98,240
Small Arms (thousand)	729	440	630	827	207
Gunpower & Ammunition	52,342	67,461	71,574	81,324	21,279
Index of Real Growth (1937=100)	474	659	923	1,406	447

Source: 50

Table 2.7: Production Index in Japan between 1941 and 1945

(1937=100)

Year	1941	1942	1943	1944	1945
Agriculture & Forestry	95.1	99.8	96.3	76.2	59.3
Rice	83.0	100.6	94.8	88.2	59.0
Mining	120.0	117.4	118.5	107.8	56.9
Manufacturing	123.1	119.6	121.0	124.2	52.7
Steel	132.0	139.5	156.1	145.8	51.8
Non-Ferrous Metals	111.4	126.1	153.2	170.2	63.2
Machinery	188.2	195.4	214.3	252.3	107.2
Chemicals	120.3	100.3	87.1	80.8	33.2
Paper & Pulp	106.3	83.6	71.5	41.4	19.5
Textiles	60.4	47.7	31.3	16.6	6.4
Food Products	78.1	69.4	57.5	47.4	31.6
Other	60.8	59.2	52.1	31.3	11.3

Source: 50

Table 2.8: Production Plant Capacity for Key Materials in Japan before and after World War II

Production Plants	Units	Production Plant Capacity in 1937	Maximum Wartime Production Capacity	Production Plant Capacity at End of War
(Mining)				
Pig Iron	100 tons	3,000	6,600	5,600
Rolled Steel	100 tons	6,500	8,700	7,700
Copper	100 tons	1,200	1,440	1,050
Aluminum	100 tons	170	1,270	1,290
(Chemical)				
Oil Refinery	100 kl	2,320	4,157	2,130
Machine Tool	unit	22,000	60,134	54,000
Sulphuric Acid	100 tons	4,373	6,271	5,586
Caustic soda	100 tons	380	723	661
Soda Ash	100 tons	600	889	835
Ammo. Sulphate	100 tons	1,460	1,979	1,243
Super Phosphate	100 tons	2,980	2,846	1,721
Cement	100 tons	12,894	9,621	6,109
(Textile)				
Cotton yarn	100 spdl	12,165	13,796	2,367
Rayon	100 lb	570,000	570,000	88,600
Staple Fibers	100 lb	451,000	813,000	184,000
Cotton Looms	units	362,604	393,291	113,752
(Other)				
Paper Pulp	1000 tons	---	1,329	705

Source: 50

to the wartime conversion to military production and scrapping of equipment than to war damages. (Source: 50) This shift in emphasis formed the basis for the heavy and chemical industrialization following the war.

The training of engineers and workers who acquired a mastery of their technologies in these factories also directly prepared Japan for post-war development. Factories that made machine guns turned to making sewing machines; optical weapons factories began turning out cameras and binoculars. (Source: 50) In this way, the facilities, technology, and labor accumulated during the war exerted a tremendous influence on the subsequent direction of Japan's economy.

Post-World War II and the Korean War

In May 1948, the Five-Year Economic Rehabilitation Plan was drawn up by the Japanese government, aimed at economic recovery as well as industrialization policy. Though the plan was implemented to some extent for a couple of years, the achievement was insufficient to catch up with the advanced countries. A huge trade deficit limited the capacity for introducing the advanced technologies from advanced countries and of importing resources needed in industries (Source: 50).

The advent of the Korean War in 1950, led to the solution of these problems in a mere two years. This dramitic turn-around confirmed the validity of Japanese government policy and virtually determined the direction of its subsequent policies.

The effects of the Korean were:

1) The increase in world trade by Japanese industry to $19 billion, 34% of the entire amount of world trade at that time, created a growth rate of 270% during this period. (See Table 2.9)

2) During the course of this growth in exports, Japan's production increased by 70%. This increase in production was accompanied by a remarkable rise in corporate rates of return, mainly due to rising prices. The increase in production and corporate profit promoted a vigorous expansion in plant and equipment investment.

3) Most important, the huge foreign exchange income deriving from expenditures by the U.S. Army and military personnel, called the special procurement, amounted to $590 million in 1951 and $800 million in both 1952 and 1953 (Table 2.9). The combination of export and special procurement income enabled Japan to import at the rate of $2 billion a year. Key industries which depended on imports of raw materials were able to virturally double their scales of production.

Although the Korean War had an invigorating effect on plant and equipment investment and technological innovation, mainly in heavy industries serving military procurement, the Japanese government realized that inadequate capacity in basic industries, e.g. electric power, steel, marine

Table 2.9: Economic Indicators in Japan During and After Korean War

Year	1949	1950	1951	1952	1953	1954	1955	1956
Export ($million)	510	820	1,355	1,273	1,275	1,629	2,011	2,501
Special Procurement Income		592		824	809	597	557	595
Import ($million)	905	975	1,995	2,028	2,410	2,399	2,471	3,230
Mining & Mfg Production Index	18.2	22.4	30.8	33.0	40.3	43.7	47.0	57.5
Rate of Return on Gross Capital Employed	5.1	6.7	4.2	4.6	2.4	3.6	3.6	4.5
Wholesale Price Index	59.3	70.1	97.3	99.2	99.9	99.2	97.4	101.7
Consumer Price Index	72.6	67.6	78.7	82.6	88.0	93.7	92.7	93.0

Source: 50, 53, 60

transportation, and coal, was the bottleneck that limited the expansion of production. Therefore, economic reconstruction was pushed primarily in these four key industries (See Table 2.10).

With government encouragement, these four industries flourished during this period. They also increased their capacities significantly following this period. The construction industry enjoyed the considerable capital investment of these industries.

Periods of Growth and after the Oil Crisis

Figure 2.3 shows the clear changes in domestic industrial production outputs in Japan from 1955 through 1983. As mentioned briefly above, the years 1955 - 1964 covered the period of initial rapid growth since World War II. In the 1960s especially, industrialization in capital-intensive industries, such as heavy and chemical industries, was accomplished through massive technology import and energetic private sector investment in plants and equipment.

Outputs from these industries represent significant portions of total output in this period. The combined shares of the chemical and steel industries reached 21% of Gross Domestic Products (GDP) in 1960, up from 17% in 1955 while the share of the textile industry decreased from 11.7% in 1955 to 8.1% in 1960.

Table 2.10: Plant and Equipment Investment in Japan After Korean War

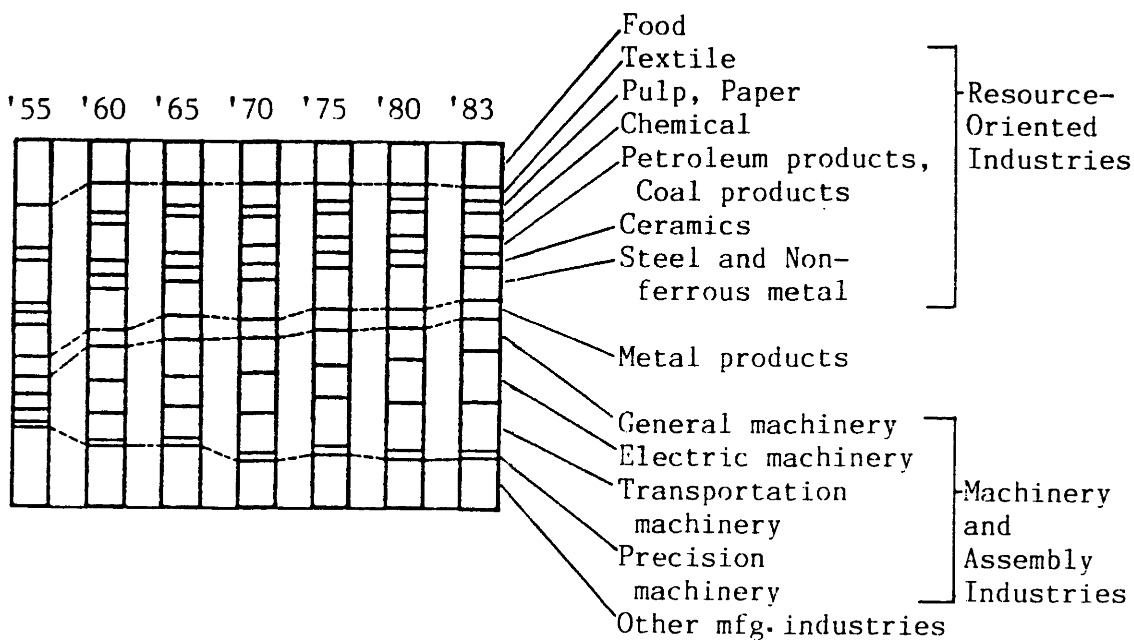
(Percent)

	1951	1952	1953	1954	1955	1956	1957	1958
Steel	8.4	7.7	6.4	4.8	4.5	6.1	8.8	9.4
Marine Transport	14.6	12.4	7.5	5.9	6.5	7.2	7.7	5.8
Electric Power	12.6	21.3	23.7	26.8	24.8	19.6	19.2	22.7
Coal	4.8	4.1	3.3	2.6	2.4	1.3	2.4	2.5
Total for 4 Key Industries	40.4	45.5	40.9	40.1	38.2	34.2	38.1	40.4

Note: $1=Y360 was used as an exchange rate.
The figures indicate plant and equipment investment in the key industries as percentages of total plant and equipment investment in Japan.

Source: 50

Figure 2.3: Change in The Structure of Manufacturing Industries in Japan



Note: Shares of industries indicate percentages of each industry's outputs in Japan's GDP(Gross Domestic Products).

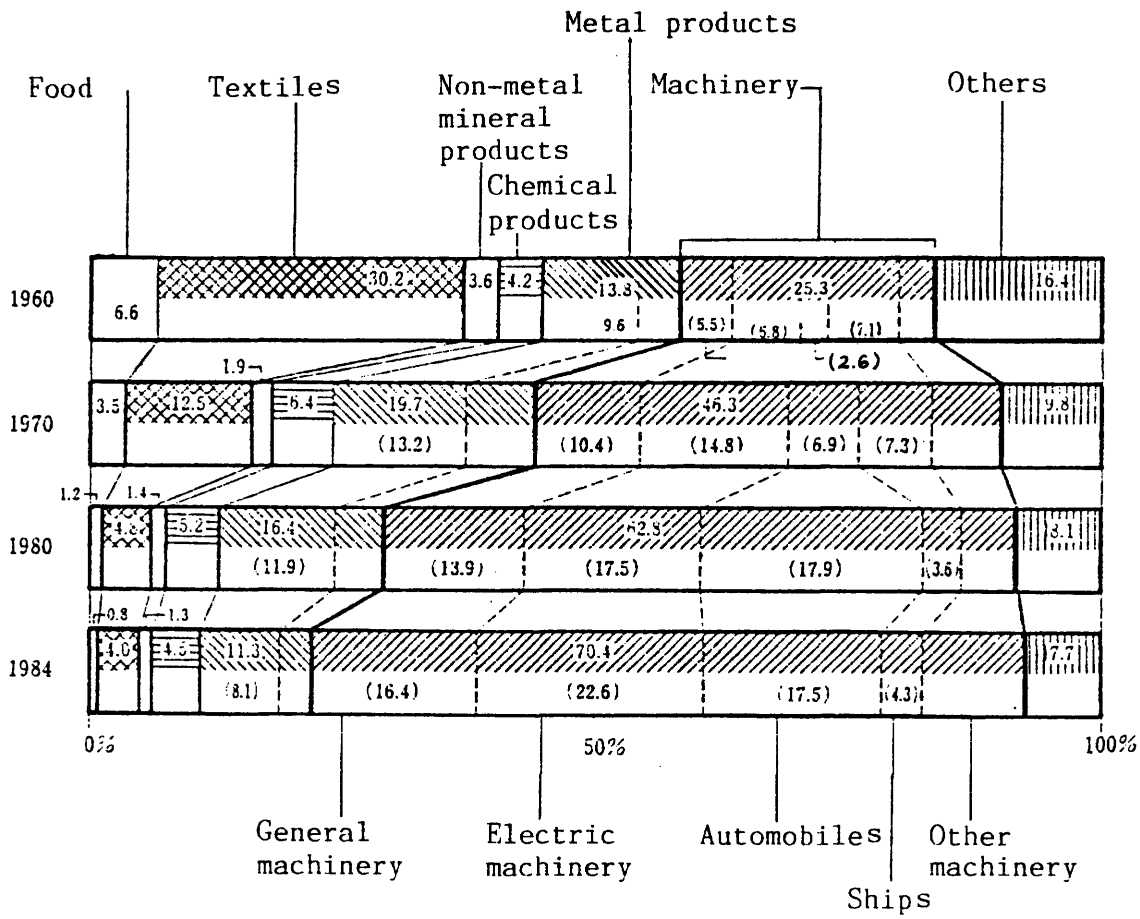
Source: 46

However, in the 1970s, because of the oil crisis and the rapid growth of newly industrialized countries, the resource-oriented capital intensive industries lost their competitive cost advantage and declined in importance to Japan's economy. Increasing in importance were machine and assembly industries such as the electrical machinery and automobile industries. These were technology-oriented industries. Figure 2.3 shows the dramatic increase in the shares of these industries and the considerable decrease in resource-oriented industries. Machine and assembly industries, which accounted for only 14% of GDP in 1955, jumped to 43% in 1983 while resource-oriented industries, which accounted for 42% in 1955, sharply dropped to 31% in 28 years.

2.2.2 Changes in Japan's Export Structure

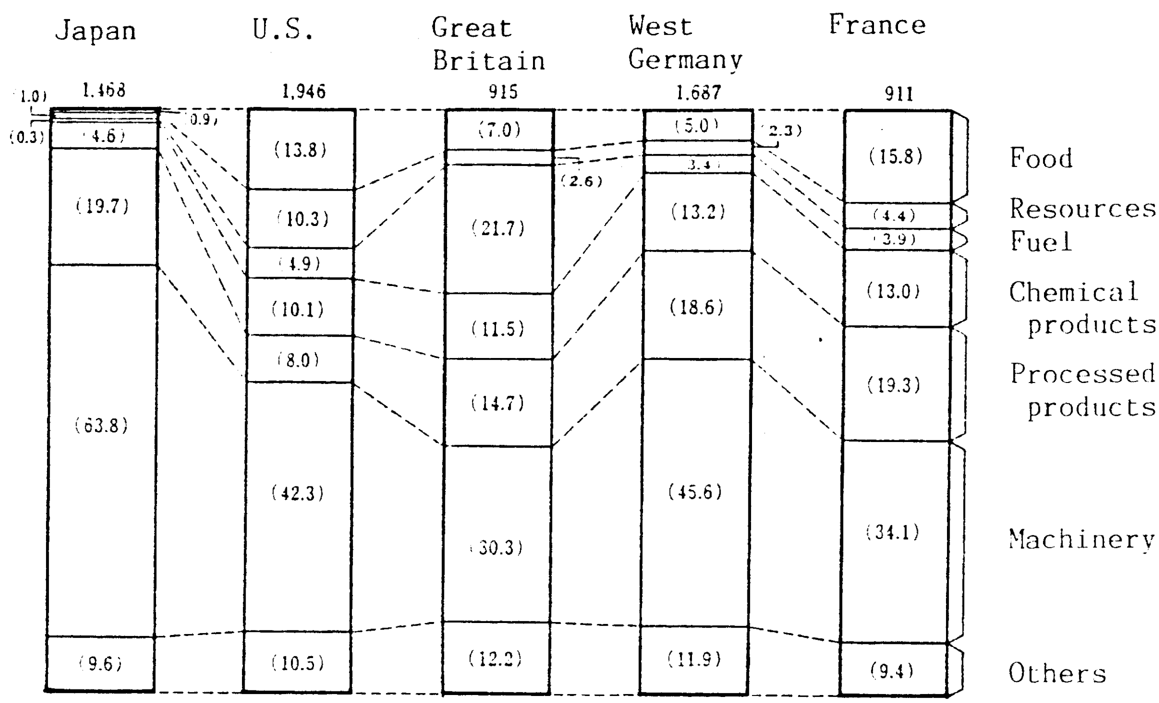
These changes reflect the history of Japan's export structure (See Figure 2.4) and the export structures of advanced countries (Figure 2.5). In the composition of exports in 1960, textiles accounted for a significant portion, 30.2%; chemicals and metals (mainly steel) 18%; and machinery 25.3%. In 1970, textile exports shrank to 12.5% of the total, chemicals and metals increased to 26.1%, and machinery almost doubled to 46.3%. In 1980, textile further diminished to 4.8%, chemicals and metals declined to 21.6%, and machinery grew to 62.8% from 40% in 1970. In

Figure 2.4 : Change in Japan's Export Structure



Source: 46

Figure 2.5: Export Structures of Advanced Countries (1983)



Note: Numbers in parentheses are expressed in percentage. Numbers below the country names indicate export values in \$100 million.

Source: 46

1984, Japan's total export reached the record-high of $170 billion, with the machinery industries accounting for 70.4%, or $119.8 billion. In the machinery industries, electrical machinery accounted for 22.6% of total exports. Automobile exports ranked 17.5%, and general machinery 16.4%. Metals dropped to 11.8% from 16.4% in 1980; chemicals also dropped to 4.5% from 5.2% in 1980, and textiles accounted for only 4.0% in 1984, only 1/13 of its share of 1960.

Table 2.11 shows the top 10 export commodities since 1960. In 1960, steel was ranked No.1, accounting for 9.6% of total exports and ships were No.3, accounting for 7.1%. Cotton textile stayed at No.2, and apparel at No.4. Seven places out of the top 10 were shared by commodities from light industries while two places were held by heavy industries and one place by an assembly industry.

The top 10 commodities changed remarkably in 24 years, reflecting the change in Japan's industrial structure. In 1984, automobiles (passenger cars) were ranked at No.1, accounting for 12.9%, trucks, motorcycles, and car parts were ranked at No.6, 8, and 9 respectively.

Furthermore, electronic commodities, such as video tape recorders, semi-conductors, office machinery, and radios were ranked at No.4, 5, 7, and 10. Figure 2.5 describes the outstanding shares of "Machine Industries" which include all of these commodities. Steel and ships still stayed at No.2 and 3 respectively in 1984 because Japanese

Table 2.11: Top 10 Export Commodities of Japan

	(1960) Commodity	($ mil)	(%)	(1970) Commodity	($ mil)	(%)
1.	Steel	388	9.6	Steel	2,844	14.7
2.	Cotton Textiles	351	8.7	Ship	1,410	7.3
3.	Ship	288	7.1	Automobile(1)	1,337	6.9
4.	Apparel	214	5.3	Radio	695	3.6
5.	Automobile	106	2.6	Synthetic Fiber	626	3.2
6.	Toy	90	2.2	Apparel	462	2.4
7.	Shoes	72	1.8	Tape Recorder(2)	451	2.3
8.	Pottery	68	1.7	Plastic	427	2.2
9.	Laminate	63	1.5	TV	384	2.0
10.	Canned Food	58	1.4	Motorcycle	384	2.0
	(1980)			(1984)		
1.	Automobile	16,115	12.4	Automobile	21,900	12.9
2.	Steel	15,454	11.9	Steel	13,852	8.1
3.	Ship	4,682	3.6	Ship	7,353	4.3
4.	Truck	3,916	3.0	VTR	6,819	4.0
5.	Tape Recorder(3)	3,305	2.5	Semi-conductor	5,816	3.4
6.	Radio	3,009	2.3	Truck	5,526	3.2
7.	Motorcycle	2,802	2.2	Micro-processor	4,566	2.7
8.	Prime mover	2,548	2.0	Parts of cars	4,513	2.7
9.	Chassis	2,373	1.8	Prime mover	3,835	2.3
10.	Semi-conductor	2,307	1.8	Radio	2.820	1.7

Note: The figures indicate value of Japanese commodities exported and their percentages to the total value of export.
(1) Parts are excluded.
(2) VTRs are excluded.
(3) VTRs are included.

Source: 46

technology for these products is the most advanced in the world.

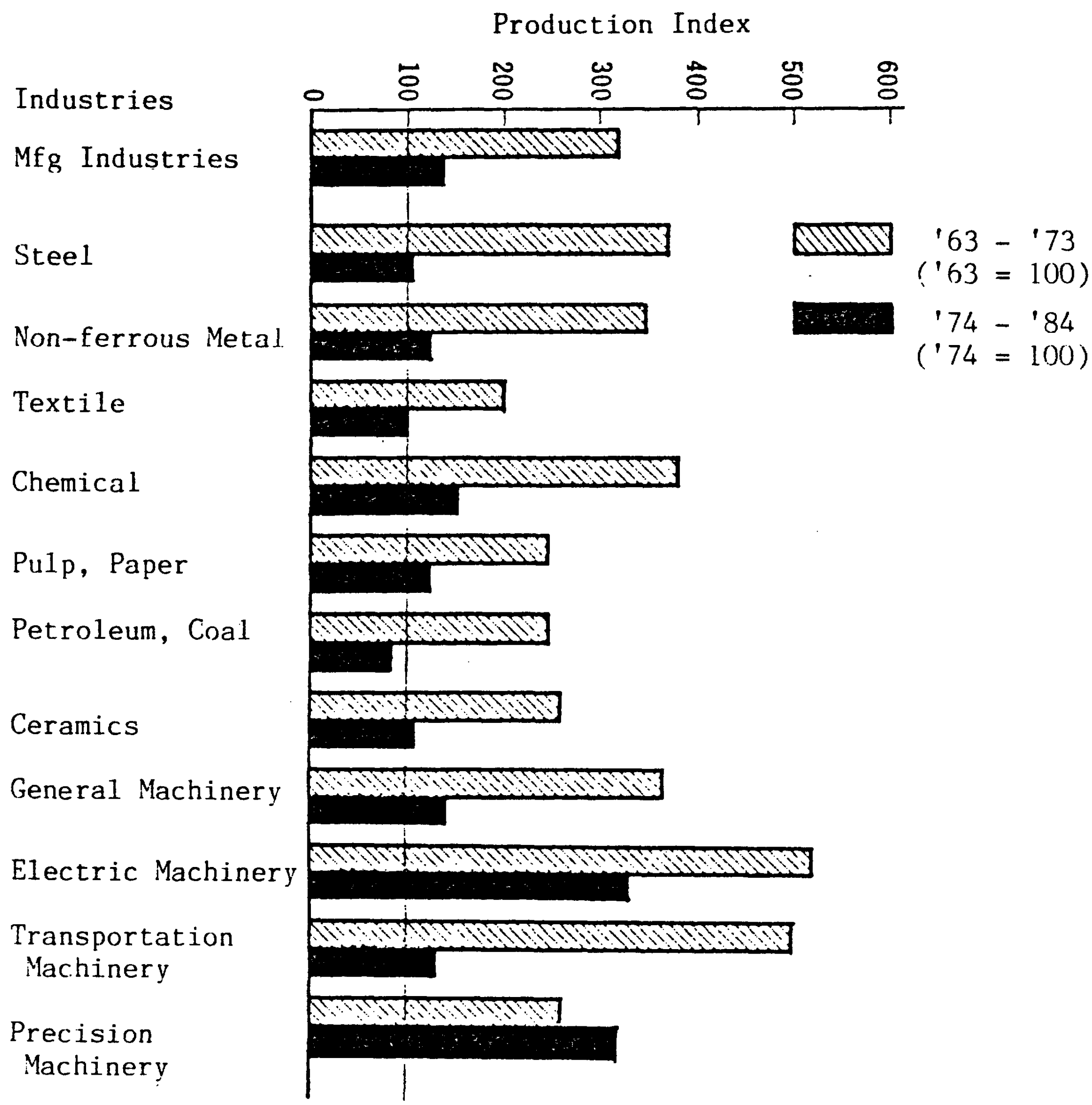
2.2.3 General Trends in Changes in The Industrial Structure

As shown above, there have been significant changes in the industrial structure of Japan following its domination by the textile and chemical industries in the 1950s. In the 1960s, the textile industry declined and heavy and chemical industries sustained Japan's economy. In the 1970s, the strength of the machinery industries began to emerge and they finally have become the leading industries in Japan in 1980s.

In this general trend, the most striking characteristic has been the changes in the hierarchy of industries by growth rate. Leadership in growth has changed several times. Before the oil crisis, many industries grew at high rates. However, only a limited number of industries could grow following the oil crisis (See Figure 2.6). Machine industries, especially electric and precision machinery industries, performed at a high rate of growth after the oil crisis while growth in resource-oriented industries such as textiles, steel, and oil refinery industries leveled off. This trend was reinforced by the second oil crisis in 1980. (Source: 60)

Several reasons for the differences in growth rate by industry can be discerned. The first reason is the

Figure 2.6: Differences in Growth of Production Indexes among Industries in Japan

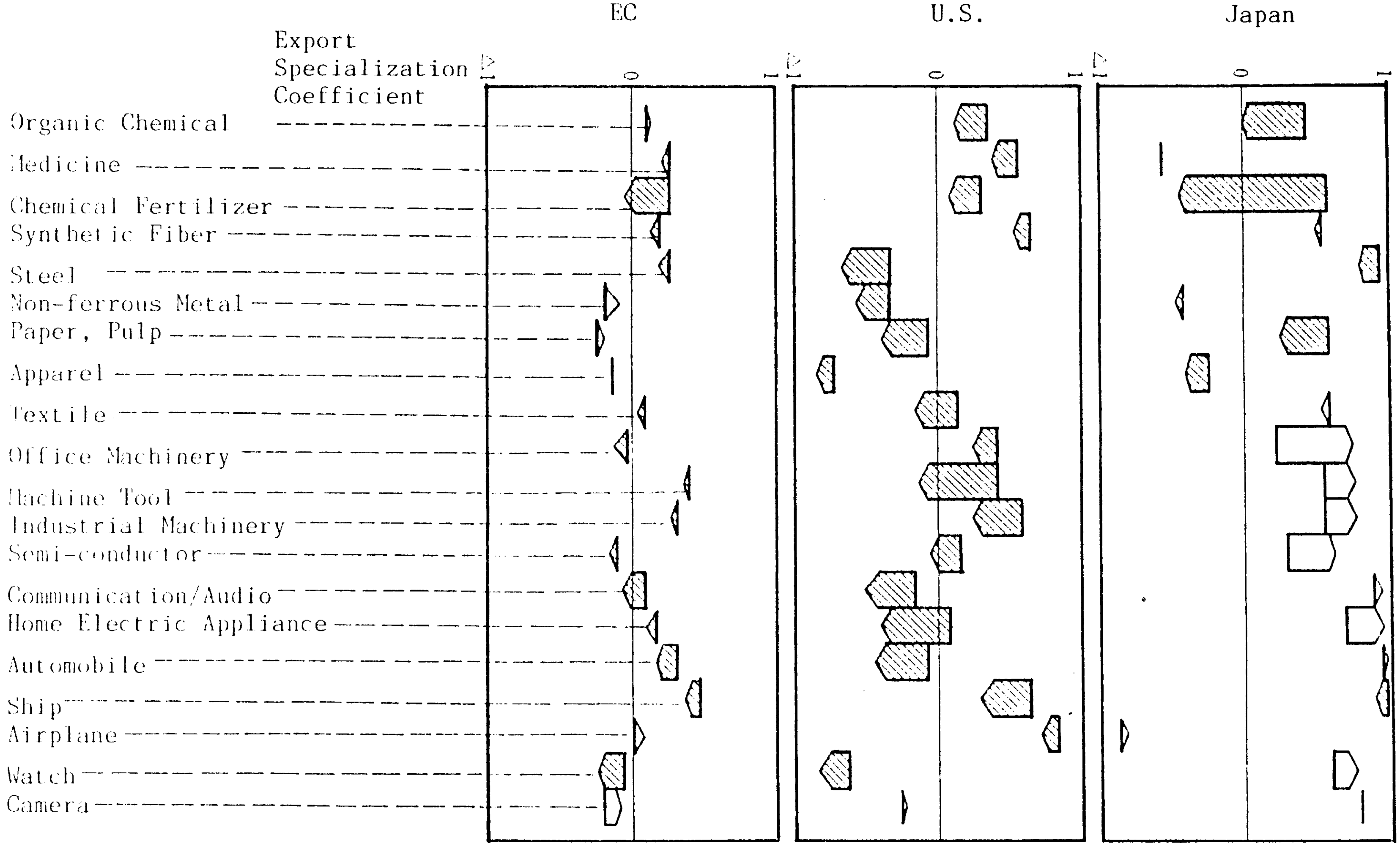


Source: 46, 58

competitive advantages in technology and cost lost by some industries. Figure 2.7 shows the changes in competitiveness among manufacturing industries using "trade specialization coefficient". Competitve edges of the technology-oriented industries in Japan represented by general and electric machinery industries have been increasing in 1970s and 1980s, while the U.S. and E.C. countries as a whole have been losing their competitive advantages.

Figure 2.8 represents the change in the shares of Japanese comodities in the international markets. Chemicals, textiles and miscellaneous commodities have been losing cost advantages against not only the newly devoloping countries but also the other advanced countries. The rise in energy costs since the oil crisis created significant cost increases in these industries in which energy cost accounts for a large portion of their cost structure or which use oil-related resources (See Figure 2.9). For instance, the aluminum refinery industry, which uses electricity produced through thermal power generation, and the oil refinery industry, which uses traditional naphtha, have obviously been losing their comparative cost advantages over these industries in the U.S. or Canada where cheap resources, such as ethane from natural gas, can be used and cheap energy, such as electricity generated through natural gas or water power can be provided (Source: 65). In addition, because

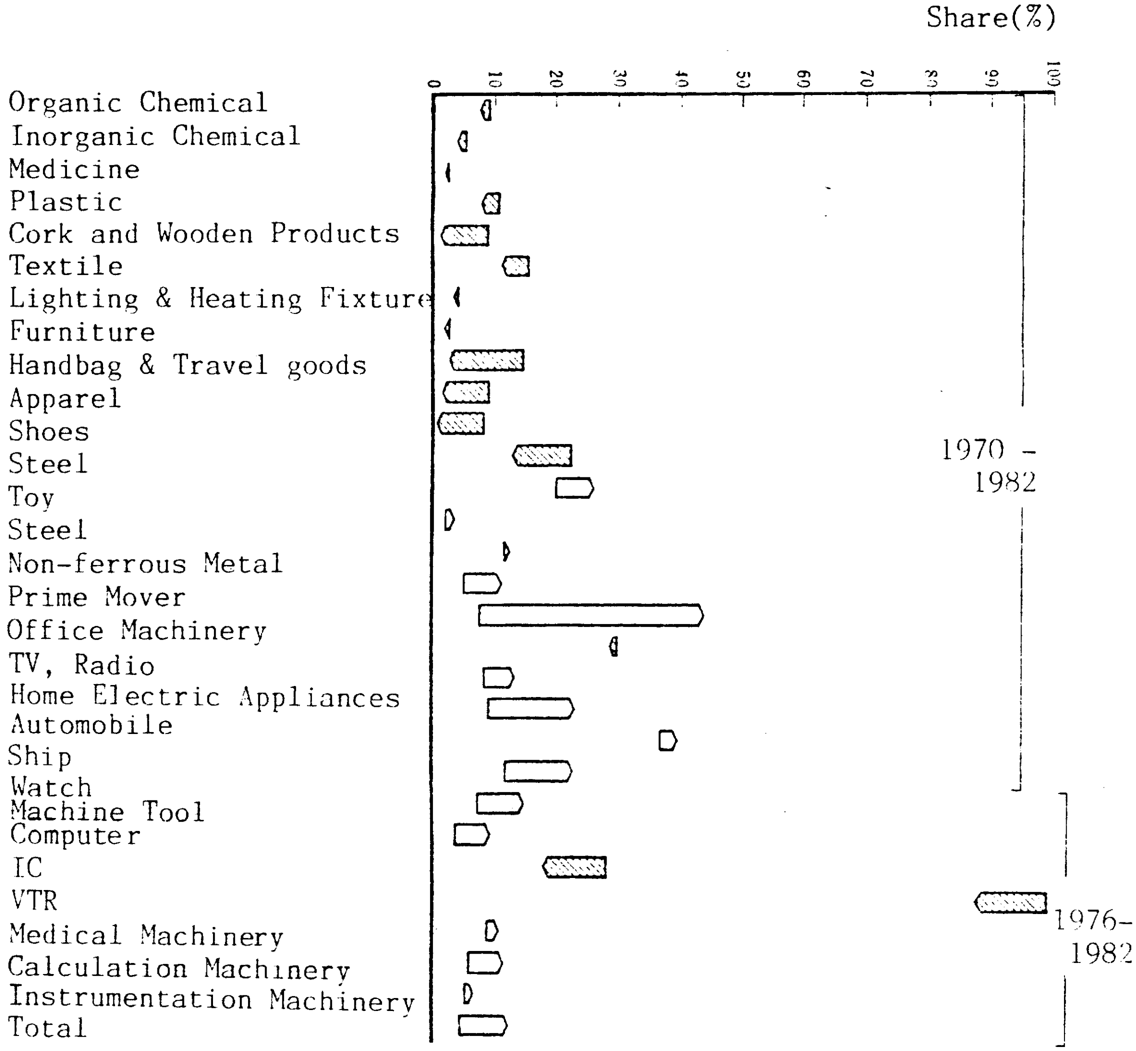
Figure 2.7: Competitive Advantage of Industries among Advanced Countries



Note: Export specialization coefficient = $\frac{\text{(Export amount - Import amount)}}{\text{(Export amount + Import amount)}}$

Source: 46

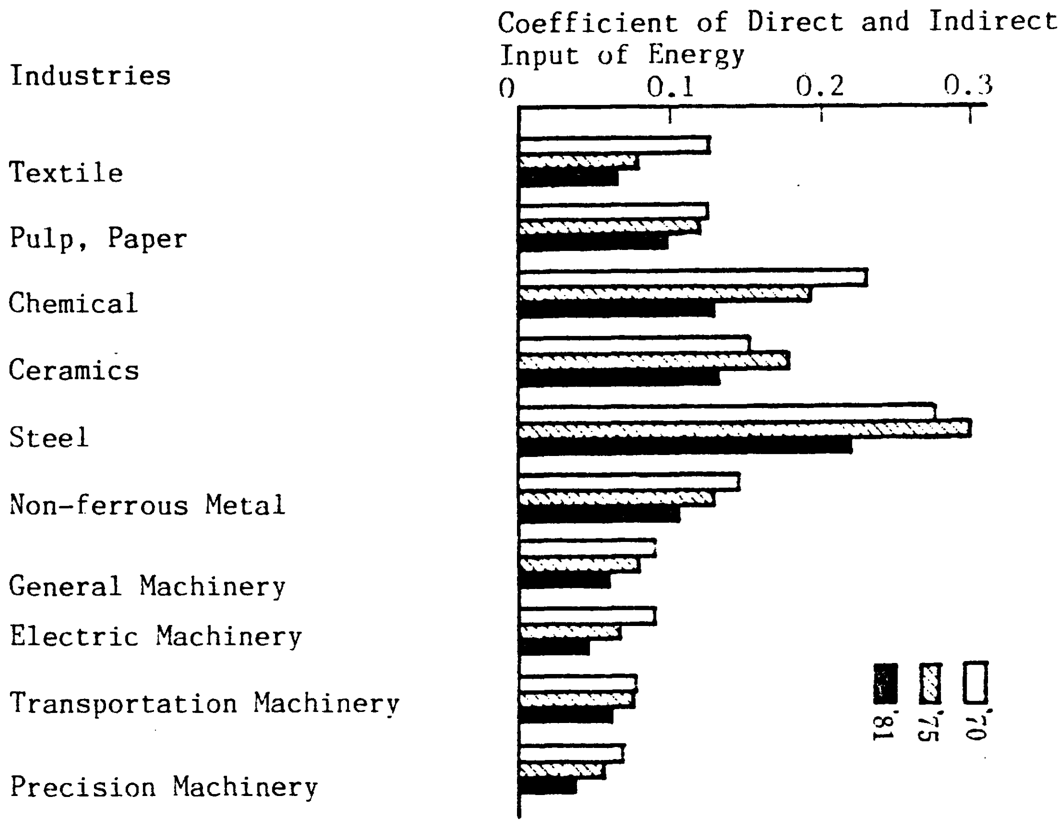
Figure 2.8: Change in Shares of Japanese Products in The World Market



Note: Share = $\frac{\text{Export amount of a product from Japan}}{\text{Export amount of a product in the World}}$

Source: 46

Figure 2.9 : Coefficient of Direct and Indirect Input of Energy



Note: Coefficient of direct and indirect input of energy indicates a coefficient of input of energy (electricity, gas, petroleum products, and coal products) to an industry in case of one unit of increase in demand for production of the industry.

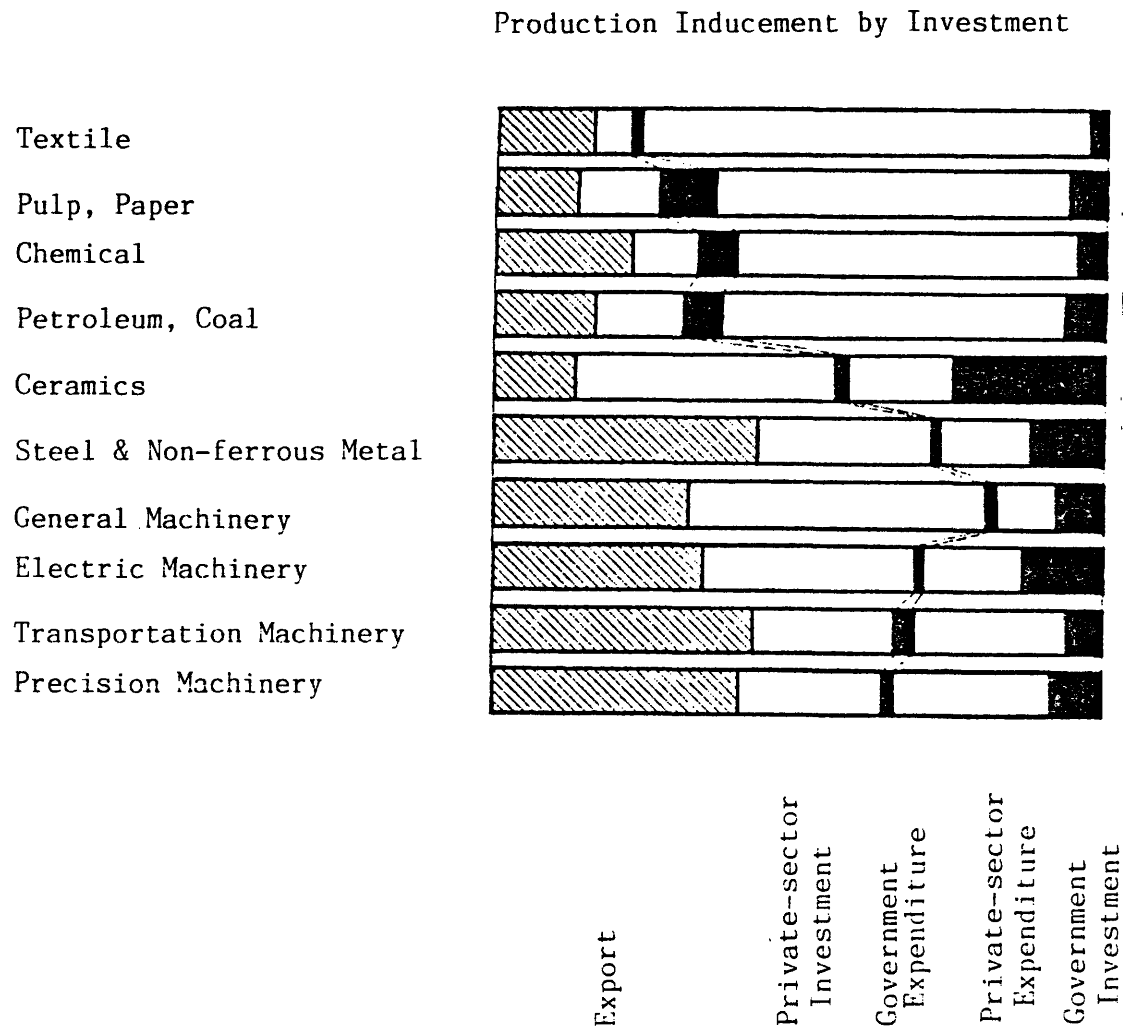
Source: 46

technology in these commodities is already highly developed, the differences in technologies used in Japan and other countries has been shrinking rapidly. As a result, these commodities have lost their competitive edges both in cost and technology.

In contrast, Figure 2.8 also shows the commodities which belong to the technology-oriented industries, such as home electrical appliances, office machines, automobile, watches, machine tools, medical apparatuses and so on. The share of these commodities have been increasing, because all of these industries enjoy competitive advantages in technology which translate into cost advantages for their products. Recently technological advantages have enabled even the steel and ship building industries, which had been among the declining industries, to increase their shares slightly. AS mentioned before, these two still remain among the top 10 export commodities.

The second reason for the differences in growth rate among industries is a conspicuous change in demand. Resource-oriented industries rely mainly on private-sector expenditure (See Figure 2.10). Such industries have suffered greatly from the generally low level of domestic demand for these industries' products. In contrast, machinery or assembly industries were sustained by relatively high levels of demand from the domestic private sector as well as by the growth in exports created by strong international demand.

Figure 2.10: Degree of Production Inducement by Investment
In Japan (1982)



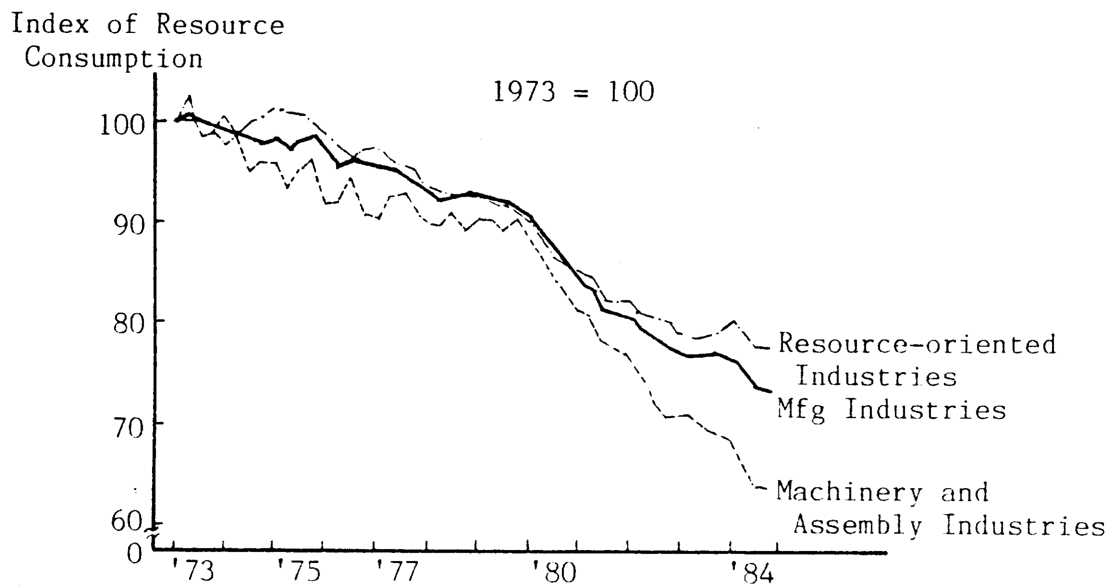
Source: 20, 46

The third reason is the decrease in expenditure on resources and materials after the oil crisis of 1973. The decrease created the cost reduction in machinery and assembly industries but affected the resource-oriented industries as reduction in demand (See Figure 2.11). Because thorough energy-saving methods were taken throughout Japan, consumption of resources and materials declined since the first oil crisis of 1973. The trend was significant especially after the second oil shock of 1980.

2.2.4 Construction Industry and Japan's Industrial Structure

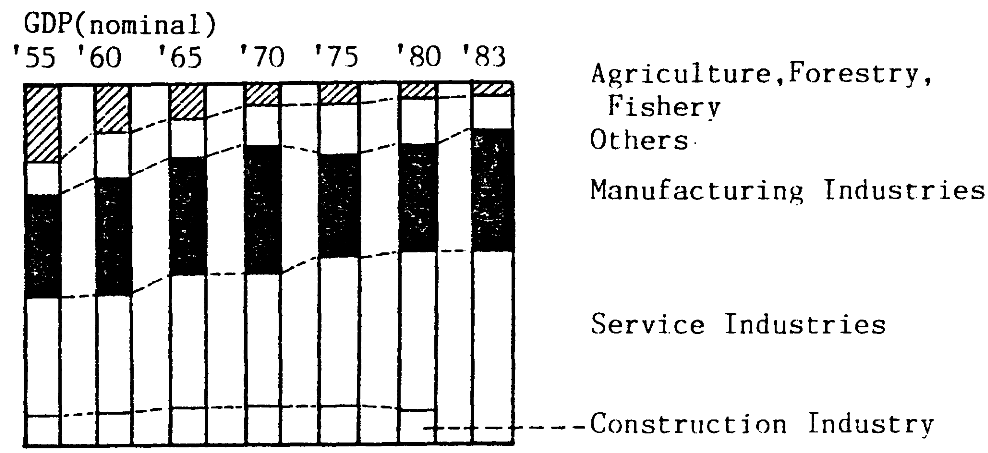
Figure 2.12 portrays the changes of Japan's industrial structure in a rough classification of industries in Japan's GDP including the share of the construction industry. First, a consecutive decline can be seen in agriculture, forestry and fishery industries. Second, there was a growth in manufacturing industries through the 1960s, a decline in 1970s and another period of growth after 1980. Taken together, the shares of manufacturing industries in Japan's GDP increased a little, though not significantly. Manufacturing industries still play a key role in Japan's economy. Third, the percentage of construction output in GDP had been increasing until 1975, accounting for slightly over 10%, then declined in the 1980s. Finally, a sectoral increase in the shares of service industries can be seen (1). The most conspicuous change among these was perhaps

Figure 2.11: Change in Resource Consumption in Japan



Source: 46

Figure 2.12: Change in The Industrial Structure in Japan in Gross National Products

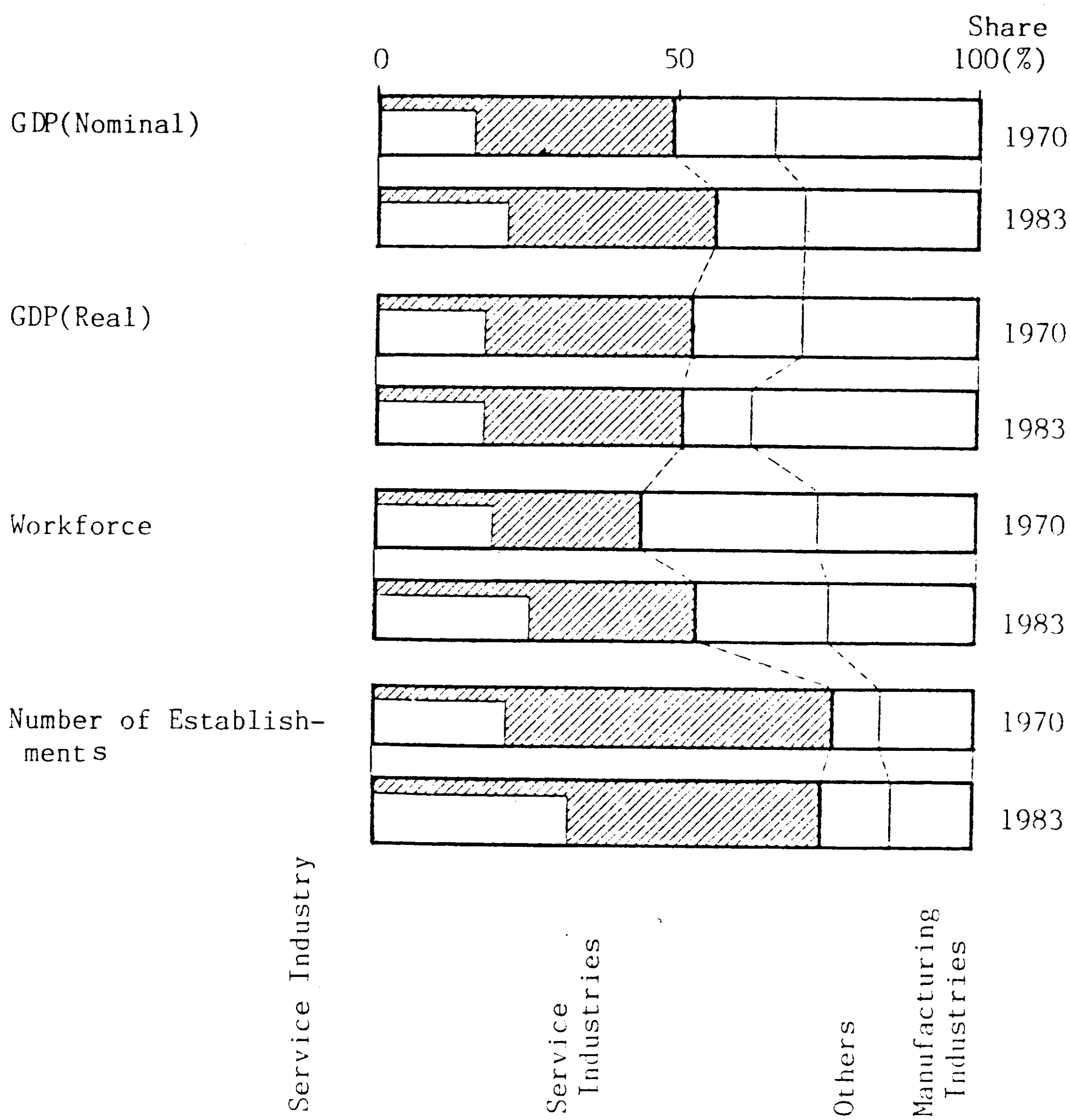


Note: Service industries include "Whole Sales", "Retail Sales", "Financial", "Insurance", "Real Estate", "Transportation", "Communication', and so-called "Service(Hotel, Restaurant, and Entertainment)" industries.

Total production output of construction industry in 1983 is not available because it is calculated in every five years.

Source: 46, 48, 58

Figure 2.13: Increase in Importance of Service Industries



Note: The d finition of "Service Industries" is the same as in the previous figure.

Source: 46

the increasing importance and share in GDP of service industries and the relative decrease in shares and importance of other industries. It is interesting to analyze impacts of each industry' orientation to service on its own performance and on the construction industry;

Figure 2.13 portrays the increasing importance of service industries in Japan's national economy. Service industries' outputs accounted for 56% of GDP and the workforce in service industries accounted for 54% of the total workforce in Japan in 1983. Furthermore, even in manufacturing industries there has been an increase of services in the forms of intermediate inputs. (Source: 46) Because of the diversification of needs for goods, manufacturers have begun to deploy strategies for producing and selling goods of higher quality in more efficient ways. In order to achieve this, manufacturers are putting more emphasis on their management and service departments, such as planning, investigation, sales promotion and advertising, rather than on production alone.

Besides their greater empahsis on services internally, manufacturing firms are increasing their purchase from firms which provide services and establishing subsidiaries to perform services for them (Source: 65). Concomitantly, service firms now need more sophisticated manufacturers'

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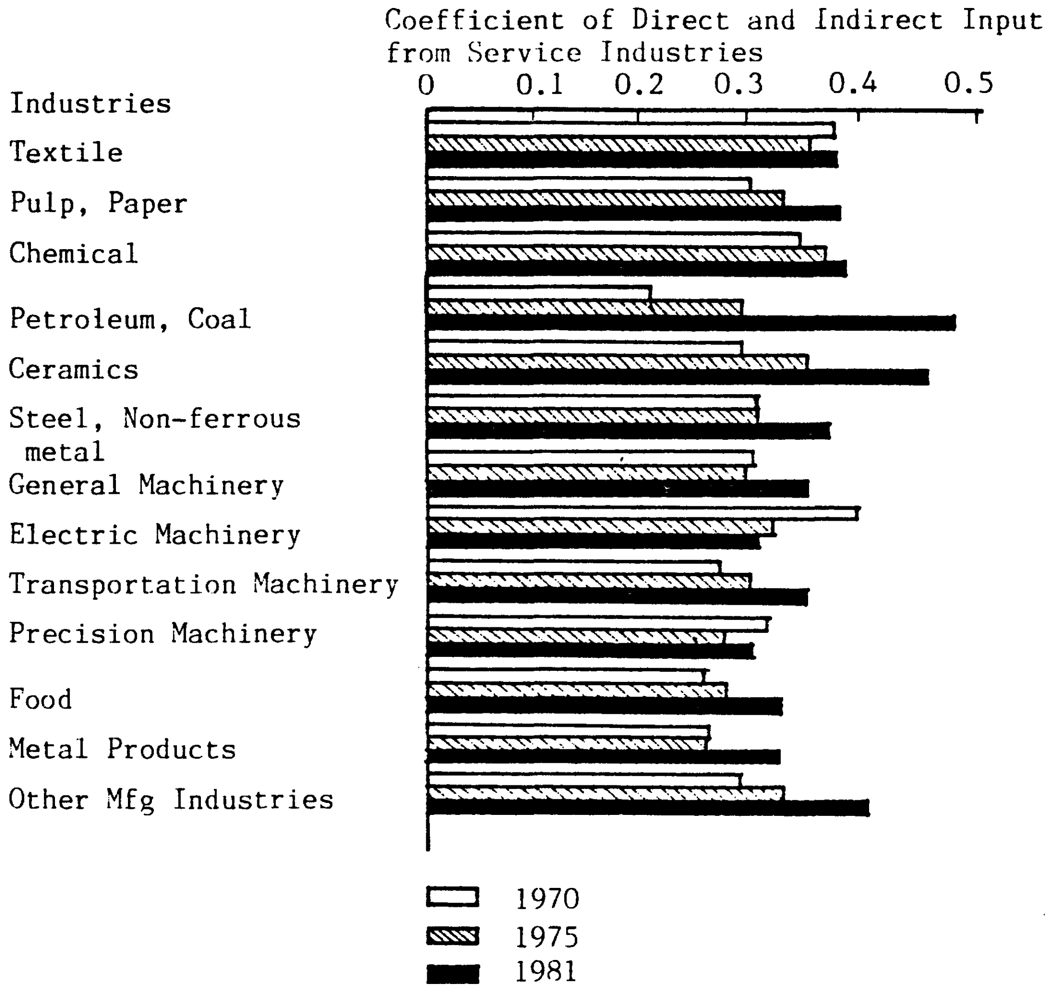
(1) Service industries include industries such as retail sales, wholesale, insurance, finance, real estate, transportation, communication and the so called service industries (hotel, restaurant, entertainment etc.).

products. Service industries are using more hardware such as computer systems to increase their own efficiency. Thus, there two kinds of relationships exist between service industries and manufacturing industries, that is, inputs to and outputs from service industries. As a result, in manufacturing industries, there has been an increase of direct and indirect input from service industries in almost all manufacturing industries (See Figure 2.14). Also, Figure 2.15 shows the increase in production of service industries induced by increases in production in all manufacturing industries.

For the construction industry, there probably has been a couple of impacts from 1) the increasing bilateral dependency between manufacturing and service industries and 2) the increasing importance of service industries. One of the impacts will be, as has been mentioned, the decrease in volume of construction because of both the less capital-intensive nature of service industries and the more service-oriented nature of manufacturing industries. (The latter trend eventually diminishes the capital-intensive nature of these firms.) Another one will be the need to establish countermeasures to the movement towards a service orientation as jobs increasingly are generated by the service industries and service-oriented manufacturers. Obviously the nature of jobs coming from both industries will be changing rapidly. These jobs not only will be shaped up by state-of-the art technology, such as

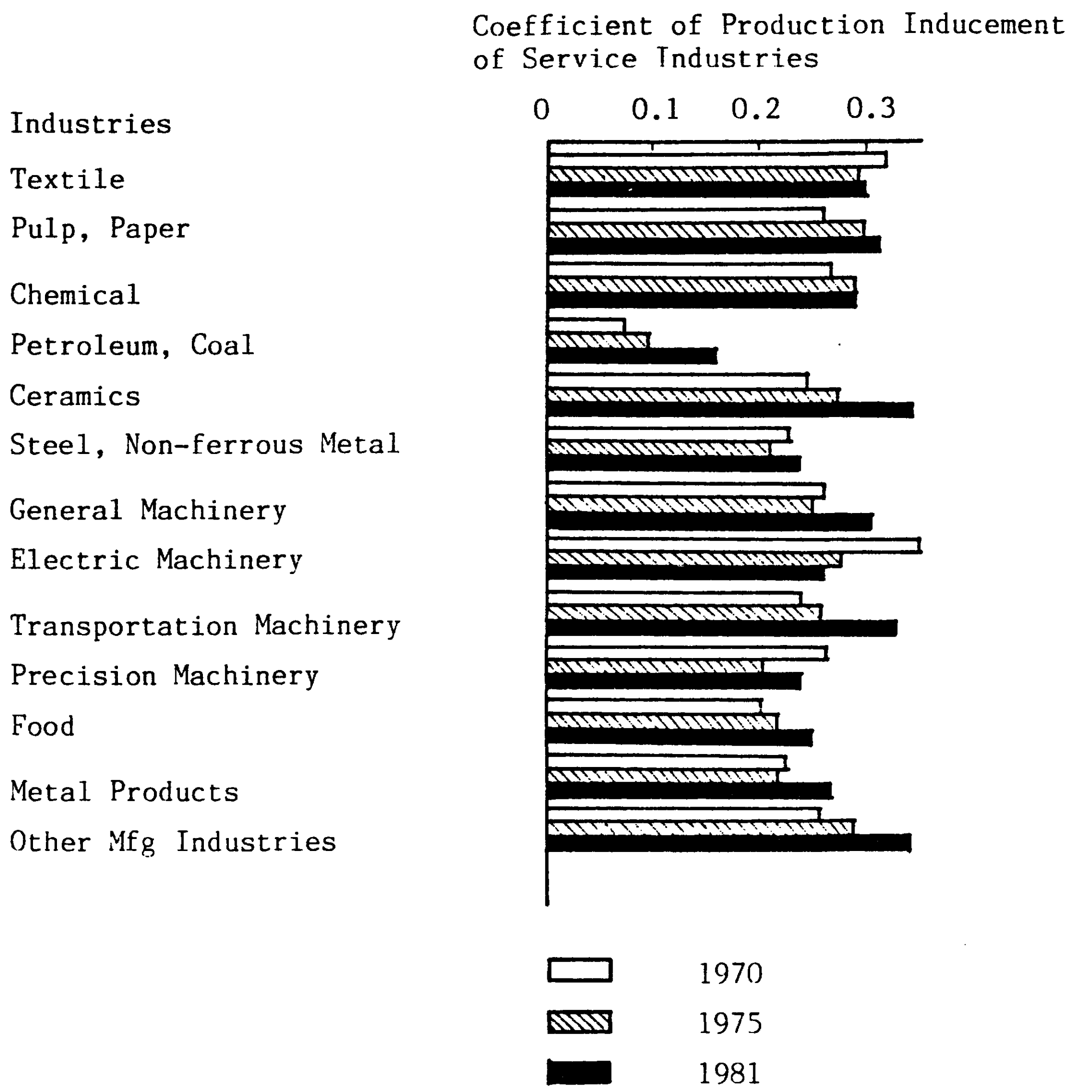
Figure 2.14: Direct and Indirect Input Coefficient from Service Industries



Note: Coefficient of direct and indirect input from service industries is the ratio of direct and indirect inflow from service industries in order to produce one unit of production in another industry.

Source: 46

Figure 2.15: Coefficient of Production Inducement of Service Industries in Japan



Note: Coefficient of production inducement of service industries is the induced production in service industries by one unit increase in production in another industry.

Source: 46

intelligent buildings or computer-controlled clean rooms, but also will require different categories of jobs not traditionally included in the construction firms. Clients may request work which has not been done by design/construction firms. Furthermore, such jobs may previously have been done by different industries or not done at all. The issue of countermeasures for the changing industrial structure will be developed further in Chapter 4 in discussing the strategies to be taken by Japanese contractors at entering to the U.S. construction market.

2.3 Financial Structure of Japanese Industries

Financial structure of Japanese industries will be analyzed in this section from three points of view: profitability, cost structure, and the capital structure of industries. Statistics on firms' financial structures were generally taken from "Analysis of Major Firms' Management "(1985) by The Bank of Japan (1).

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1. In this book, statistics are based on the selected firms with capital of more than Y1 billion ($4.5 million). Enough firms were selected from each industry to accurately reflect the characteristics of the industry. 619 firms were selected. (379 firms from manufacturing industries and 240 firms from non-manufacturing industries.) (Source:59)

2.3.1 Profitability of Industries

Among the many ratios and indexes which describe firms' business operations, the best parameter to monitor firms' fluctuations is the ratio of net income as percentage of total sales. This figure summarizes firms' entire efforts, adding up various factors characterizing the firms. These profits ratio will be reviewed in this section.

Industries can be divided into four groups by the degree of profitability;

1) highly profitable (more than 3% of net income as percentage of total sales)
2) moderately profitable (2.9% - 2.0%)
3) making little money (1.9 - 1.0%)
4) Not making money or losing money (below 1.0%) (See Table 2.12).

Each group is composed of the following industries with their percentages of net income in 1984:

Group 1): manufacturing industries--communication equipment & electronics (3.72%), home electrical appliances (3.07%), precision machinery (3.54%), ceramics (3.02%) and medicine (3.89%); non-manufacturing industries-- gas supply (5.21%), electric supply (3.38%), and private railway (3.49%).

Group 2): general electric machinery (2.72%), industrial machinery (2.89%), machine tools (2.24%), metal products (2.36%), pulp & paper (2.23%).

Group 3): manufacturing industries--food (1.40%), textiles (1.57%), steel (1.56%), and ship building (1.46%); non-manufacturing industries--construction industry (1.33%) in non-manufacturing industries.

Group 4): manufacturing industries--general chemicals (0.67%), oil refinery (0.54%), aluminum (-0.16%), and other non-ferrous metals (zinc, lead, copper) (0.80%); non-manufacturing industries--whole sales (0.14%) and marine transportation (-0.14%).

Group 1) is composed of two sub-groups. The first sub-group can be described as technology-intensive industries. These have high competitive technological advantages in the international market as stated in the previous section. The second group is comprised of utility and transportation industry. The Japanese government controls the utility industries.

Group 2) is, generally speaking, composed of machinery and assembly industries which are also technology-oriented.

Groups 3) and 4) are composed of former key industries in Japan's history of industrialization and the construction industry.

Figure 2.16 portrays the trends of industries' net income. There is a clear separation between the industries in Groups 1,2 and Groups 3,4. The former shares the upper portion of the graph while the latter may be found in the lower portion and fluctuating significantly.

As previously stated, this grouping clearly coincides

Table 2.12: Trend in Net Income as Percentage of Total Sales of Major Firms by Industries in Japan

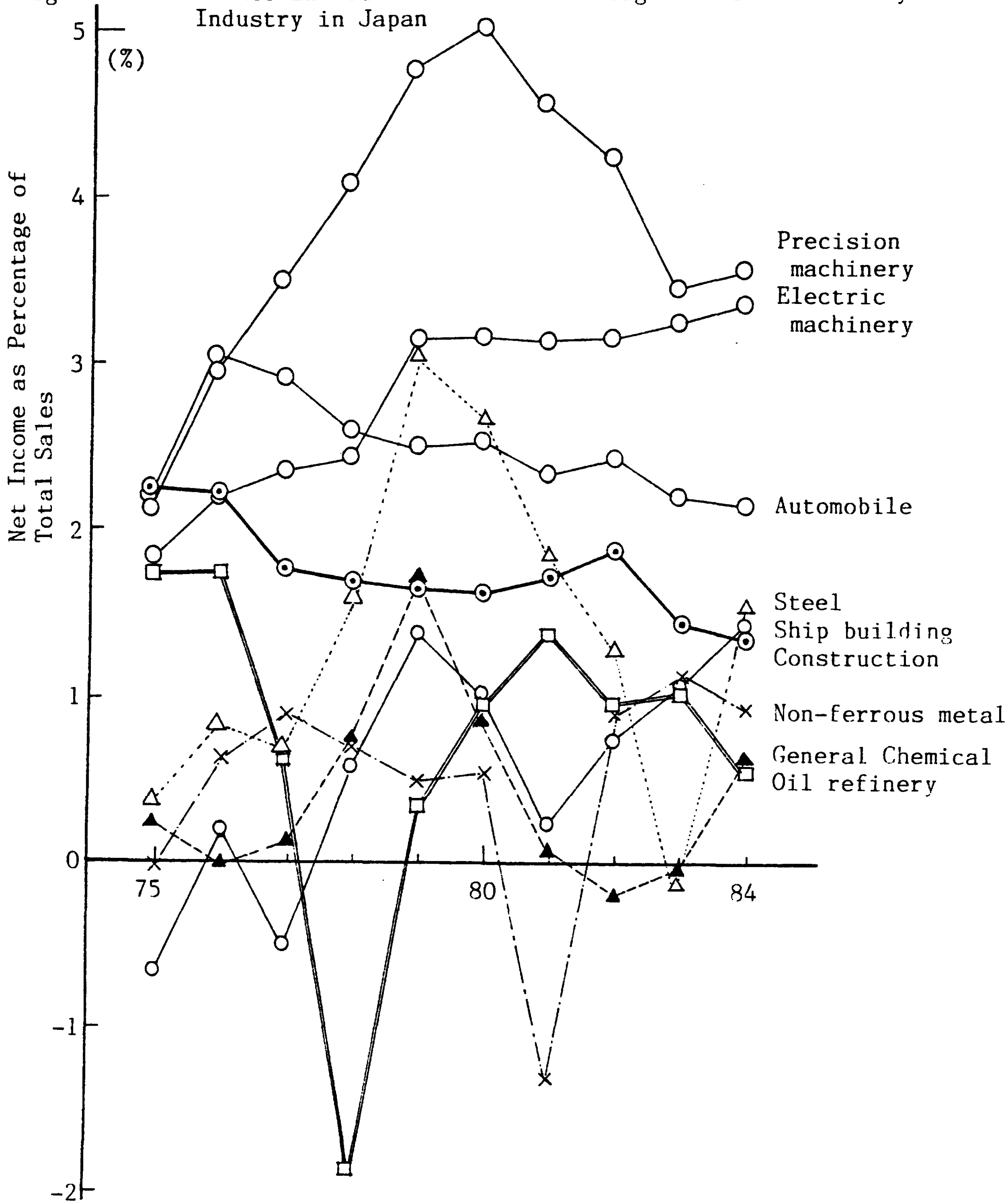
(Percent)

Industry\ Year	1975	1980	1984	Group
Mfg Industries:				
Food	0.07	1.60	1.40	-----G3
Textile	-0.98	1.56	1.57	-----G3
Pulp,Paper	0.53	1.44	2.23	--------G2
General Chemical	0.29	0.88	0.67	--G4
Medicine	3.65	4.38	3.89	------------G1
Oil Refinery	-0.01	0.56	0.54	--G4
Ceramics	1.40	2.86	3.02	------------G1
Steel	0.38	2.68	1.56	-----G3
Non-Ferrous Metal	-0.01	0.53	0.80	--G4
Aluminum	-5.20	1.38	-0.16	--G4
General Machinery	2.66	3.29	2.91	--------G2
Gen.Elec.Machinery	1.16	2.66	2.72	--------G2
Home.Elec.Appliance	2.83	3.84	3.07	------------G1
Communi/Electron	1.77	2.79	3.72	------------G1
Automobile	2.13	2.53	2.14	--------G2
Ship Building	1.75	0.99	1.46	-----G3
Precision Machinery	2.22	5.00	3.54	------------G1
Non-Mfg Industries:				
Construction	2.24	1.63	1.33	-----G3
Whole Sales	0.11	0.19	0.14	--G4
Retail Sales	1.18	1.37	1.00	-----G3
Private Transport	2.70	2.44	3.49	------------G1
Marine Transport	0.81	0.92	-0.14	--G4
Electric Supply	3.08	4.97	3.38	------------G1
Gas Supply	2.84	4.85	5.21	------------G1
Service	2.00	2.14	2.61	--------G2

Note: Grouping is according to net income as percentage of total sales.
G1 --- Group 1 (More than 3%)
G2 --- Group 2 (2.99 - 2.00%)
G3 --- Group 3 (1.99 - 1.00%)
G4 --- Group 4 (Below 1.00%)

Source: 59

Figure 2.16 : Trends in Net Income as Percentage of Total Sales by Industry in Japan



Source: 59

with the grouping discussed in the historical review of the ups and downs of Japan's industries. High-tech industries, such as communication, electronics, and home electrical appliances, have been seen the most growth since the latter half of 1970s. Their high level profitability was followed by that of the machinery and automobile industries which also have been leading Japan's economy since early 1970s. The capital-intensive industries (the former key industries) are clearly separated from these groups and have been struggling to survive in the changing environment.

The construction industry originally fell into the profitable group. For example, it recorded more than 2% of net income in 1975. However, since then, its profits have been on a continuing downward trend. As a result, the construction industry now is among the unprofitable group. Firms in the construction industry are not making money, and are struggling to servive in the changing economic environment.

2.3.2 Cost Structure of Industries

Table 2.13 shows a breakdown of expenditures as percentage of sales in each industry. Capital intensive industries have generally high rates of material cost and parts costs. The total of these costs in the capital-intensive industries accounts for 60 - 75% of the sales while these costs in the high-tech industries account for 45 - 55%. This difference comes from the nature of the capital intensive industries, which are resource-intensive as well as capital-intensive.

Industries with high material and parts costs are very vulnerable to rapid rises in the cost of raw materials. The capital-intensive industries lost their cost leadership after the rapid rise in material costs caused by the oil crisis of 1973. Table 2.14 demonstrates the difference in cost competitiveness between the high-tech and capital-intensive industries. The competitive advantages of the high-tech industries appear in their high gross margins. (Gross margin = Total Sales - Cost of Goods Sold) The high-tech industries generally claim 17.5 - 31% of gross margins while the capital-intensive industries gain only 7.6 - 19.1% of sales as gross margins.

Furthermore, some of the high-tech industries, such as general machinery, home electrical appliances, and automobile industries, are gaining additional income from sources other than their manufacturing operation. For example, their investment return (dividend or capital gain) and interest income from savings surpass their miscellaneous loss (unforeseeable or accidental loss) and interest payment for lending (See Table 2.13).

The financial structure of the construction industry will be detailed in Chapter 3. It will be treated only briefly here in comparison with other industries.

Table 2.13: Breakdown of Expenditure of Major Firms by Industries in Japan

1984 (Percent)

Industries	Material	Parts, Goods	Personnel	Depreciation	Interest	Others	Profit
Food	37.3	13.5	7.6	2.0	1.2	35.4	3.1
Textile	36.9	21.2	9.9	2.9	3.4	22.9	2.9
Pulp,Paper	48.2	10.2	10.6	3.8	4.0	18.4	4.8
General Chemicals	37.9	27.3	6.5	3.3	5.4	16.0	3.7
Medicine	16.9	28.8	18.2	2.9	1.0	22.0	10.2
Oil Refine	55.3	22.5	1.6	1.0	2.4	16.2	0.9
Ceramics	24.7	24.4	11.6	4.4	3.7	25.6	5.5
Steel	44.2	0.9	13.1	6.4	6.0	28.9	2.7
Non-Ferrous	48.3	26.6	4.9	2.0	4.4	12.4	1.5
Aluminum	36.9	33.3	8.1	2.0	5.7	14.2	-0.2
General Machinery	40.4	9.8	14.1	3.0	2.3	24.8	5.7
Gen.Elec. Machinery	41.1	6.0	14.7	4.4	1.5	26.2	6.2
Home Elec. Appliance	33.3	34.2	7.7	2.3	0.9	15.4	6.3
Commun/ Electronics	41.4	10.5	12.2	4.5	1.9	22.6	6.9
Automobile	62.8	1.6	8.2	3.3	1.0	18.3	4.7
Ship Build	37.9	0.3	13.5	2.0	4.6	38.9	2.8
Precision Machinery	43.0	1.8	14.8	4.1	2.2	27.8	6.4
Non-Mfg							
Construction	16.0	2.6	16.1	0.7	1.9	59.6	3.2
Whole Sales	0.1	96.0	0.8	0.1	1.0	1.6	0.4
Retail Sales	0.1	74.8	9.0	1.1	1.5	11.2	2.3
Priv.Trans.	1.5	7.6	33.2	8.7	15.4	29.7	4.0
Marine Trans.	17.2	0.0	6.7	5.1	3.7	66.6	0.7
Elec. Supply	31.4	10.1	7.7	12.5	11.0	20.4	6.9
Gas Supply	37.5	1.1	13.0	10.1	3.5	23.7	11.1
Services	10.7	42.3	16.1	2.3	1.4	21.7	5.5

Note: The figures indicate breakdown of expenditures as percentage of total expenditure of major firms in each industry.

Source: 59

Table 2.14: Breakdown of Revenues of Major Firms by Industries in Japan

1984 (Percent)

Industries	Cost of Sales	General Admi. Cost	Other Income/Cost Interest Payment/ Revenue	Earning Before Tax
Manufacturing:				
Textile	83.7	11.3	1.8	3.2
General Chemical	80.9	11.8	3.3	4.0
Oil Refinery	92.4	4.5	2.1	1.0
Steel	83.2	8.8	5.1	2.9
Aluminum	89.1	8.0	3.1	-0.2
Other Non-Ferrous Metal	91.0	4.3	3.2	1.5
Ship Building	87.1	8.6	1.4	2.9
Ceramics	72.1	20.6	1.5	5.8
General Machinery	79.7	14.9	-0.6	6.0
Home Appliances	80.5	15.3	-2.5	6.7
Communication/ Electronics	69.0	22.4	0.8	7.8
Automobile	83.5	12.6	-1.0	4.9
Precision Machinery	73.9	18.4	0.5	7.2
Non-Manufacturing:				
Construction	89.1	7.4	0.2	3.3
Marine Transport	93.0	4.8	1.4	0.8
Electric Supply	71.0	11.2	10.8	7.0
Gas Supply	44.4	40.8	2.9	11.9

Note: The figures indicate breakdown of revenues as percentage of total revenue of major firms in each industry.
A minus sign in "Other Income or Cost, Interest Payment or Revenue" means revenue.

Source: 59

One of the unique characteristics of the Japanese construction industry is its considerable subcontracting ratio, generally more than 50% regardless of the type or size of a construction firm. As a result, we see in Table 2.13, that the high subcontracting ratio is reflected in the very high rate of other costs in which subcontract cost is included. Low rates of material and parts costs, relatively high rate of personnel cost and small depreciation costs also characterize the construction industry.

The construction industry has a very weak cost advantage. Its gross margin is only 10.9%, very small compared to the gross margin of 17.5 - 31% enjoyed by the high-tech industries (See Table 2.14).

It may not appropriate to compare the construction industry with manufacturing industries because their cost structures are quite different. However, generally speaking, However, the weak competitive cost advantage of the Japanese construction industry makes it more comparable to the capital intensive industries than to the high-tech industries.

2.3.3 Capital Structure of Industries

Table 2.15 shows the debt-to-equity ratios of major firms in each industry. There is an apparent difference in debt-to-equity ratios between both Group 1,2 and Group

Table 2.15: Debt to Equity Ratio and Interest Payment of Major Firms by Industries in Japan

1984

Industries	Debt to Equity Ratio	Interest Payment for Sales	Interest,Dividend Received for Interest,Dividend Payment
(Mfg)			
Food	2.00	1.20	0.69 -----G3
Textile	3.11	3.74	0.49 -----G3
Pulp, Paper	4.59	4.06	0.25 -------G2
General Chemical	6.80	5.78	0.28 ---G4
Oil Refinery	9.83	2.55	0.24 ---G4
Steel	5.77	6.52	0.27 -----G3
Aluminum	11.52	5.91	0.41 ---G4
Non-Ferrous Metal	7.24	4.52	0.29 ---G4
General Machine	1.78	2.41	0.87 -------G2
Gen.Elec.Machine	3.18	1.53	1.01 -------G2
Home Appliances	1.08	0.94	2.64 ---------G1
Commun/Electronics	2.34	2.15	0.63 ---------G1
Automobile	1.39	1.07	1.59 -------G2
Ship Building	7.35	4.75	0.76 -----G3
Precision Machine	1.05	2.45	0.94 ---------G1
(Non-Mfg)			
Construction	4.34	1.89	0.77 -----G3
Whole Sales	13.54	1.03	0.86 ---G4
Retail Sales	2.42	1.55	0.42 -----G3
Private Transport	7.83	16.06	0.20 ----------G1
Marine Transport	5.03	3.84	0.49 ---G4
Electric Supply	5.59	11.11	0.04 ----------G1
Gas Supply	2.18	3.78	0.19 ----------G1
Services	1.92	1.44	0.76 --------G2

Note: Debt to equity ratio
= (Amount of debt)/(Amount of equity)
Interest payment for sales
= (Amount of interest payment)/(Amount of total sales)
Interest,dividend received for Interest, dividend paid
= (Amount of interest and dividend received)
/(Amount of interest and divident paid)
G1 indicates Group 1
G2 indicates Group 2
G3 indicates Group 3
G4 indicates Group 4

Source: 59

3,4. Firms in Group 1,2 have very low debt-to-equity ratios, ranging from 1.0 to 2.0 while firms in Group 3,4 have considerably higher ratios, around 10.

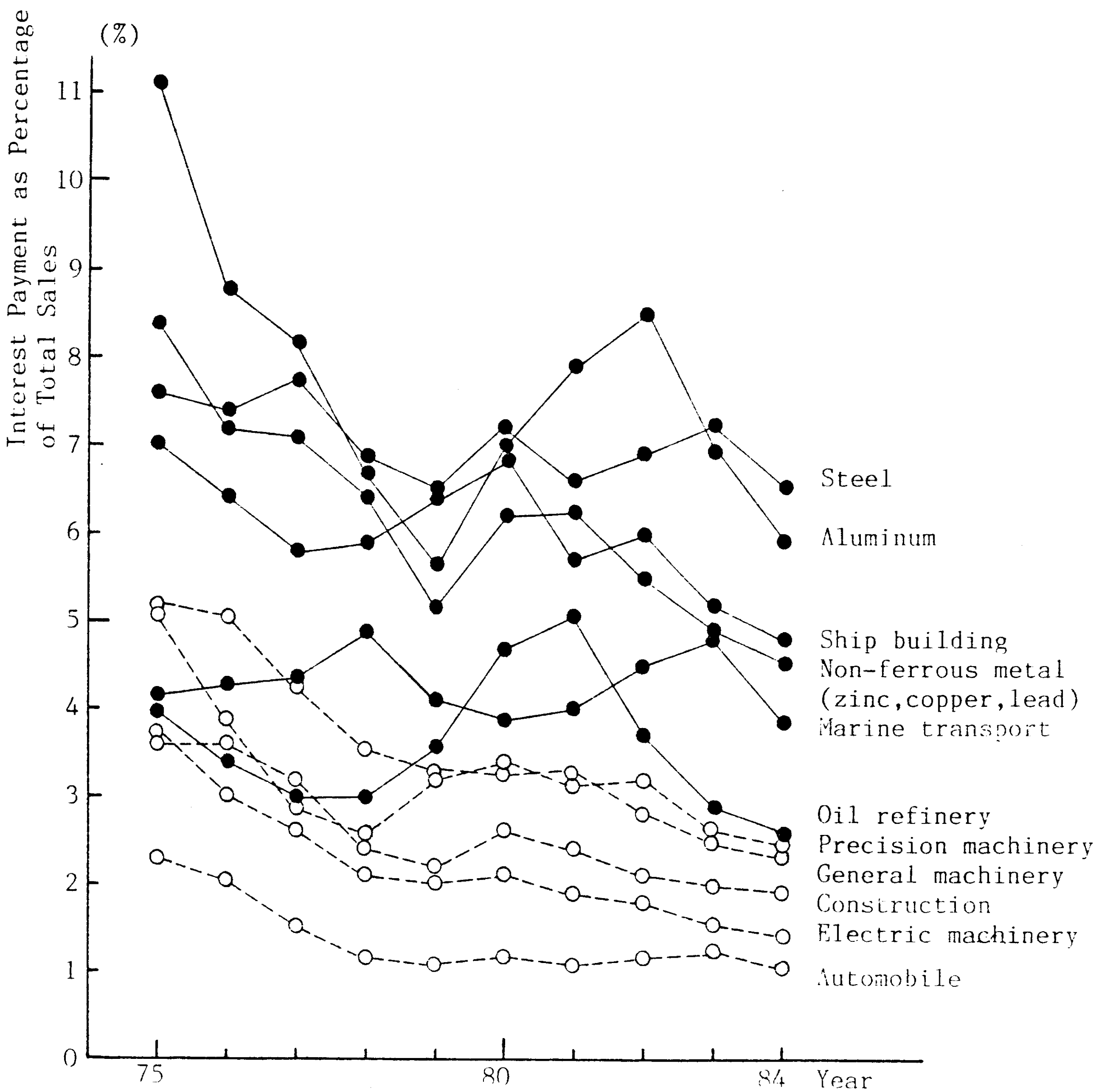
As a result, interest payments by the industries in Group 3,4 obviously are suppressing their profitability. Their interest payments account for 3 to 6% of their total sales. In contrast, industries in Group 1,2 spend only 1 to 2% of their total sales for interest payment.

Figure 2.17 shows the historical record of the interest payment by each industry after 1975. Although interest payment, as a whole, has been in a downward trend in each industry, industries in Group 3,4 still have much larger percentages than industries in Group 1,2. Most significant here are the high ratios of industries in Group 3,4 at around 1975 and 1980. Similarly, high debt-to-equity ratios can be seen around 1975 and 1980 (See Figure 2.18).

Characteristics of the capital structure of Japanese industries can be summerized as (1) originally high debt-to-equity ratio in all industries, (2) especially high ratios of industries in Group 3,4 around the two oil crises, (3) downward trend of the debt-to-equity ratios in all industries, and (4) recent steep downward curves in Group 1,2 and a clear separation between Group 1,2 and 3,4.

Several factors have shaped these characteristics. First, the special nature of Japan's capital market, and consequenct investment policies of government and business

Figure 2.17 : Trends of Interest Payment as Percentage of Total Sales



Source: 59

must be considered. Originally, the stock market in Japan was an expensive and unreliable source of capital. In Japan's stock market, stocks are issued at par rather than at market value, and the sales of stocks thus yield less cash than in the stock markets of other countries. Furthermore, because of the cyclical nature of Japan's stock market since World War II, investment by stockholders traditionally has been risky and hence has required a high rate of return on equity. In addition, individual stockholders in Japan put less pressure on companies to issue scheduled dividends so that the money which otherwise would be paid to stockholders can be used for other purposes, such as interest payment (Source: 37, 53).

In the context of the objective of government and business to rapidly expand the economy, debt financing was a commonly accepted idea during the period of post-war reconstruction. If plant and equipment investment had been made using only equity capital, the scale of such investments would have been limited by the size of capital increases and internal reserves. Accordingly, expansion would have fallen behind other companies in Japan as well as in the world. Therefore, firms in Japan originally functioned with high debt-to-equity ratios (characteristics (1)) though the degree of dependency differed industry by industry.

Second factor: The differences in natures of industries between Groups 1,2 and 3,4 may have created the especially high debt-to-equity ratios for Groups 3,4 at the time of the oil crises. Industries in Group 1,2 are generally technology-intensive or technology-oriented industries less dependent on capital. Because, they never had to make heavy investments in plants and equipment, they originally had smaller debt-to-equity ratios than the capital-intensive industries.

In contrast, the industries in Group 3,4 are capital-intensive industries. They include steel and aluminum production, oil refineries, chemical and ship building industries, all of which require giant plants and much heavy equipment. As a result, the much heavier capital investment by industries in Groups 3,4 gave them an originally high debt-to-equity ratios.

A third factor was the timing of the change in the world economic situation which affected Japanese industries' financial structure, causing a downward trand in debt-to-equity ratios for all and creating a clear split between Groups 1,2 and 3,4. Before the capital intensive industries were able to improve or even decide to improve their capital structures, the oil crisis altered the economic environment so rapidly that these industries lost the chance to do so. (Once profitability is lost, it is difficult to improve a debt-to-equity ratio, which may generally be reduced by plowing profit back in the form of retained earnings.)

As mentioned above, debt financing has two contradictory effects on a firm's performance. When the profit margin exceeds interest payment, firms can gain extra profit from debt financing and stockholders can be benefited in the same way.

However, once the profit margin drops to a level comparable to interest payment, debt financing presses profit considerably, and may force a firm to the edge of bankruptcy. Stockholders will also be seriously affected by the priority in payment to debt holders.

This has been the story for Japan's capital-intensive industries. Table 2.16 shows the positive effects on the profit margins of Japanese firms in 1965 as from heavy debt financing in the late 1950s. Although their debt-to-equity ratios were especially high in the 1960s and early 1970s due to heavy investment in plants and equipment, they were able to take advantage of economies of scale in modernizing plants and equipment through heavy investment. However, the oil crisis suddenly undercut these industries' comparative advantages.

On the other hand, the high-tech industries were well suited to the new economic situation created by the oil crisis. Since their comparative cost advantages lay in the use of inexpensive materials, these business made remarkable profits which they were able to use to improve their capital structures (See Table 2.17 and Figure 2.18).

The debt-to-equity ratio of the construction industry was originally high, but not as high as the capital-

Table 2.16: Pre-war and Post-war Comparison of Business Firms' Financial Conditions in Japan(All industries; figures in parentheses are figures for manufacturing industries.)

(Percent)

Year	1935	1950	1955	1960
Equity Capital As a Proportion of Gross Capital	61 (67)	23 (26)	39 (41)	29 (32)
Fixed Assets As a Proportion of Gross Capital	60 (51)	29 (23)	54 (42)	53 (45)
Turnover-Ratio of Total Liabilities and Net Worth	0.42 (0.67)	1.64 (1.42)	1.08 (0.86)	1.12 (0.84)
Profit Ratio on Employed Capital	5.7 (7.8)	2.2 (2.8)	2.4 (5.2)	5.8 (7.9)
Profit Ratio on Paid-in Capital	12.1 (16.3)	18.3 (23.6)	21.6 (40.1)	40.5 (50.6)
Corporate Debenture Borrowings As a Proportion of Total Capital Employed	21.1 (13.1)	30.9 (28.5)	33.1 (28.2)	39.1 (35.3)
Depreciation Rate on Fixed Assets	3.9 (5.8)	8.0 (6.3)	8.3 (10.9)	10.1 (13.7)

Source: 50, 60

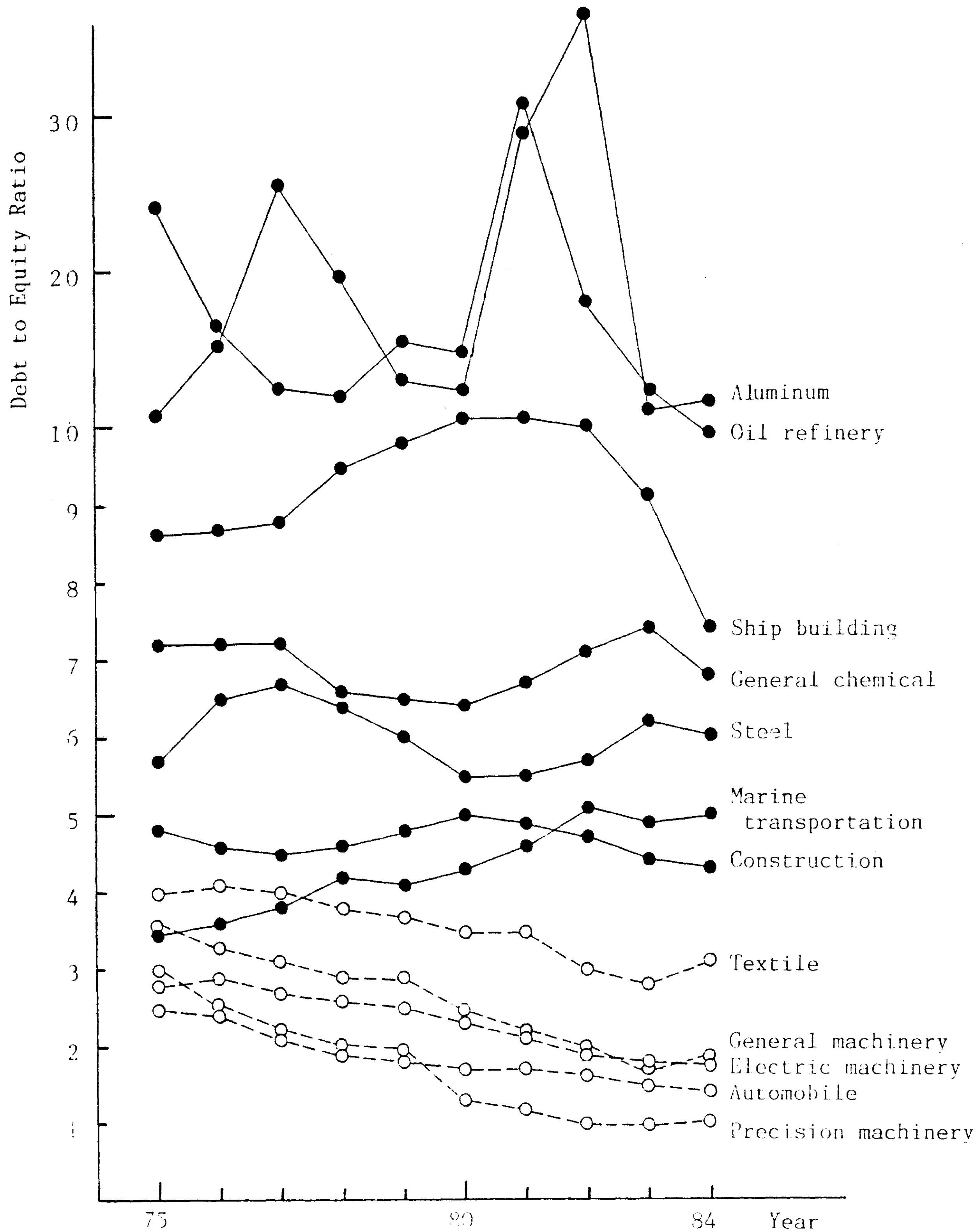
Table 2.17: Net Income and Payout Ratios of Major Firms by Industries in Japan

	Net Income	1984 (Percent) Payout Ratio
(Mfg)		
Food	1.40	0.33
Textile	1.57	0.42
Paper, Pulp	2.23	0.27
General Chemical	0.67	0.42
Medicine	3.89	0.30
Oil Refinery	0.54	0.33
Ceramics	3.02	0.33
Steel	1.56	0.61
Non-Ferrous Metal	0.80	0.51
Aluminum	-0.16	0.00
General Machinery	2.91	0.36
Gen.Elec.Machinery	2.72	0.29
Home Elec. Machinery	3.07	0.22
Communi/Electronics	3.72	0.21
Automobile	2.14	0.27
Ship Building	1.46	0.50
Precision Machinery	3.54	0.34
(Non-Mfg)		
Construction	1.33	0.42
Whole Sales	0.14	0.38
Retail Sales	1.00	0.46
Private Transport	3.49	0.58
Marine Transport	-0.14	0.00
Electric Supply	3.38	0.58
Gas Supply	5.21	0.39
Service	2.61	0.23

Note: Payout ratio (%) = (Dividend paid)/(Net Income)
Plow-back ratio (%)= 1 - Payout ratio
Therefore, (Net Income) x (Payout Ratio) equals the amount paid out to stockholders. (Net Income) x (Plow back ratio) equals the amount plowed back to business.

Source: 59

Figure 2.18 : Trends in Debt to Equity Ratios by Industry in Japan



Source: 59

intensive industries because construction firms possessed relatively small long-term assets (land, plants and equipment) compared to the capital-intensive industries. However, the debt-to-equity ratio of the construction industry has been remained in the same level since 1975. Accordingly, the ratio is now closer to capital-intensive industries. Now that Japan's economy has entered a period of moderate growth, the Japanese construction industry may now need to move its capital structure closer to an equity financing structure.

2.4 Summary of Japan's Industrial Structure Analysis

Japanese construction firms have long depended on the domestic market alone. The course of Japanese industry has been significantly affected by the following factors; 1) the government policy of fostering manufacturing industries, 2) the supporting role played by the post-war construction industry in reconstructing facilities and people's dwellings, 3) the traditional emphasis of Japanese contractors on building and heavy construction firms alone, to the exclusion of plants and industrial facilities construction, and several other problems which were created by the delay in entering the overseas markets. The interplay of these factors held Japanese contractors far behind other countries' international contractors in entering the overseas markets.

In Japan's efforts to reconstruct its economy, there were clear fluctuations in Japan's industrial structure. These changes were directed primarily by the Japanese government, but were sometimes forced by changes in economic situation, especially by the two oil crises. Japan's economy after World War II was led by heavy and chemical industries and other industries which ultimately became a bottleneck in the expansion of heavy and chemical industries. At the same time, machinery industries adapted from wartime munition industries grew rapidly. Then, high-tech industries began to develop significantly, especially after the first oil crisis. The economic characteristics of these industries were very well suited to the change in the world economy and in Japan's new economic situation. Japan's economy is heading for a service-oriented economy.

The driving force of Japan's post-war economic expansion was debt financing which was directed by Japanese government and accepted by Japanese firms. This strategy succeeded until the oil crisis. The slowly growing and less energy consuming economy allowed the high-tech industries to expand and made an equity financing policy more suitable.

The construction industry's financial structure has not improved so far. Its debt financing structure is now more comparable to the declining capital-intensive industries than to the high-tech industries.

Until the oil crisis came, various industries, government, and households provided enough work at diiferent times to keep the construction industry growing faster than Japan's GNP. The slowing of the entire economy stopped the construction industry's growth. The construction industry now must find new markets somewhere other than in Japan.

Among several candidates, the U.S. construction market is the largest and one of the healthiest in the world. To develop strategies for Japanese contractors wishing to enter the U.S. construction market, a comparative study of the U.S. and Japanese construction industries will be made in Chapter 3 based on the underlying characteristics of Japanese construction industry discussed in this chapter. The focus will be on the differences between the two industries and on the impact of the differences on Japanese firms. Also, the impacts of the Japanese entry on the U.S. market will be discussed.

Chapter 3

Comparative Analysis of U.S. and Japanese Construction Industries

As has been discussed in Chapter 2, the growth of Japan's domestic construction industry was hampered by the first oil crisis in 1973. After a couple of years of struggle, it began to grow again. However, it was again checked by the second oil shock of 1980. Since then, the value of Japan's construction has been decreasing continuously. The cessation of growth of Japan's domestic construction market was the primary reason why Japanese general contractors began to rush into the foreign construction market.

The major markets for Japanese general contractors originally were in South-East Asia and Middle East countries in the late 1970s and 1980s. The total contracts won in these two regions in 1980 accounted for 83.7% of the total overseas contracts won by Japanese contractors (See Table 3.1). However, with the sudden downturn in oil prices and demand, the Middle East countries were beset by cash flow problems and their ability to invest in construction faded away. The share of contracts won by Japanese contractors in Middle East countries dramatically decreased and accounted for only 8.1% in 1984 (38.7% in 1980). Recently, China (Mainland), Australia, and the United States became the most important new markets. Especially,

Table 3.1: Overseas Contracts Won by Japanese Contractors by Region

(Percent)

	1980	1981	1982	1983	1984
South-East Asia	45.0	61.4	75.6	66.6	53.7
Middle East	38.7	26.8	12.8	16.1	8.1
Africa	1.0	2.3	1.0	1.0	0.4
North America (Mainly in the U.S.)	3.4	3.1	3.6	8.2	22.1
Latin America	10.1	5.7	3.6	1.4	2.4
Oceania (Mainly in Australia)	1.2	0.4	0.9	5.8	12.3
West Europe	5.4	0.4	0.9	0.7	1.0
East Europe	0.1	0.1	1.5	0.0	0.0
Total Overseas Construction ($ million)	2,457	3,967	4,205	4,777	4,585

Note: The figures indicate contracts won by Japanese contractors in each region as percentage of total contracts won by Japanese contractors.

Source: 47

contracts won in the United States were the greatest in terms of value, of contracts won in any single country by Japanese contractors in 1984 (See Table 3.2). The share of contracts won in the U.S. accounted for 22.1% of the total overseas contracts (See Table 3.1 again).

Japanese contractors' choice of the U.S. as a construction market niche seems reasonable, mostly because the U.S. construction market is the world largest (See Table 3.3). The U.S. domestic market was three to four times larger than the entire international market shared by the top 250 international contractors which ENR (Engineering New Record) picked up in 1984. Furthermore, the U.S. construction market is, generally speaking, composed of well-established participants, such as clients, design firms, engineering firms, contractors, subcontractors, suppliers, and so on. Within the market, competition is performed fundamentally through an open bid system. Therefore, the market is maintained fairly efficiently.

The U.S. has the largest and the most powerful economy and construction cost is, as a whole, kept under control through relatively stable costs for labor, material, and daily necessities. Also, transportation and communication are easily performed through advanced nationwide systems. Furthermore, in the U.S. there are no sudden change in policies, such as enforcement of capital localization or expropriation, cancellation of projects after order, freezing of commenced works, or abrupt adaptation of new

Table 3.2: Top 10 Countries by Contracts Won by Japanese Contractors

	1982 Country	($ bil)	1983 Country	($ bil)	1984 Country	($ bil)
1.	Hong Kong	1,109	Singapore	1,198	U.S.	694
2.	Malaysia	885	Malaysia	736	Malaysia	638
3.	Singapore	585	Indonesia	482	Singapore	489
4.	Saudi Arabia	392	Hong Kong	361	Australia	487
5.	Indonesia	256	U.S.	354	Hong Kong	383
6.	Thailand	136	Kuwait	317	Thailand	273
7.	U.S.	98	Australia	248	China	212
8.	Brunei	88	Saudi Arabia	198	Saudi Arabia	196
9.	Sri Lanka	88	Sri Lanka	97	Hawaii	153
10.	East Germany	62	Algeria	87	Indonesia	127

Note: Contracts won in Hawaii is separately listed because of the special nature of Hawaii for Japan. (See 4.4 in Chapter 4.)

Source: 47

Table 3.3: Trends of The U.S., Japanese, and International Markets

($ billion)

	1972	'77	'78	'79	'80	'81	'82	'83	'84
U.S.	125	174	206	230	231	239	237	269	313
Japan		130	197	217	224	228	227	218	221
Int'l			52	62	108	147	123	94	81

Note: Values of U.S. construction reflect new domestic construction put in place.
Values of Japanese construction are total domestic construction.
Values of international construction include the value won by the top 250 international contractors.

Sources: 13.b., 18.a.-h. 47

laws or regulations.

Finally, the U.S. is absolutely free from unrest, revolution, guerrilla warfare, riots, war, and violent racial confrontation within the country. In this chapter, a a review and analysis of the U.S. construction industry, in comparison with its Japanese counterpart, will be made with the objective of considering the U.S. as a market niche for Japanese general contractors.

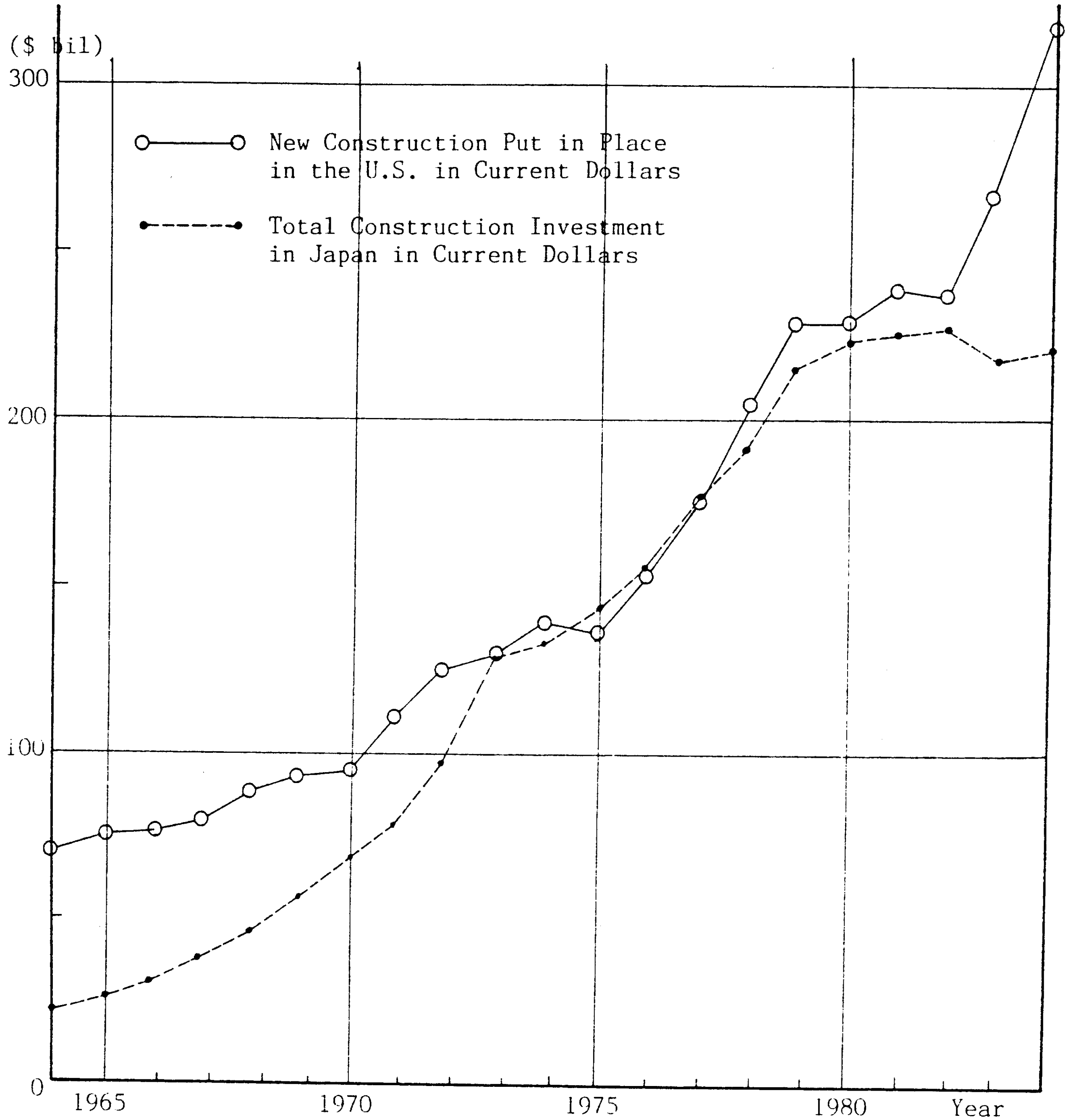
3.1 Scale and Importance of the Construction Industry in the U.S. and Japan

Construction Industry and National Economy

The construction industry is considered to be one of the most important industries in both the U.S. and Japan. The U.S. construction market is the largest in the world, with the value of its new construction put in place amounting to $313 billion in 1984 (See Figure 3.1). The Japanese construction market is the next largest, claiming $220 billion in 1984, about 70% of the value U.S. new construction put in place in the same year.

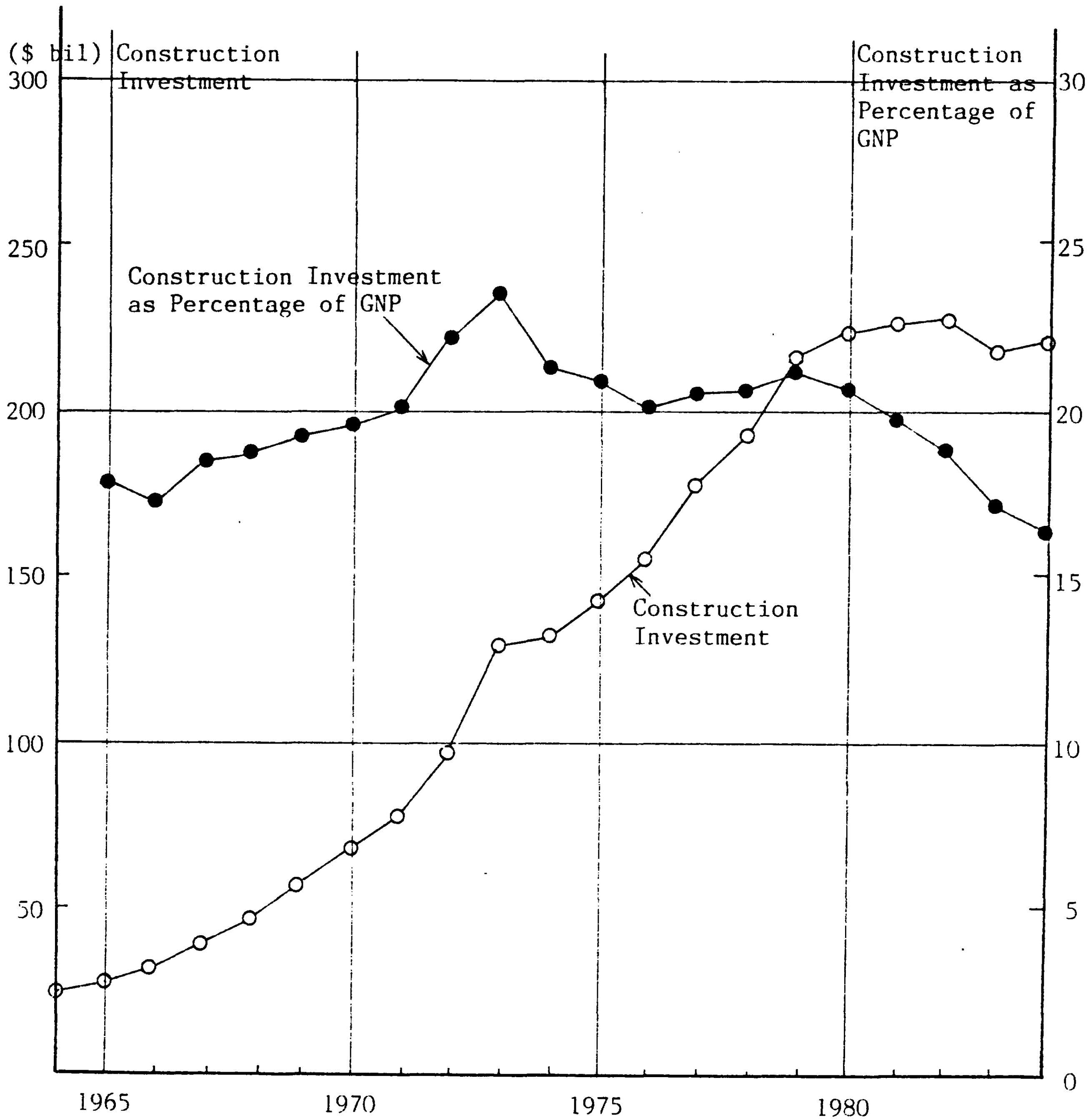
However, the degree of importance of the construction industry in the national economy differs remarkably between the two countries. For example, construction investment was a steady 20% of GNP (Gross National Product) in Japan until 1981, though it declined slowly thereafter (See Figure 3.2). New U.S. construction accounted for around 10% of

Figure 3.1 : Construction in the U.S. and Japan in Current Dollars



Source: 12, 13.a, 48, 58, 13.b

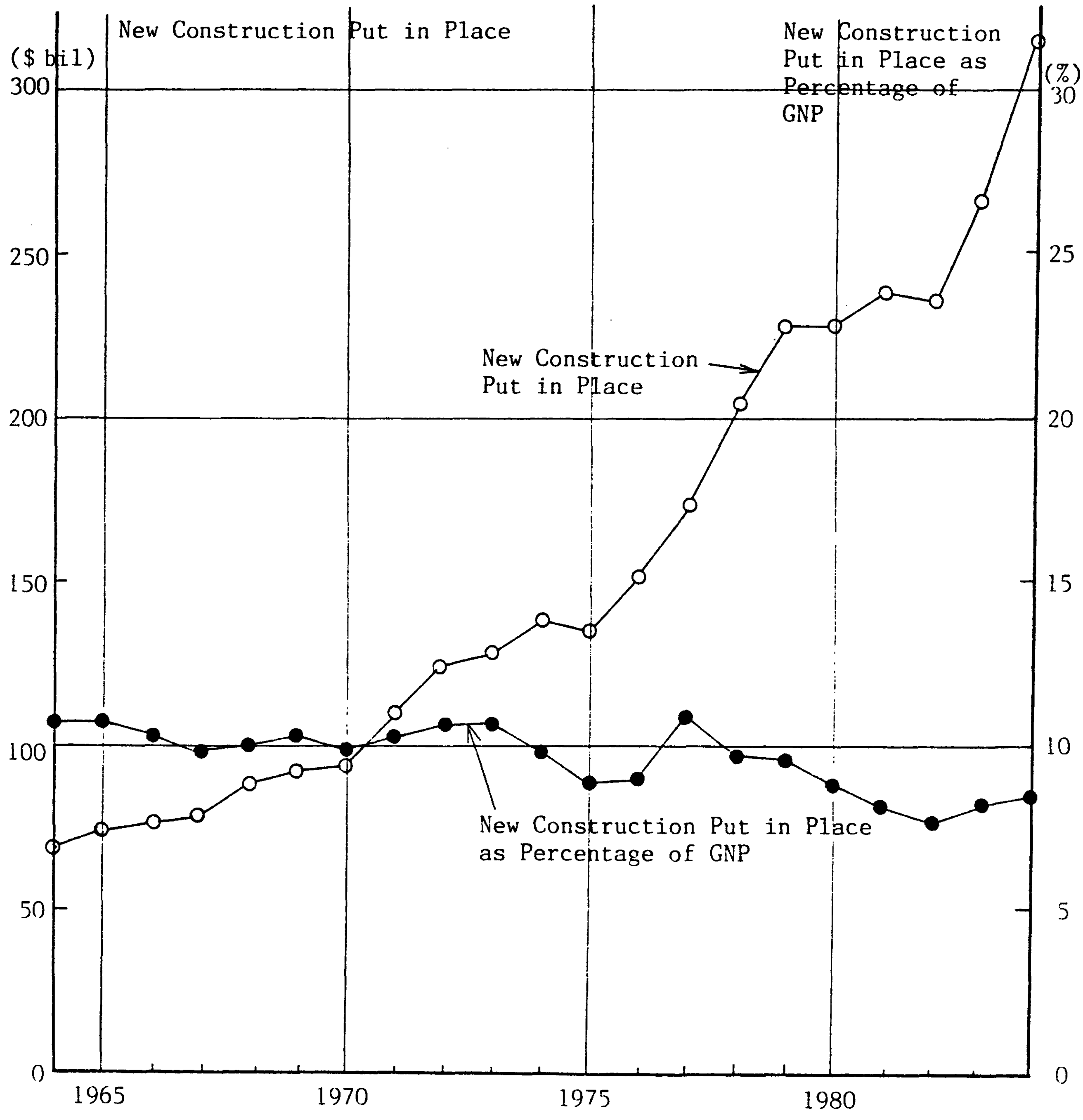
Figure 3.2 : Construction Investment as Percentage of GNP in Japan



Note: $1 = ¥220.54 was used as the exchange rate.

Source: 48, 58

Figure 3.3 : New Construction Put in Place as Percentage of GNP in the U.S.



Source: 12, 13.a, b

GNP until the late 1970s and more recently 8.0 to 8.5% (See Figure 3.3) (1). Table 3.4 graphically represents the difference in percentages of GNP between the two countries. The U.S. had a GNP, 2.9 times larger roughly speaking, than did Japan in 1984 (2.5 times in 1982) while the U.S. new construction was only 1.23 times larger than Japanese total construction (1.04 times in 1982). Therefore, the percentage of Japanese construction compared to GNP was almost twice as large in the U.S. (See Table 3.4).

The greater importance of Japanese construction to Japan's national economy compared to the U.S. situation is also evident comparison when input-output tables of both countries are compared. Table 3.5 shows the inputs to the construction industry in the form of intermediate products from other industries as percentages of other industries' total outputs. The larger the percentages of the outputs to the construction industry are, the more dependent the production of such industries are on the construction

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(1) The volume of maintenance and repair (M&R) work accounts for a considerable portion of the total U.S. construction. However, because statistics relating to M&R work are scarce, it is very difficult to determine its exact figures. According to a calculation in Construction Review (Sept/Oct 1985), M&R receipts increased from $10.5 billion in 1967 (14% for the total construction receipts in the U.S.) to $35 billion in 1977 (19% for the net construction receipts). Furthermore, during the past decade, M&R and other works that are not categorized as new construction, such as commercial/industrial renovation or hazardous waste clean-up, have grown rapidly (Source: 13.a). Therefore, the U.S. "total" construction as percentage of GNP could be a little higher than the percentage for only "new" construction, probably higher by around 2% assuming that M&R work accounts for 20% of new construction put in place.

Table 3.4: Scale of Construction Industry for the National Economy in the U.S. and Japan

U.S.				Japan		
		($ billion)	*			($ billion)
GNP	(1983)	3,304.8	*	GNP	(1983)	1,263.2
	(1982)	3,069.3	*		(1982)	1,212.1
			*			
New Construction Put in Place	(1983)	268.9	*	Construction Investment	(1983)	217.5
	(1982)	236.9	*		(1982)	227.0
		(%)	*			(%)
New Construction Put in Place as Percentage of GNP	(1983)	8.1	*	Construction Investment as Percentage of GNP	(1983)	17.2
	(1982)	7.8	*		(1982)	18.7

Note: New construction put in place was used for U.S. construction whereas construction investment was used for Japanese construction.

Source: 13.a., 47, 59, 70

Table 3.5: Input from Other Industries to Construction Industry in the U.S. and Japan

U.S.: (1977)	Input from Other Industry to Construction Industry ($ million)	Percentage for Each Industries' Total Output (%)
from Mining Other Than Metal	2,115	9.0
Wood Products & Furniture	18,688	33.6
Chemicals & Chemical Products	3,489	3.1
Petroleum & Coal Products	7,137	7.2
Rubber, Plastics & Leather	3,040	6.5
Stone, Clay & Glass Products	15,913	46.0
Primary & Fabricated Metals	32,460	17.2
Machinery, except Electrical	5,657	4.8
Electrical Equipment & Supplies	7,216	8.1
Transportation and Trade	28,945	5.7

Japan: (1980)		
from Mining Other Than Metal	5,045	52.5
Miscellaneous Textile Products	1,522	19.3
Wood, Wooden Product Mfg	12,961	57.7
Furniture & Fixture	4,235	28.8
Coal Products	1,550	13.8
Stone, Clay & Glass Products	21,615	57.8
Iron and Steel Rolled Products	7,839	11.9
Cast and Forged Steel Products	1,212	6.9
Basic Non-Ferrous Products	3,031	14.5
Metal Products	22,035	46.7
Machinery except electrical	5,834	5.6
Heavy Electrical Apparatus	1,271	8.0
Miscellaneous Industrial Products	3,478	9.4
Gas Supply	363	5.6
Wholesale and Retail Sale	16,136	6.9
Real Estate Rental	1,406	6.5
Transport except Private	4,961	5.3
Private Transport	4,701	8.8
Other Communication Services	1,004	6.3
Others	2,947	8.8

Source: 44, 59

industry. For example in the U.S. in 1977, output from the "Stone, Clay, and Glass products" industry to the construction industry accounted for 46% of the total output of the industry. Outputs from "Wood Products and Furniture", "Primary and Fabricated Metals", "Mining Other Than Metal" and "Electrical Equipment and Supplies" industries accounted for 33.6%, 17.2%, 9.0%, 8.1% respectively.

In contrast, there were, in Japan, three industries which had higher percentages. For example, outputs to the construction industry from "Mining Other Than Metal", "Wood Mining, Wooden Product Manufacturing", and "Stone, Clay, and Glass Products" accounted for more than 50% of total outputs to construction in 1980. Five more industries recorded more than 10%. Although the difference in the number of industries recorded in the two input-output tables (U.S.--23 industries vs. Japan--72 industries) has to be taken into consideration, the contributions that the construction industry is making to other industries in Japan were obviously much greater than the contributions of the U.S. construction industry to other U.S. industries.

In terms of national employment, again the Japanese construction industry has been making much more contributions to Japanese national employment than has U.S. construction to the national employment in the U.S.. There are 5.4 million employees and workers in the Japanese construction industry in 1983 compared to 5.1 million in the

U.S. construction industry in the same year. Japan and the U.S. have almost the same number of people in the construction industry, but Japan has half the population of the U.S.. Therefore, the Japanese construction industry employed 8.9% of the total workforce in 1984 compared to 4.9% in the U.S. (See Figure 3.4). The percentage in Japan had increased until 1980, but has been rapidly decreasing since then, while the percentage in the U.S. has been on a gentle downward trend since 1965.

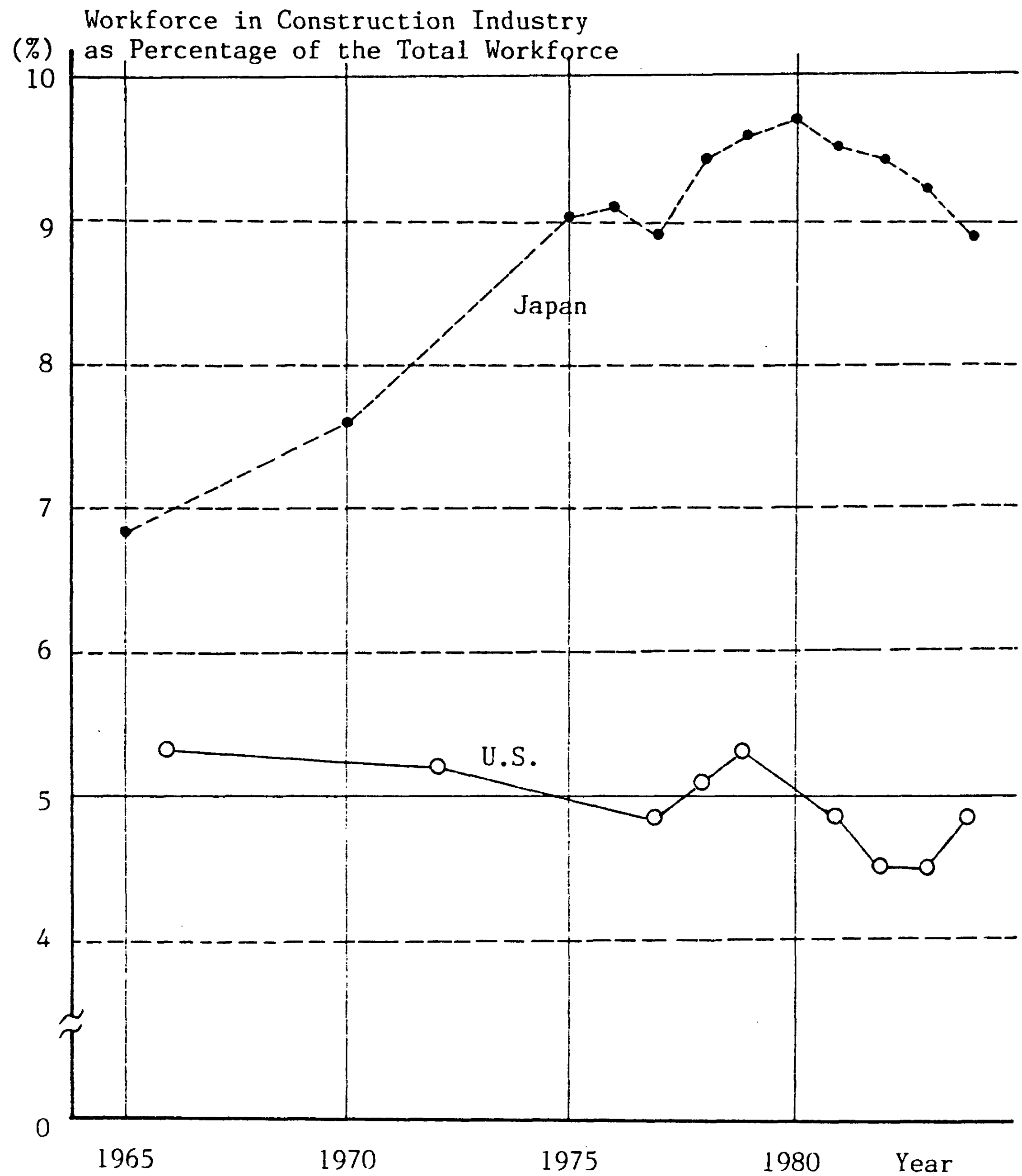
It is clear that the construction industry in Japan is playing a more important role in its national economy than is the U.S. construction industry in the U.S. economy. One of the reasons has been Japan's energetic efforts to reconstruct the nation's destroyed infrastructure, facilities, and residences in a relatively short period following World War II. Also, the stock of the social resources already accumulated in the U.S. has been making construction less important in the U.S. than it is in Japan.

3.2 Characteristics of U.S. and Japanese Construction Markets, Industries, and Firms

3.2.1 General Trend of U.S. and Japanese Construction Markets

The domestic construction volume in the U.S. in real term has remained within a certain range since 1965, but it fluctuated considerably in two- to four-year cycles. In

Figure 3.4 : Workforce in Construction Industry as Percentage of the Total Workforce in the U.S. and Japan



Source: 47, 48, 58, 66

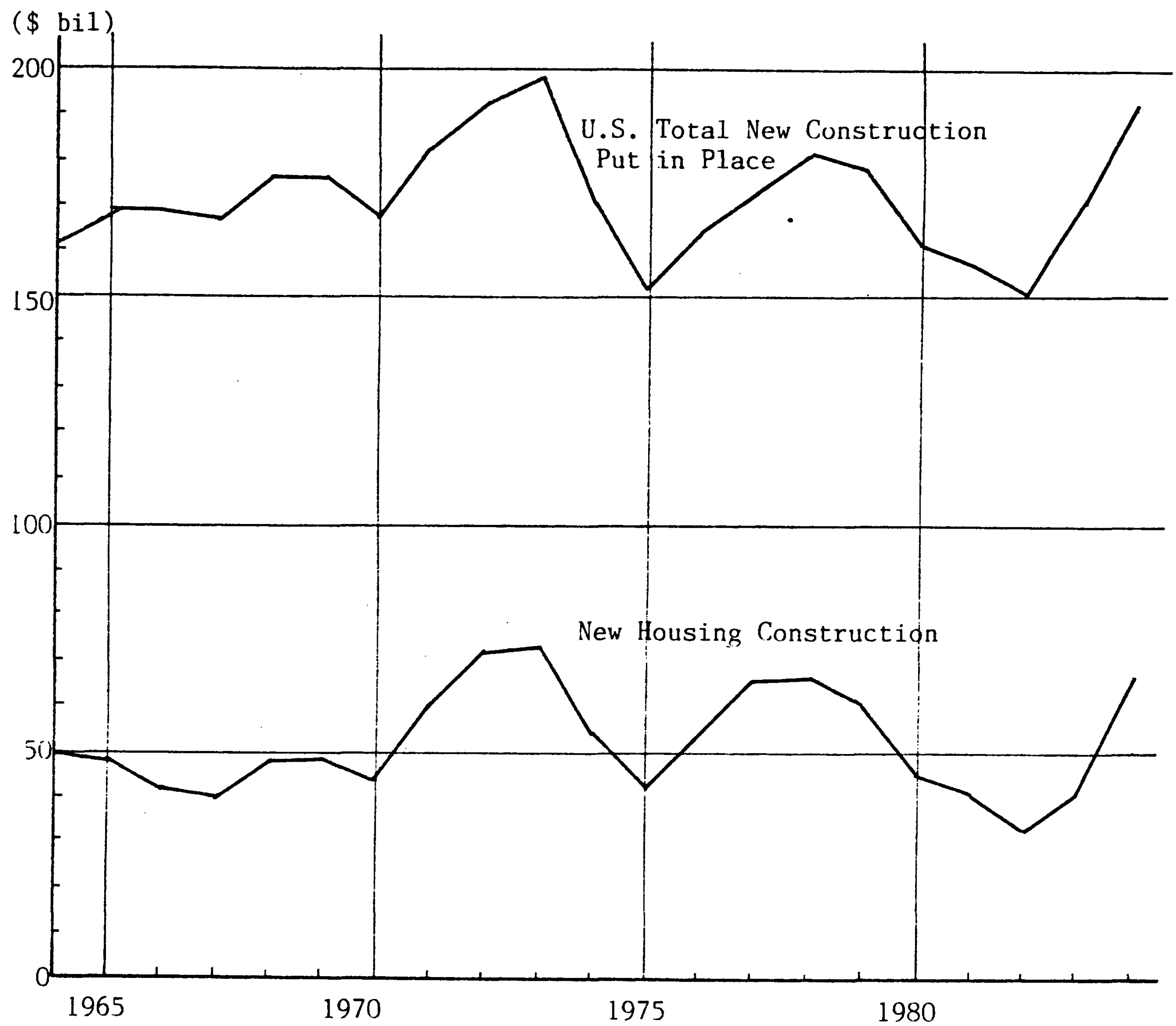
contrast Japanese domestic construction volume in real terms had grown at a significantly high rate until the oil crisis of 1973. However, it has been on a downward trend, especially after 1980.

Figure 3.5 shows total new construction put in place in the U.S. in 1977 constant dollars. While the amount has remained within the range of $150 and $200 billion, it has fluctuated cyclically. There were at least three major lows, in 1970, 1975, and 1982 and two peaks in 1973 and 1978. After the lows of 1982, U.S. domestic construction has been on a steep upward curve.

As clearly indicated in Figure 3.5, the fluctuation of U.S. new construction in dollar value corresponds exactly to the fluctuation of new private housing construction in dollar value. Annual changes in total construction spending equals variation in housing construction. Ups and downs in all U.S. domestic construction are highly influenced by the ups and downs of new housing construction. Construction other than new housing is stable in the U.S..

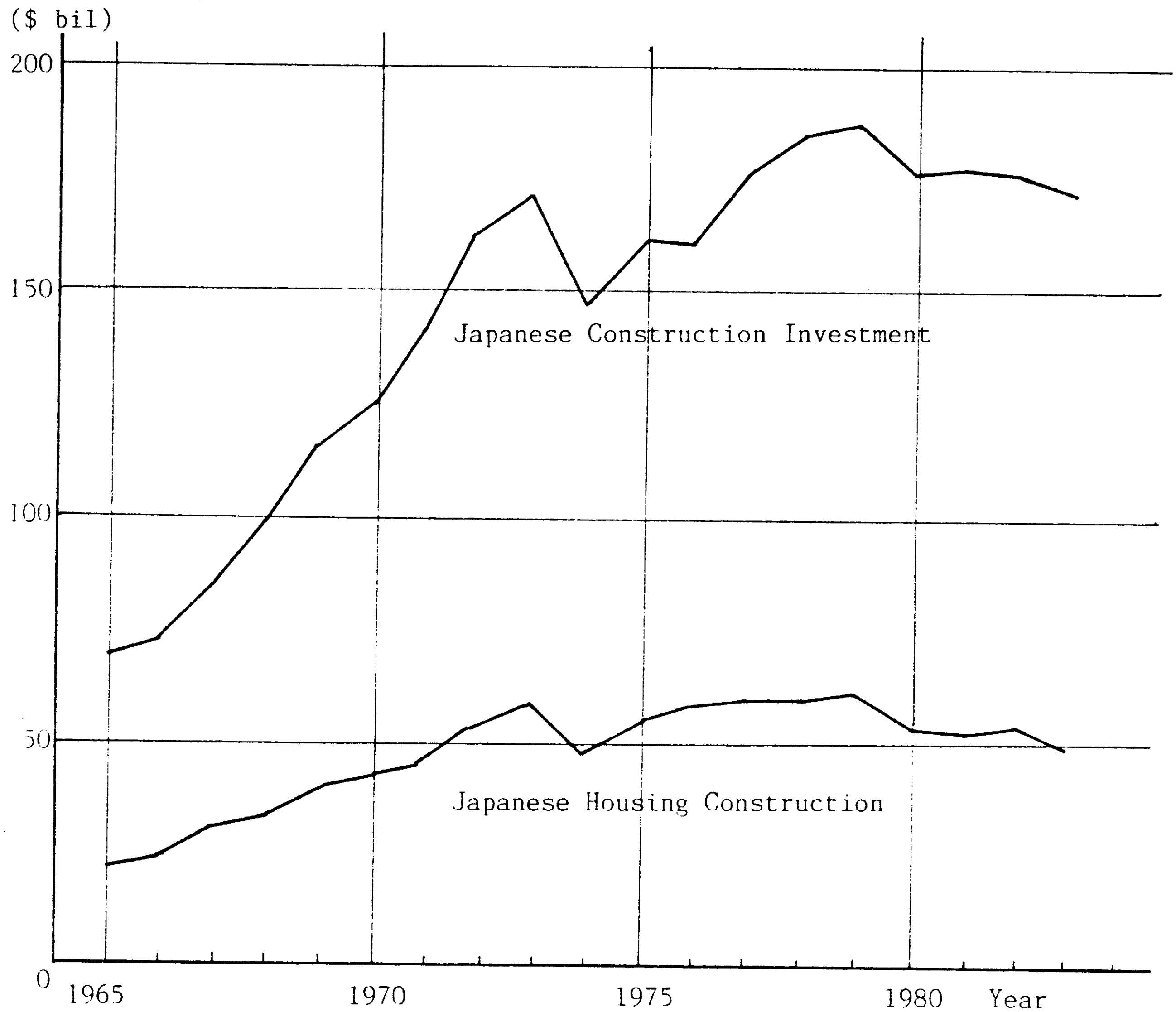
Japanese domestic construction, as stated in the previous chapter, had shown tremendous growth until the oil crisis. (See Figure 3.6) Its value almost tripled in real terms between 1965 and 1973. After the sudden drop in construction demand caused by the oil crisis, the Japanese construction market expanded again, but more slowly compared to the rate before the oil crisis. After the second oil crisis in 1980, the Japanese domestic

Figure 3.5 : U.S. Total New Construction Put in Place and New Housing Construction in 1977 Constant Dollars



Source: 13.a, b

Figure 3.6 : Japanese Construction Investment and Housing Construction in 1977 Constant Dollars



Note: $1=¥220.54 was used as the exchange rate.

Source: 48,58

construction market has been slowly shrinking in its scale.

Japanese housing construction investment has characteristics quite different from U.S. housing construction. As indicated in Figure 3.6, changes in the annual rate of Japanese housing construction are moderate and proportional to that of Japanese total construction investment. Unlike in the U.S., the change in housing construction in dollar value is not necessarily equal to the change in construction investment in dollar value.

3.2.2 Components of U.S. and Japanese Construction Markets

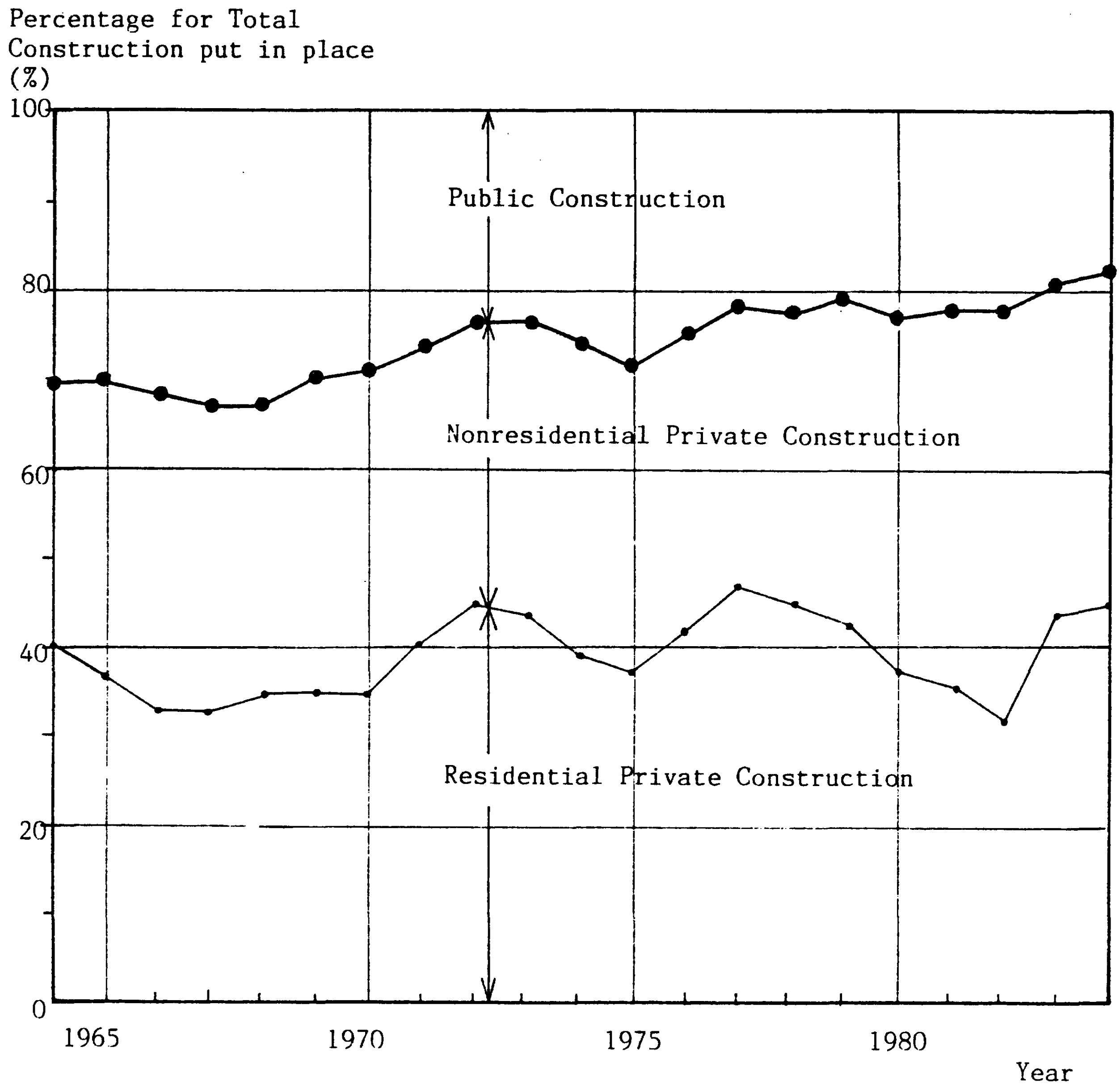
(U.S. Construction Market)

Public construction in the U.S. accounted for 30% of total construction in 1965. However, since then, its share has been decreasing. Public construction in the U.S. accounted for below 20% in 1984 (See Figure 3.7).

Conversely, U.S. private construction has been gaining shares and accounted for 80% in 1984. Among U.S. private construction, residential private construction is the largest category. It has been accounting for around 40% of the U.S. total new construction on average though it has been fluctuating between 30 to 50% of the total new construction. Private residential construction is more than half of U.S. private construction.

The same thing can be said in the classification of building and non-building construction. Although building

Figure 3.7 : Rough Breakdown of U.S. New Construction Put in Place



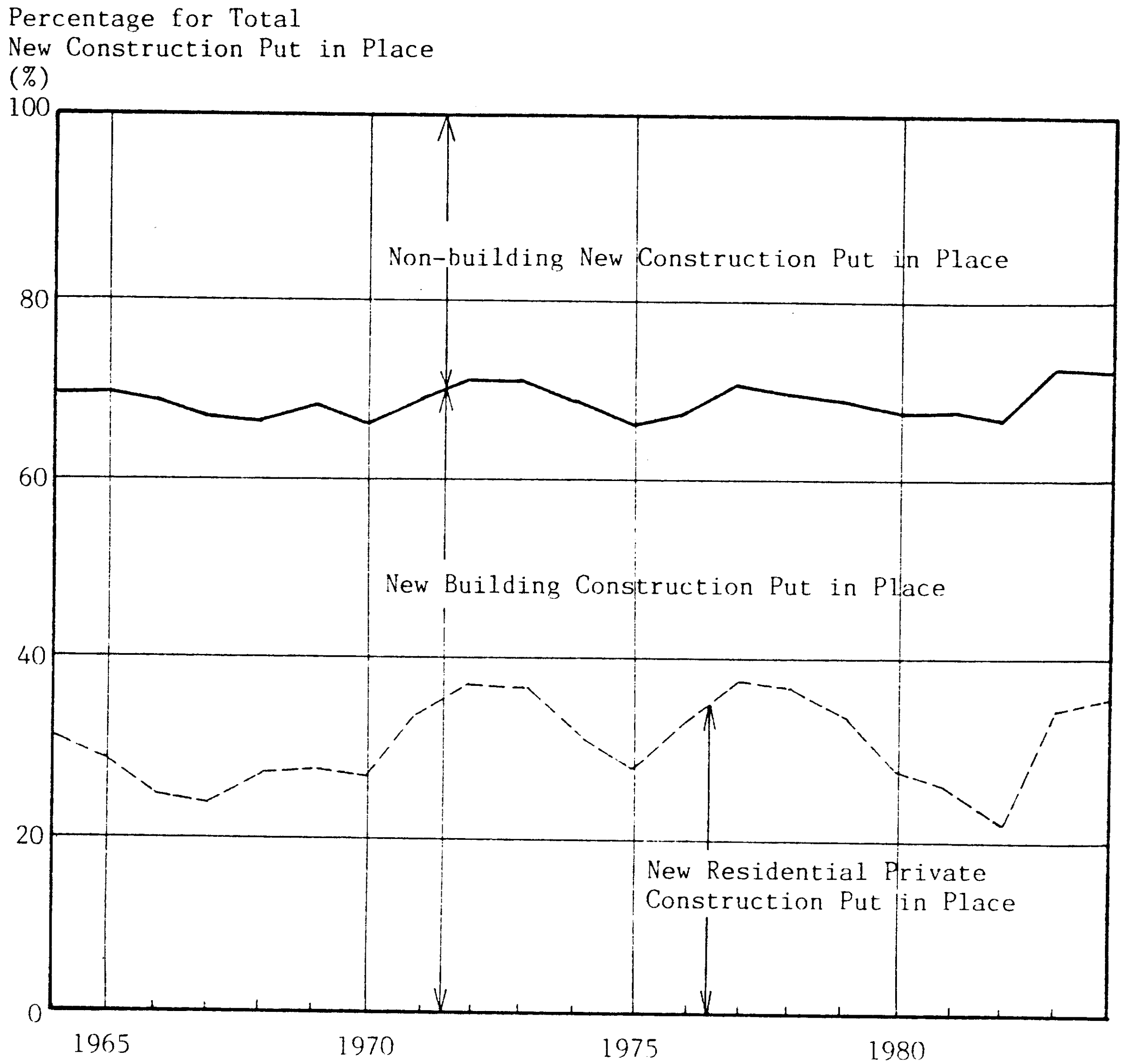
Source: 13.a, b

construction has been accounting for 70% of the total construction constantly, only private residential construction fluctuated a lot (See Figure 3.8). As mentioned already, ups and downs in the U.S. new housing construction exactly parallel variation of total U.S. new construction. New housing construction is not only the largest but also the most influential type of construction in the entire U.S. construction industry.

The fluctuation in new housing construction in the U.S. is related to loan interest rates and, more closely, to the entire economic situation in the U.S. Figure 3.9 shows the relationship between U.S. new housing construction and interest rates. In the period of 1965 - 1984, there were three highs and three lows in the new housing construction in the U.S. The three highs occurred in 1973, 1978, and 1984 (1984 might be in the middle of an upward slope) for and the lows in 1970, 1975, and 1982. When interest rates for new-home mortgage loans went up and stayed at a high level, the rate of new house construction fell. When interest rates for mortgage loans became relatively low and flat, new housing construction went up one or two years after the rates came down.

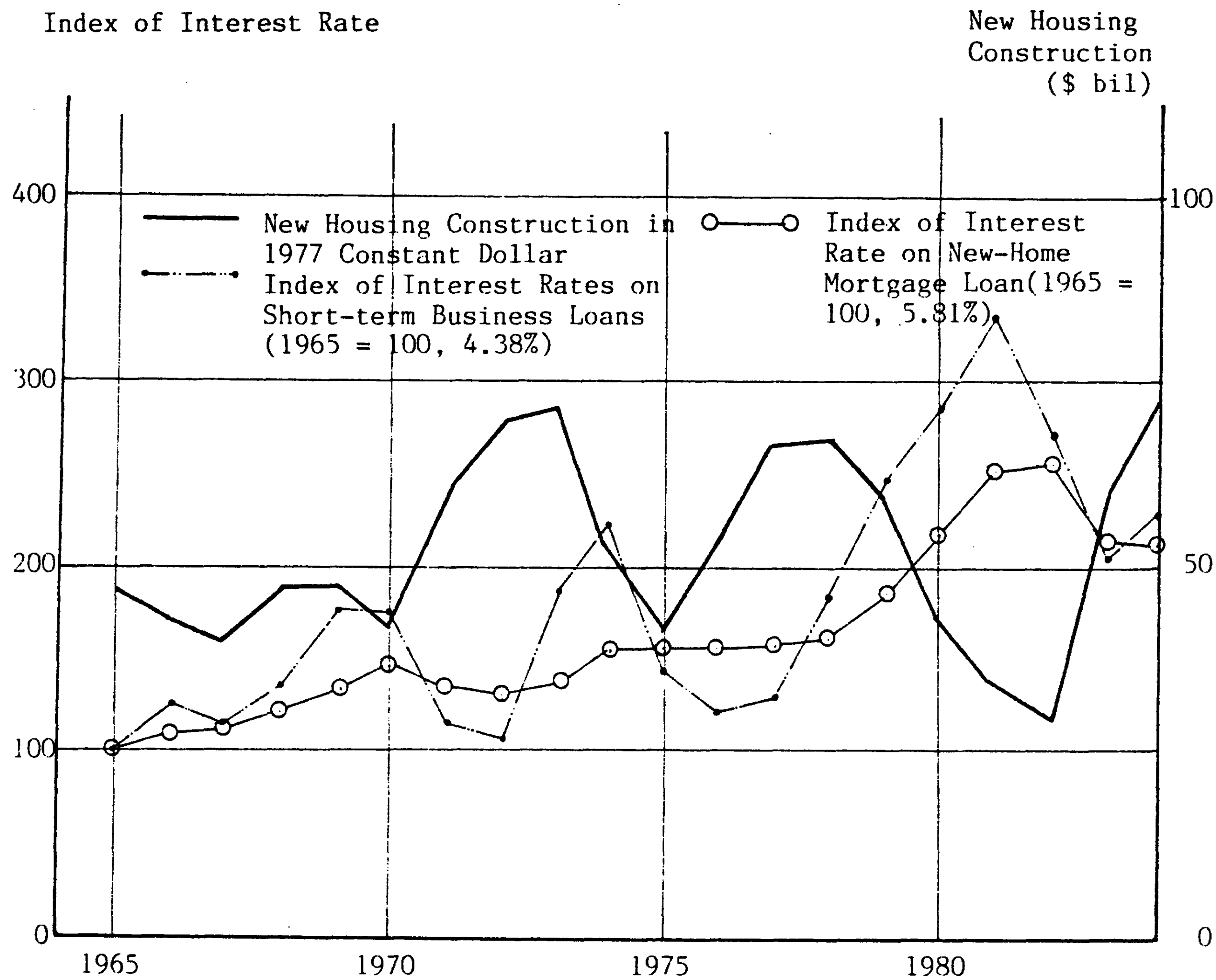
However, the movement of interest rates for new-home mortgage loans does not entirely explain the mechanism of the upward movements in new housing construction. For instance, the movements in the period of 1970-1973, 1975-1978, and 1982-1984 do not fit the above pattern exactly.

Figure 3.8 : Building and Non-building New Construction in the U.S.



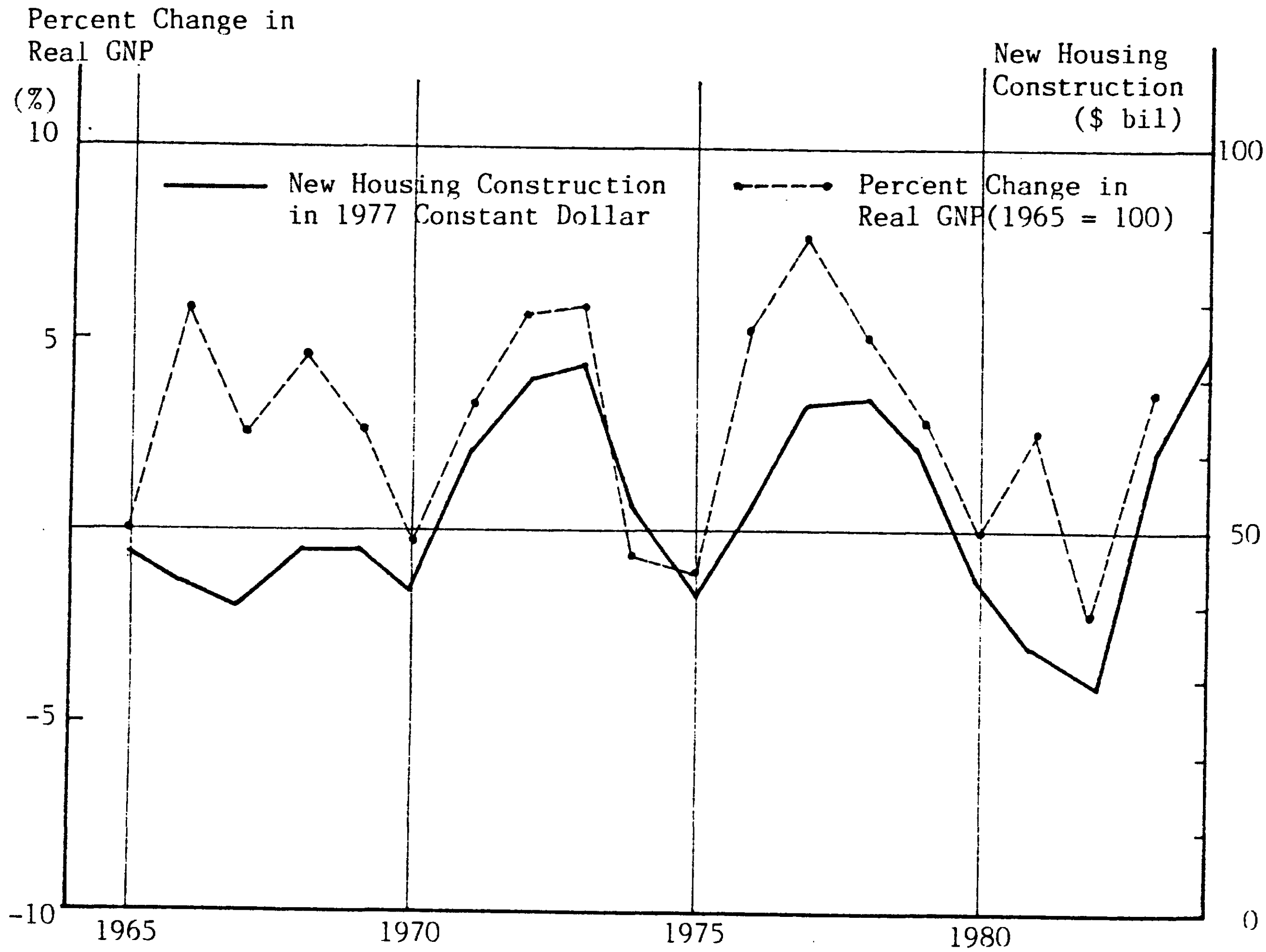
Source: 13.a, b

Figure 3.9 : New Housing Construction and Interest Rate in the U.S.



Source: 12, 13.a, b, 70

Figure 3.10 : New Housing Construction and Change in Real GNP in the U.S.

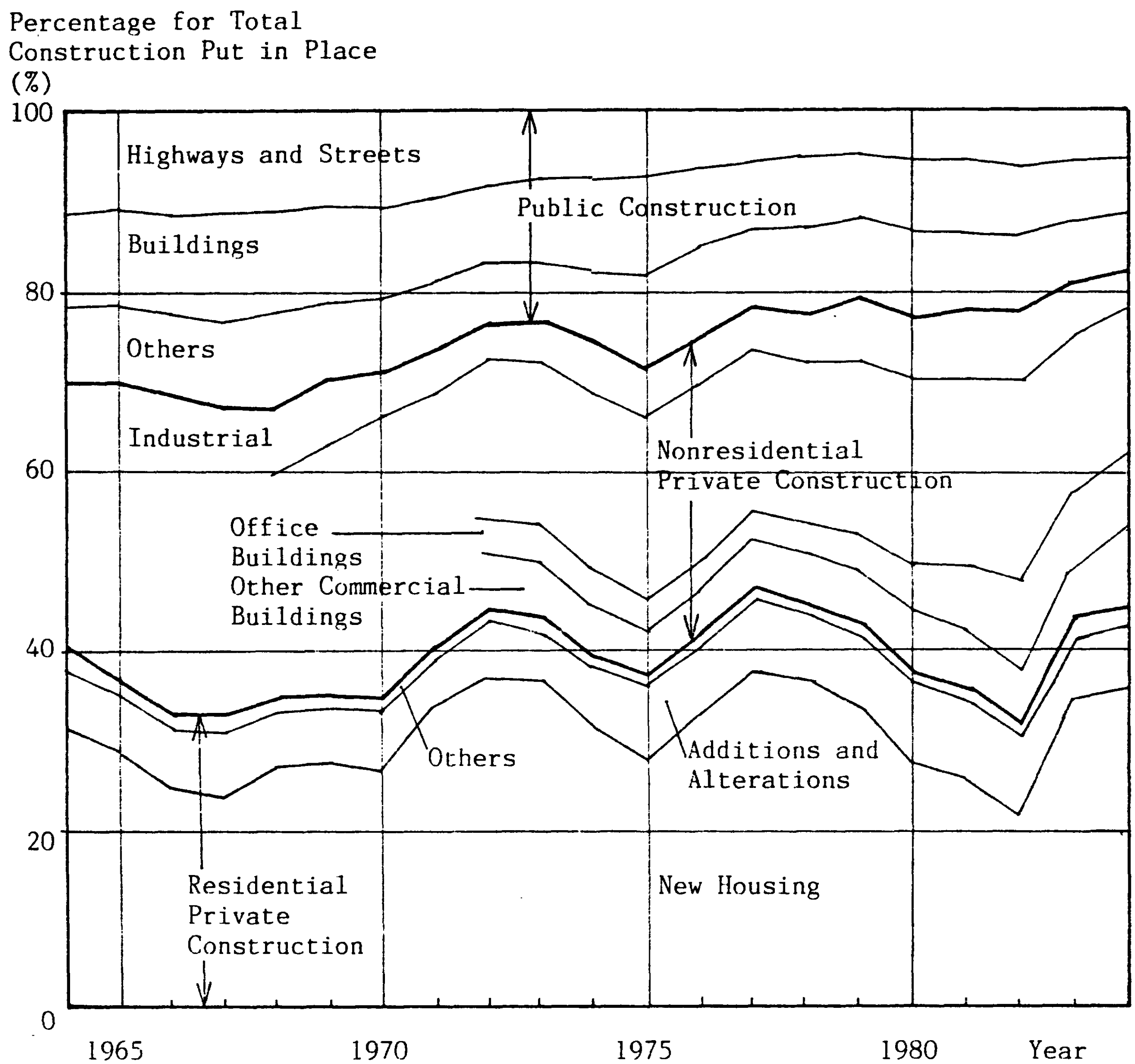


Source: 13.a,b

Figure 3.10 illuminates remainder of the story; it shows that fluctuations in new housing construction exactly corresponds to the changes in the GNP of the U.S. The relationship may be as follows: When the economy is faltering, overall interest rates are dropped to stimulate investment and activate the economy. The consequent upturn in the entire U.S. economy relieves peoples' uncertainty for the future and encourages them to invest in new houses. Also, during a period of economic upturn in the U.S., interest rates for new-home mortgage loans drop and stabilize, as an effect of lower overall interest rates. Low-cost mortgages certainly contribute to the economic optimism of households considering investment in a new home. As the economy reaches its peak and begins to decline, people who are still undecided abandon the idea of investment in housing, because they feel uncertain about the future. Finally, the value of housing construction declines as the houses already under construction are completed one after another. In the U.S. housing construction closely reflects changes in the overall U.S. economy, not simply the movements of interest rates on mortgage loans.

Among U.S. non-residential private construction, the fastest growing categories have been office buildings and other commercial buildings, especially after 1981 (See Figure 3.11). The new tax law enacted in 1981 precipitated so much investment in construction in these two categories because it offered attractive tax shelters for

Figure 3.11 : Breakdown of U.S. New Construction Put in Place



Note: Data on industrial construction before 1968, office buildings and other commercial buildings before 1972 are not available. Others in public construction include military facilities, conservation and development, sewer systems, and water supply facilities. Others in nonresidential private construction include religious buildings, educational, hospital and institutional buildings.

Source: 13.a, b

depreciation and investment tax credit. Although the U.S. construction market is facing less attractive potential tax law changes in the near future, investment in these two categories is still active as of early 1986 as investors hurry to take advantage of the existing tax law.

Other incentives which have affected non-residential private construction recently include more easily availabile financing, such as lower yields on corporate bonds and short-term business loans compared to yields at the beginning of 1980s; surging business profits accompanying the overall economic boom in the U.S. after 1982; and the record-high inflow of foreign capital to the U.S. (Source: 17.a., b.)

Seventy percent of non-residential private construction has been recently performed in southern and western regions of the U.S., such as California, Arizona, Texas, and Georgia. (Source: 13.a.)

Among U.S. non-residential private construction, industrial facilities construction increased between 1972 and 1982, but is decreasing after 1982. The key in this category of construction may be the solid growth of the U.S. economy and general improvement of U.S. manufacturers' competitiveness. Depreciation of the foreign exchange value of the dollar will also help.

In public construction in the U.S. before 1970, new highway and street construction accounted for more than 10% of U.S. total construction. However, after the completion of the nationwide highway system at around 1970, this market declined rapidly and has provided only 3% of the total U.S. construction market. Public building construction has been slowly and continuously declining since 1965.

(Japanese Construction Market)

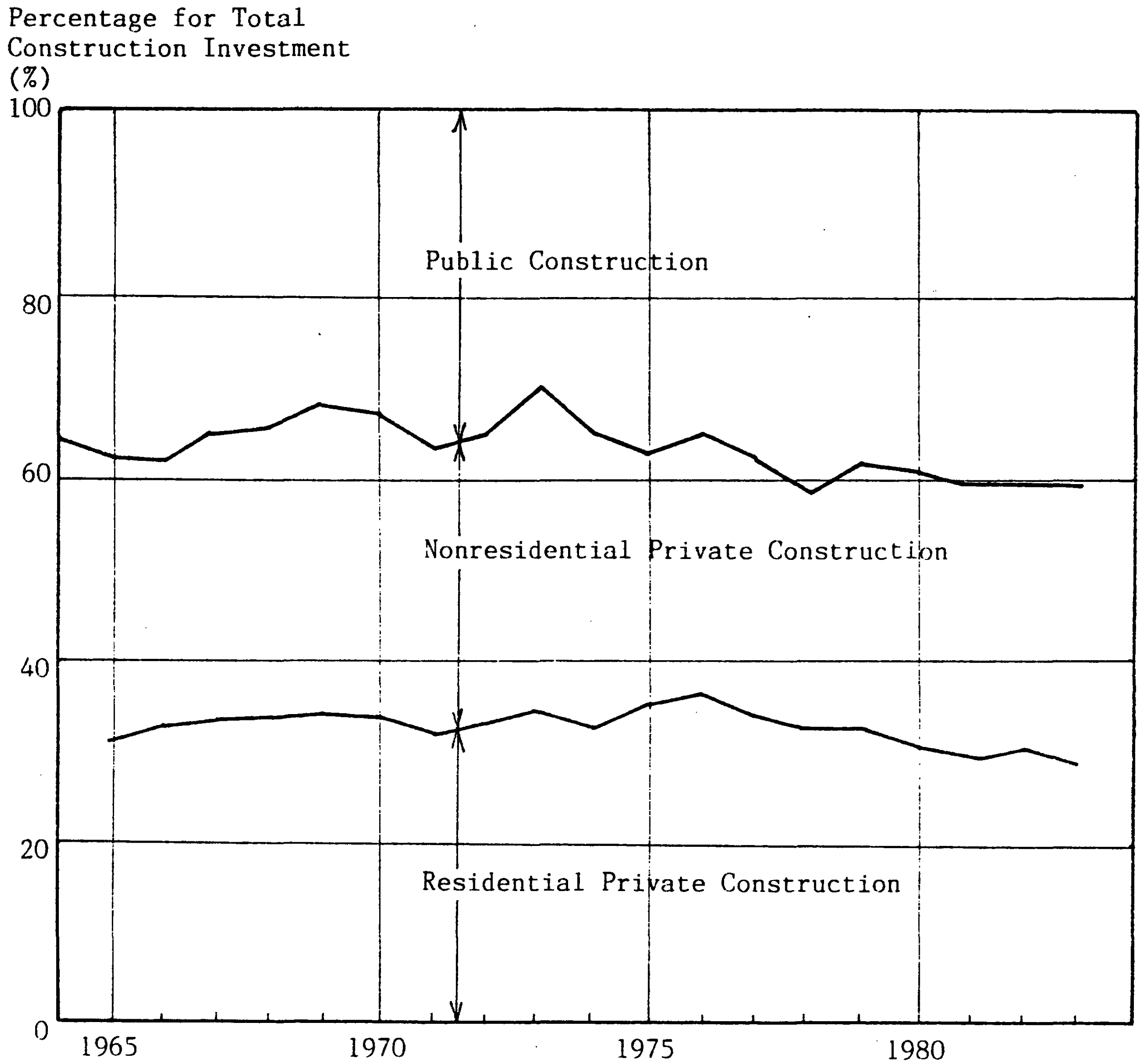
Because the details of the components of the Japanese construction market have been discussed already as part of the discussion of fluctuations in all Japanese industries in Chapter 2, only a general overview of Japanese construction market is necessary here.

Private construction in the Japanese construction market had been increasing until the oil crisis of 1973, supported by energetic construction investment in non-residential private construction (See Figure 3.6). Private construction investment recorded its peak and accounted for 70% of total construction investment in 1973 (See Figure 3.12). Since 1973, however, the share of private construction in total construction investment has been declining continuously. Its share has reached slightly below 60%.

Conversely, public construction has been increasing since 1973 and has been accounting for more than 40% of Japanese total construction investment recently.

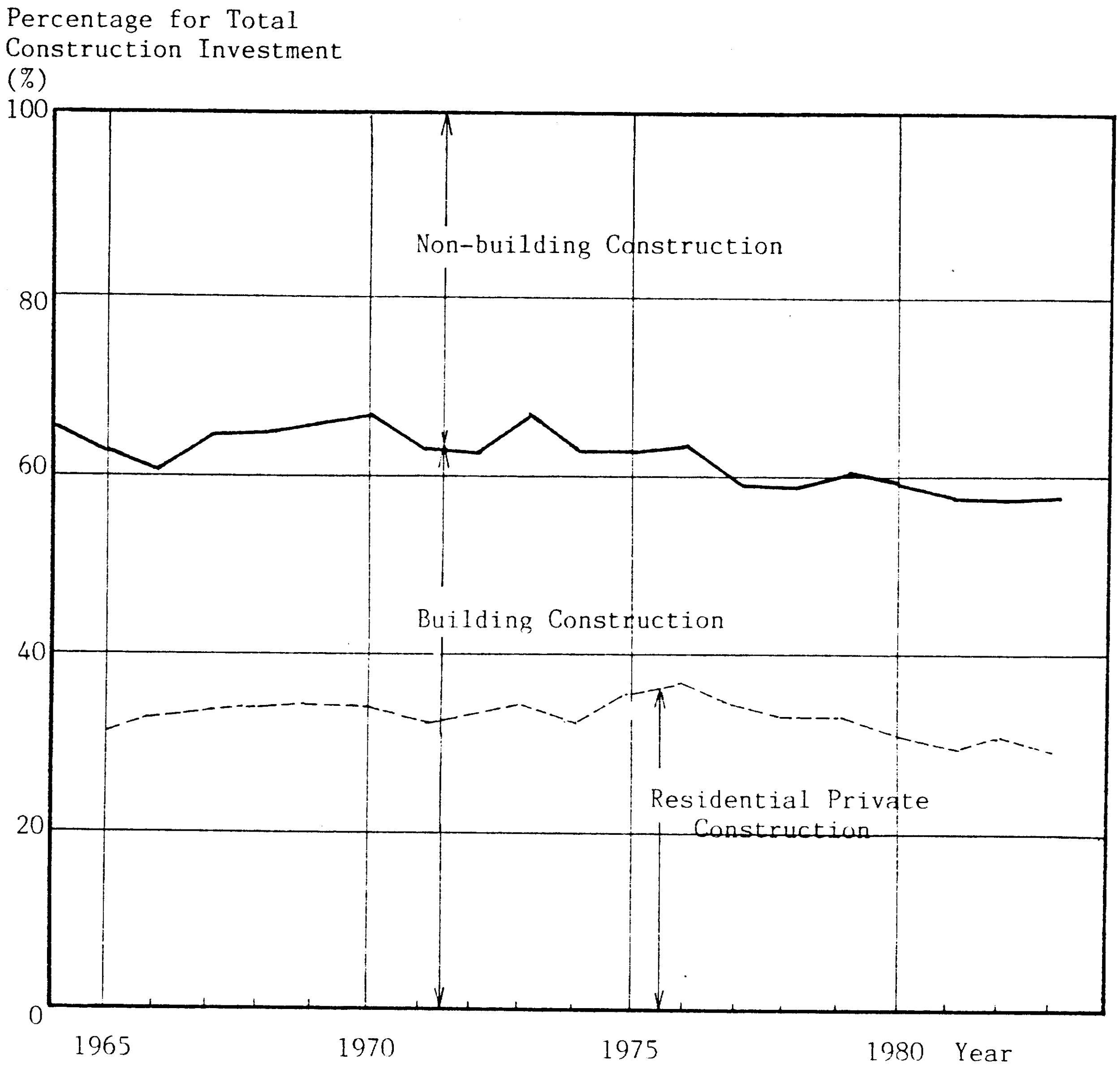
Fluctuations in building construction in Japan have followed almost exactly the activity in private construction

Figure 3.12 : Rough Breakdown of Construction Investment in Japan



Source: 48

Figure 3.13: Building and Non-building Construction in Japan



Source: 48

as a whole because a large portion of non-building construction has been offered by public sector (See Figure 3.13).

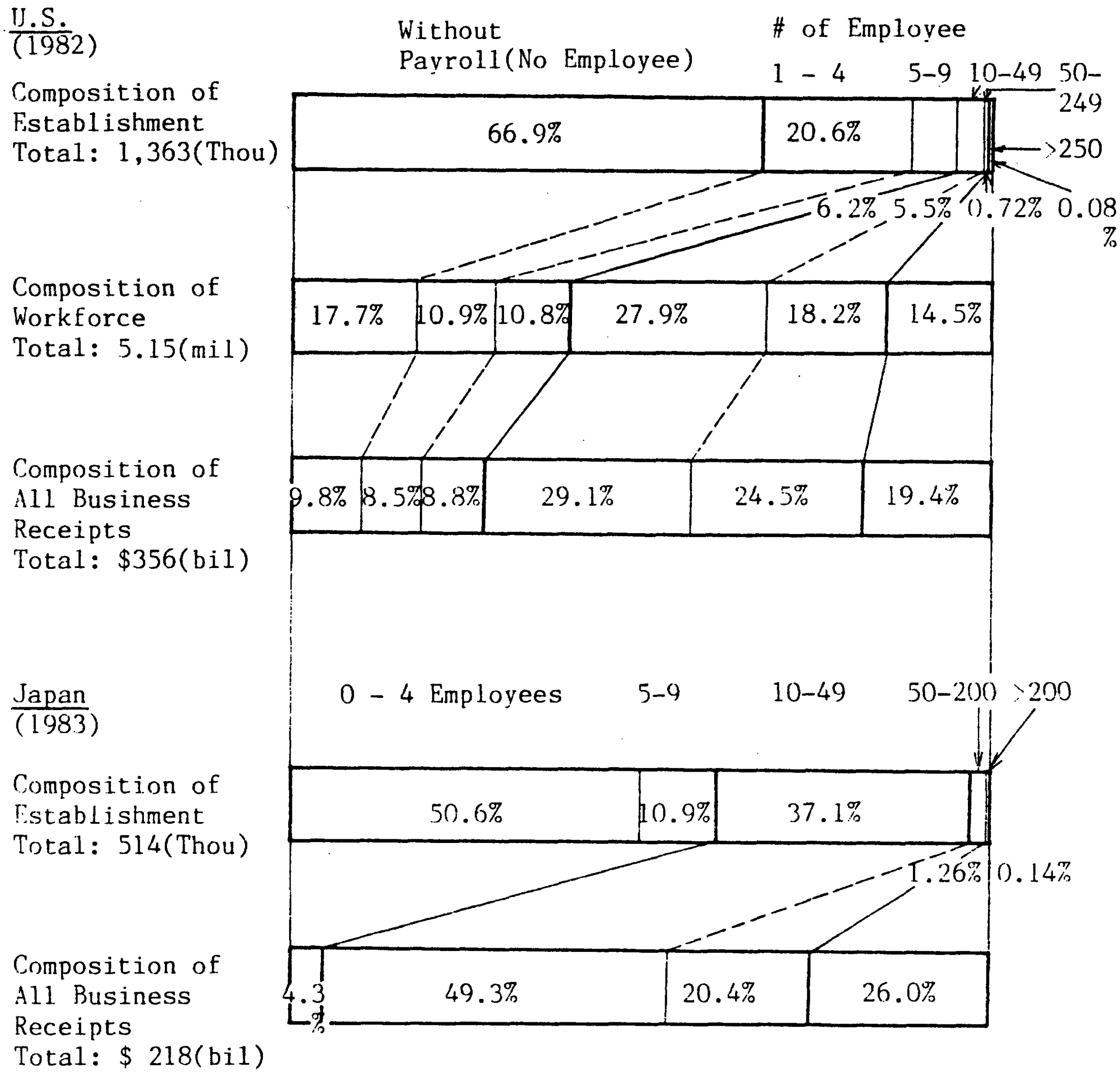
Residential private construction in Japan has been proportional to the movement of Japan's total construction investment as mentioned already. Private residential construction had been almost half of non-residential construction until 1973, but it has accounted for more than half since then. However, the share of private residential construction has been declining also since around 1975 although not as significantly as non-residential private construction.

3.2.3 Structure of the Construction Industry

The construction industry is highly fragmented both in the U.S. and Japan, but more so in the U.S. There were 1.36 million establishments in the U.S. construction industry in 1982. Of these, 66.9% reported no payroll, that is, they were very tiny firms having no employees (See Figure 3.14). In addition, establishments with 1-4 employees accounted for 20.6% and establishments with 5-9 employees accounted for 6.2% of the total establishments. Taken together, 93.7% of the total establishments in the U.S. construction industry were small firms with less than 10 employees.

Only 0.08% of the establishments were large firms with

Figure 3.14 : Industry Structure by Number of Workforce in the U.S. and Japan



Note: Composition of workforce of Japan is not available.

Source: 12.c

more than 250 employees. Medium-sized firms (with 10 - 249 employees) were also scarce, accounting for 6.22%. However, the 93.7% of small firms employed only 39.4% of the total workforce of 5.15 million and shared only 27.1% of total business receipts in the construction industry. Large firms, only 0.08% of establishments, employed 14.5% of the total workforce and shared 19.4% of total business receipts in the industry. The performance of medium sized firms is also interesting. With 6.22% of all establishments, they employ 46.1% of the workforce and accrue 53.6% of total receipts in the industry.

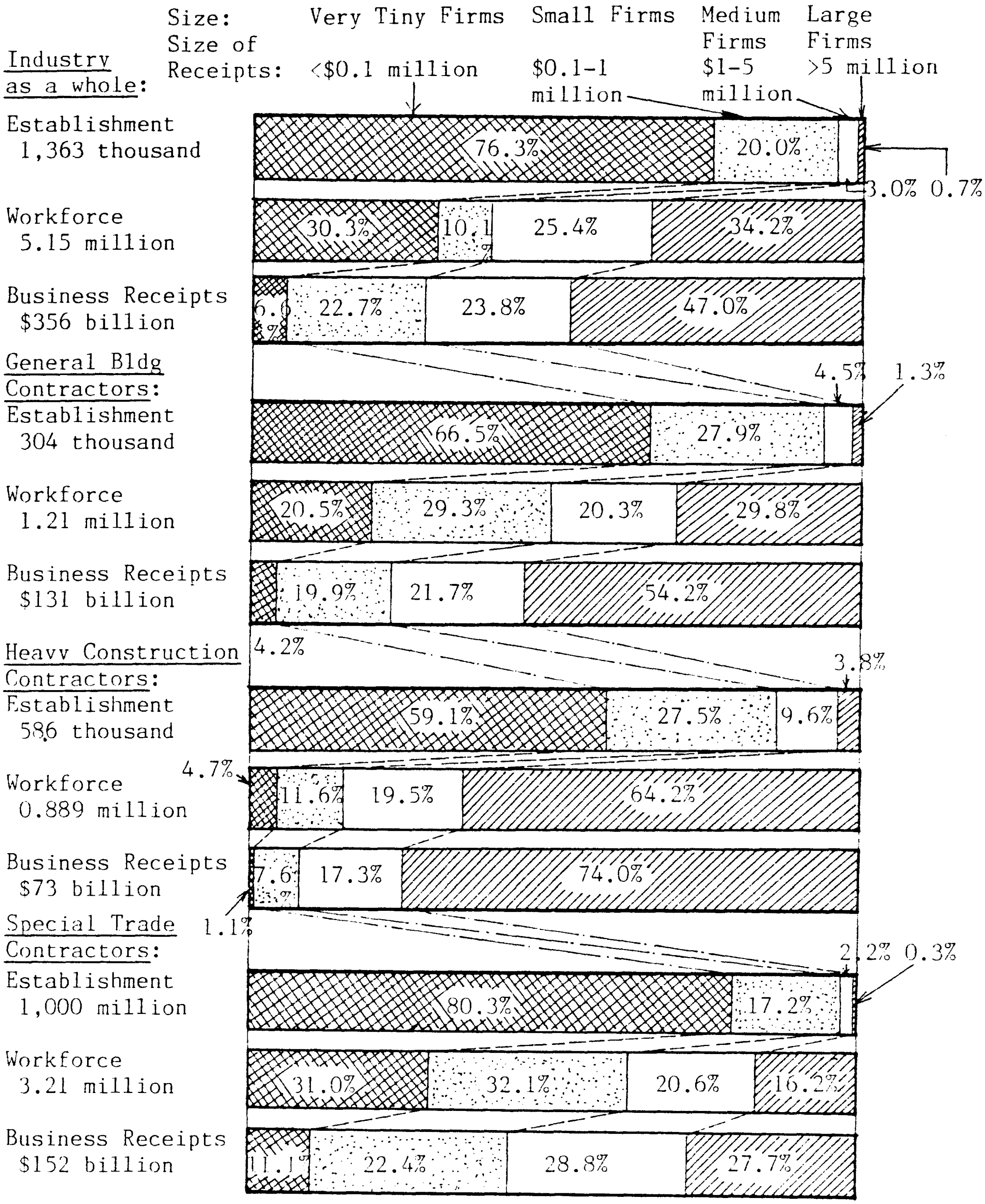
Firms may be classified in greater detail on the basis of total receipts (See Figure 3.15). In Figure 3.15, establishments are classified as;

Very tiny firms	:	annual receipts	-- below 0.1 mil
Small firms	:	"	-- \$0.1 mil-\$1 mil
Medium sized firms	:	"	-- \$ 1 mil-\$5 mil
Large firms	:	"	-- over \$5 mil

In the industry as a whole, similar proportions characterize the number of workforce of firms in each group. Very tiny and small firms comprised 96.3% of all establishments in 1982. They accounted for 40.4% of the total workforce, and 29.3% of the total business receipts. Large firms included 0.7% of all establishments. These firms accounted for 34.2% of the total workforce and 47.0% of the total business receipts.

Fragmentation was especially significant among special trade contractors. One million out of 1.36 million

Figure 3.15: Detailed Construction Industry Structure in the U.S.(1982)



Source: 12.c

establishments were special trade contractors. Among special trade contractors, 97.5% were very tiny to small firms. General building contractors are similarly fragmented as indicated by the large number of small residential builders in this category.

The least fragmented were heavy construction contractors. Although many small firms existed in this category (86.6%), large firms accounted for 3.8% of the total establishments, 64.2% of the total workforce, and 74.0% of the total business receipts.

In the construction industry in Japan, there were 514,000 establishments, 37.7% of the total number of establishments in the U.S.. Of the total number of construction firms in Japan, 61.5% fell into the "small" category of establishments with less than 9 employees (See Figure 3.14). These firms shared only 4.3% of the total business receipts of the construction industry. Large firms with more than 200 employees accounted for 0.14% of the total establishments, but 26% of the total business receipts.

Also significant in the construction industry in Japan were medium-sized firms with 10-200 employees. These firms accounted for 38.4% of the total establishments and 69.7% of the total business receipts. Table 3.6 shows the increase in number of establishments in Japan. Between 1975 and 1983, the fastest growing firms were medium sized firms with capital of Y5-10 million ($20.7-41.3

Table 3.6: Change in Construction Establishments in Japan by Size of Firms

(Percentage)

	I	II	III	IV	V	VI	VII
1968	76.6	12.9	4.9	4.3	0.5	0.6	0.1
1970	75.2	13.5	5.3	4.7	0.5	0.6	0.2
1975	73.2	13.4	6.5	5.9	0.4	0.5	0.16
1976	72.6	13.6	6.6	6.3	0.4	0.5	0.15
1977	71.2	13.6	7.2	6.8	0.4	0.5	0.13
1978	70.4	14.1	7.5	7.0	0.4	0.5	0.13
1979	68.7	14.7	7.9	7.6	0.5	0.5	0.13
1980	66.8	15.3	8.6	8.1	0.5	0.5	0.13
1981	64.9	16.0	9.3	8.5	0.6	0.5	0.13
1982	63.3	16.4	9.8	9.2	0.6	0.5	0.14
1983	51.5	16.8	10.5	9.8	0.7	0.5	0.14
Number of Firms							
1975	256,870	46,866	22,915	20,590	1,257	1,749	550
1983	316,066	86,590	53,754	50,615	3,506	2,791	725
Rate of Increase (1975-1983)	+23.0	+84.7	134.6	+145.8	+178.9	+59.0	+31.8

Note: Capital sizes of firms in Yen value are as below in Dollar value.

I	Below Y2 mil	(Below $8.2 thousand)	
II	Y2 mil- Y5 mil	($8.2-	$20.7 thousand)
III	Y5 mil- Y10 mil	($20.7-	$41.3 thousand)
IV	Y10 mil- Y50 mil	($41.3-	$206.7 thousand)
V	Y50 mil- Y100 mil	($206.7-	$413.2 thousand)
VI	Y100 mil- Y1 bil	($413.2-	$4,132 thousand)
VII	More than Y1 bil	(More than	$4,132 thousand)

Note: Total of percentages from I through VII equals 100%.

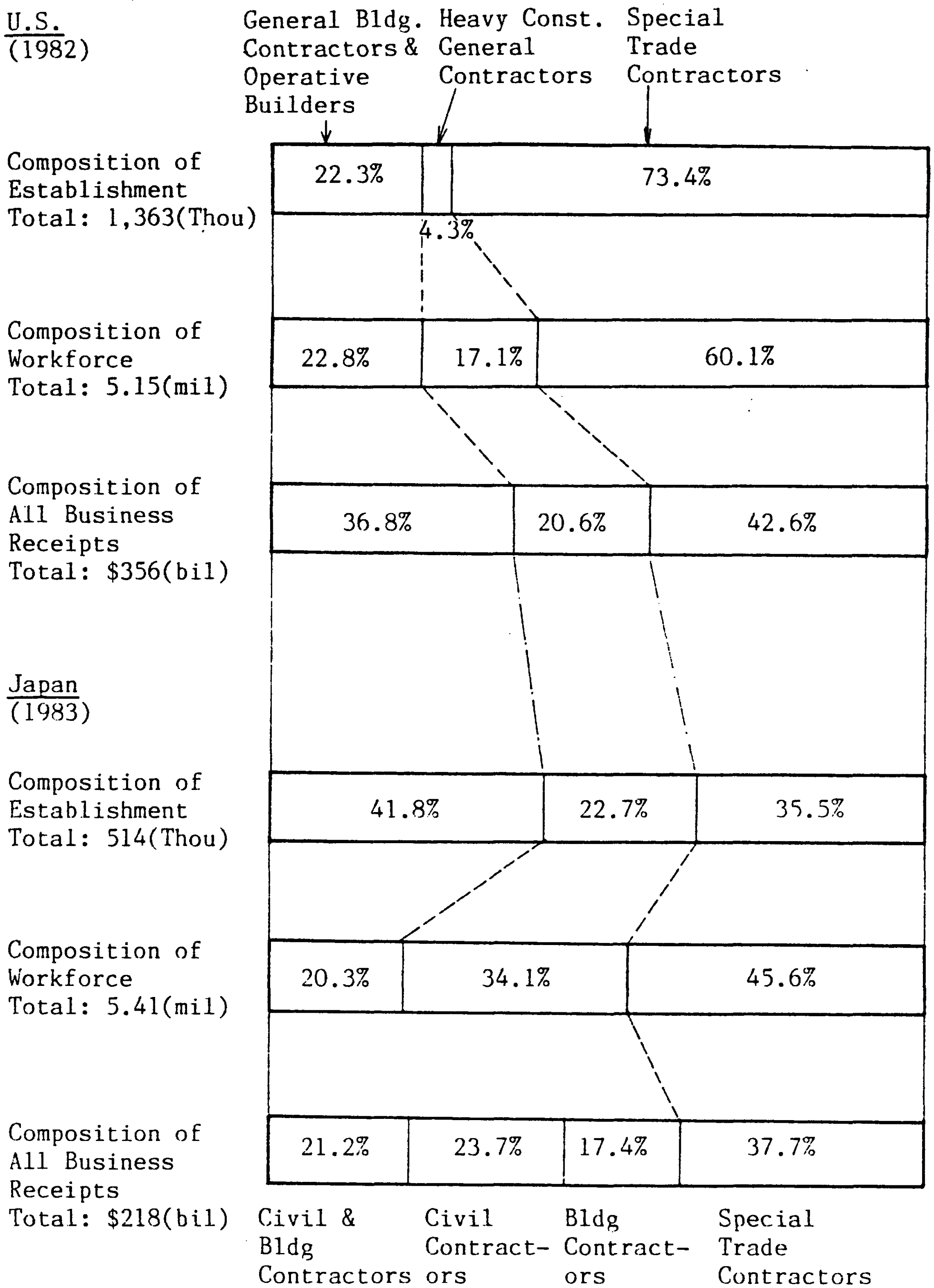
Source: 48, 49

thousand), Y10-50 million ($41.3-206.7 thousand), and Y50-100 million ($206.7-413.2 thousand). These firms' rates of growth in this period were 134.6%, 145.8%, and 178.9% respectively. These medium sized firms accounted for 47.0% of the construction completed in Japan in 1983 whereas large firms with capital of more than Y1 billion (more than $4.1 million) accounted for 26.0% (See Table 3.7).

These medium-sized firms are now competing successfully with large firms in the Japanese domestic construction market, a phenomenon which has apparently been lowering marginal profit in the industry.

Compared to the U.S., Japan has a relatively small number of special trade contractors (35.5% of the total in Japan while 73.4% of the total in the U.S.) (Figure 3.16). Japanese special trade contractors shared a smaller portion of the total workforce (45.6%) and business receipts (37.7%), compared to U.S. special trade contractors (60.1% and 42.6% respectively). There were more heavy construction general contractors in Japan (22.7% of the total establishments); they had more employees (34.1% of the total workforce) than their U.S. counterparts which comprised 4.3% of the total number of establishments, and received 17.1% of the total business receipts.

Figure 3.16 : Industry Structure by Type of Firms in the U.S. and Japan



Note: Civil & Building contractors are those who are involved in both civil (heavy) and building construciton and percentage of neither one is less than 20%.

Source: 12.c, 48

Table 3.7: Number of Construction Establishments and Value of Construction Completed by Size of Capital

(1983)

	I	II	III	IV	V	VI	VII
Number of Firms	316,066	86,590	53,754	50,615	3,506	6,297	725
(%)	61.5	16.8	10.5	9.8	0.7	1.2	0.1
Const. Completed (%)	4.3	9.2	10.6	29.5	6.9	13.5	26.0

Total Number of Firms 514,047

Total Construction Completed $217.5 billion

Note: Capital sizes in Yen value are as below in Dollar value.

I	Below	Y2	mil	(Below $8.2 thousand)	
II	Y2 mil-	Y5	mil	($8.2- $20.7	thousand)
III	Y5 mil-	Y10	mil	($20.7- $41.3	thousand)
IV	Y10 mil-	Y50	mil	($41.3- $206.7	thousand)
V	Y50 mil-	Y100	mil	($206.7- $413.2	thousand)
VI	Y100 mil-	Y1	bil	($413.2- $4,132	thousand)
VII	More than	Y1	bil	(More than $4,132	thousand)

Each total of percentages from size I through VII in number of firms and value of construction completed equals 100%.

Source: 48, 49

3.3 Construction Cost

3.3.1 Construction Cost as a Whole

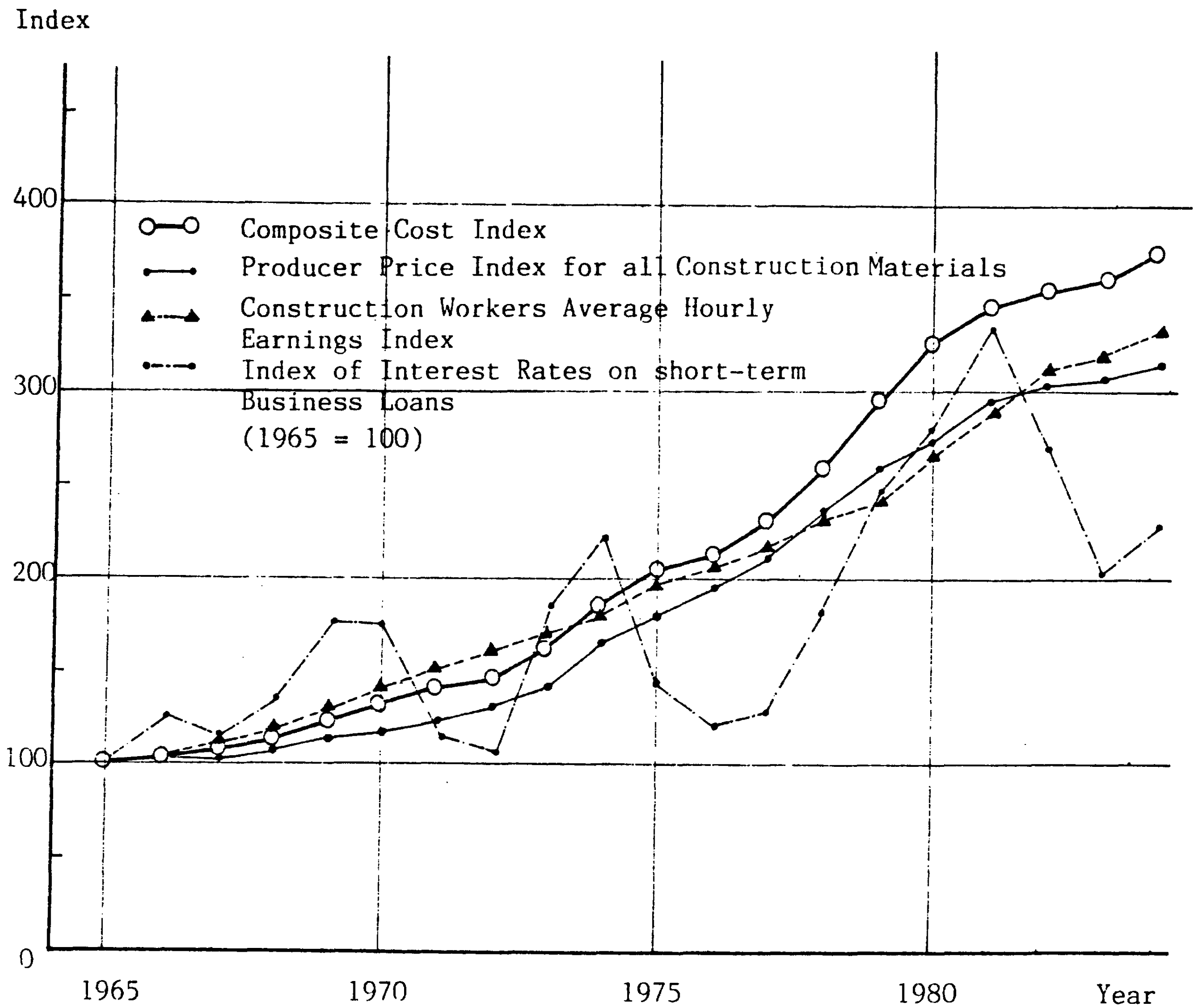
Cost increase was significant after the oil crisis of 1973 in both countries; the rate of increase in costs was almost identical until 1980. However, construction costs ceased to increase after 1980 in Japan while they continued to rise in the U.S.. As a result, if the construction costs in 1965 are set at 100, the construction costs index were about 370 in 1984 in the U.S., but only around 330 in Japan in the same year (See Figure 3.17 and 3.18).

In the U.S., increases in labor costs had mainly determined the rise in construction costs until 1974. Thereafter, increases in construction costs were due mainly to other factors. Especially, after 1978, material cost and financing cost have become major factors in increased construction costs.

In Japan, on the other hand, the main factor in rising construction costs has been the increase in material cost as shown in Figure 3.18. Although the rate of increase in wages has been much more significant in Japan than in the U.S., it has been balanced by the low financing costs. (In real term, financing cost in Japan actually has been decreasing.)

Furthermore, although the increase in wages has been significant in Japan, it has not affected total construction

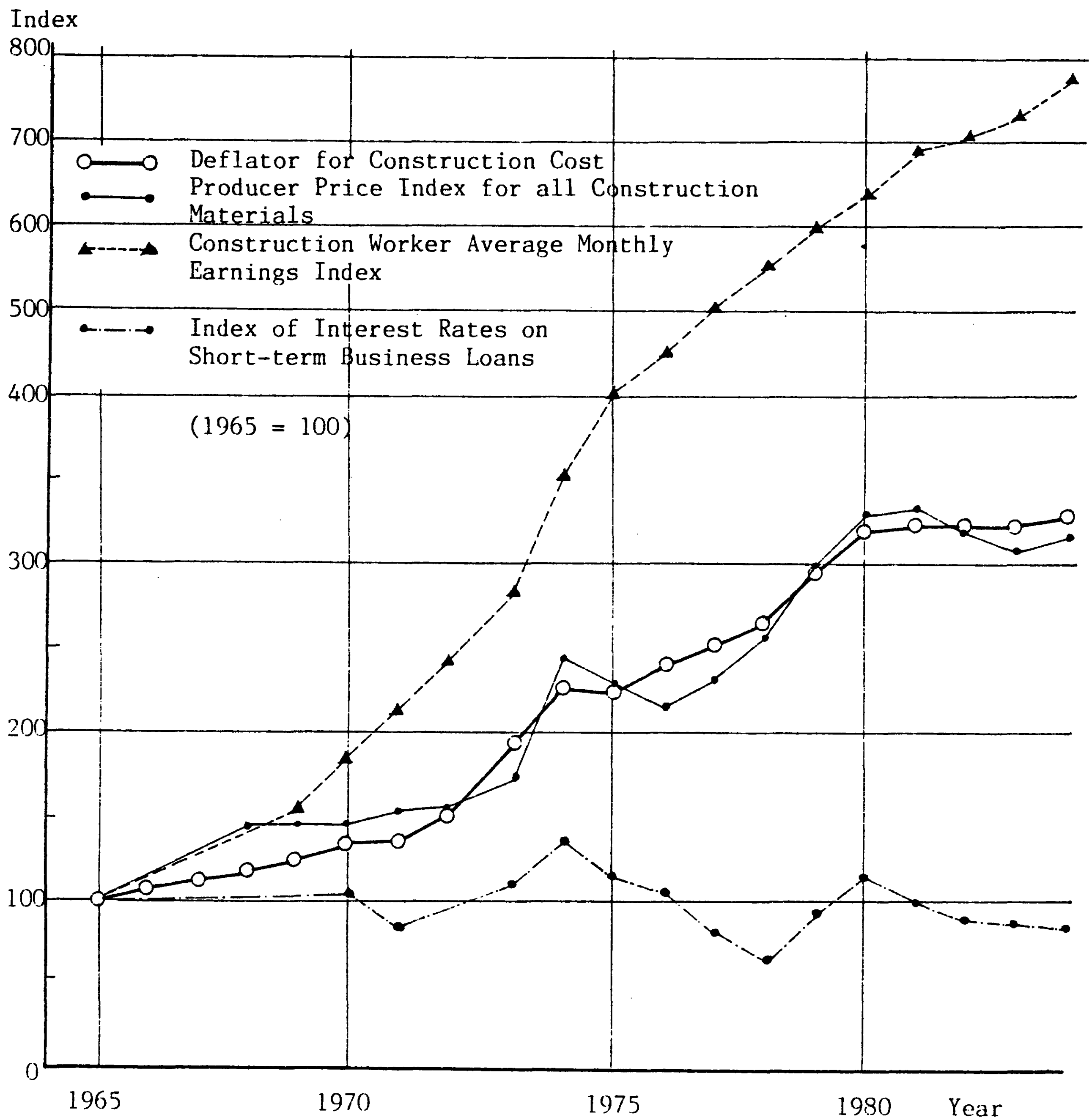
Figure 3.17 : Trend in Construction Cost and Input Prices in the U.S.



Note: Composite Construction Cost Index is compiled by the Bureau of Census, Department of Commerce, and is in effect a weighted average of a variety of specialized cost indexes developed for different types of construction. The Producer Price Index for all construction materials was developed by the Bureau of Labor Statistics, and is a weighted average of price indexes for a wide variety of building products. Average hourly earnings represents the average hourly earnings of all construction workers and non-supervisory employees of construction establishments.

Source: 13.a, b, 70

Figure 3.18 : Trend in Construction Cost and Input Prices in Japan



Note: Deflator for Construction Cost was used against Composite Cost Index in the U.S..

Source: 47, 48, 58

cost as much as has rising material cost because wage for construction workers were originally very low compared with the wages of U.S. construction workers. A worker's monthly wage in 1984 in Japan ($1,316 in average) was still lower than that of U.S. workers. ($9.94/hour x 7 hours x 22 days = $1,530, Source: 58, or 443.42/week x 4 weeks = $1,773.7, Source: 70)

3.3.2 Cost Structure of Construction Firms

Conspicuous differences between U.S. and Japanese contractors' cost structures appear in the share of subcontract cost and labor costs (See Table 3.8 and 3.9). In the construction industry as a whole, Japanese contractors have more than twice as a large share of subcontract costs in the total cost but less than half as large a share of labor cost as U.S. contractors. Building, heavy, and even special trade contractors show more or less the same tendency.

However, this does not necessarily mean that Japanese contractors' subcontract rates are simply more than twice as large as U.S. contractors or that Japanese contractors are performing works with less than half the labor.

These differences arise from the two things, first, the multi-layer subcontract system in Japan, and second, the differences in what entity may be considered the "employer" of construction labor in the Japanese and U.S. industrial structures. Although further detail will be argued later in this chapter, basically the multi-layer subcontract system is one of the most conspicuous characteristics in Japanese construction industry. For example, general contractor A subcontract a portion of work to contractor B (usually a special trade contractor). Contractor B subcontracts a part of the work to contractor C (other special trade contractor) and contractor C subcontract it to contractor D and so on, down to very tiny and highly specialized firms.

As a result, Japanese contractors, from large general contractors through small special trade contractors, subcontract their work to other contractors. Therefore, the typical pattern in Japan may be for a general contractor on the top of the layer to provides only engineers to coordinate and manage the subcontractors on a project. The first layer subcontractors also provide one coordinator and several workers. Contractors below the second layer fundamentally provide the majority of construction workers.

Japanese general contractors, therefore, do not employ any workers in their firms whether they are building or heavy contractors. Instead, they usually employ many various types of engineers who manage any jobs related to a given construction project, but not any workers.

On the other hand, U.S. contractors have their own workforce in addition to engineers who manage projects. U.S. contractors, even large general contractors, have a considerable number of their own construction workers on

Table 3.8: Cost Structure of U.S. Contractors by Type of Firms

(Percentage,1982)

	Material Cost	Subcontract Cost	Labor Cost	Other Cost
Construction Industry	30.9	25.2	29.8	14.1
General Building Contractors & Operative Builders	22.6	49.3	17.8	10.3
Single-Family House Contractors	34.2	28.2	37.7	
Other Residential Bldgs Contractors	22.0	54.5	23.5	
Operative Builders	24.2	43.4	32.4	
Industrial Bldgs	21.4	47.9	30.7	
Other Non-Residential Bldgs	18.3	58.8	22.9	
Heavy Construction General Contractors	33.2	18.8	34.1	14.0
Special Trade Contractors	37.0	7.5	38.1	17.5

Note: "Labor Cost" and "Other Cost" are not available separately in general building contractors & operative builders.
Material cost includes all payment to parts and materials purchased by contractors.
Subcontract cost includes all payments made for construction work subcontracted out to other contractors. If materials are purchased directly by the subcontractors, the payment will be included in subcontract cost.
Labor cost is equal to payments for all employees (construction workers and other employees).
Other cost includes power, fuel, and lubricants, rental payments for machinery, equipment and structures, purchased services (such as communication services, repairs to structures, related facilities, machinery and equipment), capital expenditure for assets, and employer costs for fringe benefits.

Source: 12.c.

Table 3.9: Cost Structure of Japanese Contractors by Type of Firms

(Percentage,1982)

	Material Cost	Subcontract Cost	Labor Cost	Other Cost
Construction Industry	26.0	50.3	10.1	13.6
Heavy & Building Contractors	23.7	54.5	9.0	12.8
Bldg Contractors	19.1	64.5	7.9	8.5
Heavy Contractors	27.4	39.0	14.0	19.2
Special Trade Contractors	37.1	37.0	12.3	13.6

Note: Heavy and building contractors are those who are involved in both heavy and building construction and percentage of neither one is less than 20%.
Material cost includes all payment for material and parts purchased by contractors.
Subcontract cost includes all payments made for construction work subcontracted out to other contractors. If material is purchased directly by the subcontractors, the payment will be included in subcontract cost.
Labor cost includes all payments made to subcontractors which provides the contractor with only labor.
Other costs include all payments to employees, power, fuel, and lubricants costs, payments for purchase, repair, lease, and depreciation for machinery and equipment, and tax payments.

Source: 48

their jobs. U.S. general contractors contract with labor unions or with open-shop workers directly to obtain workers, then put these workers on their payroll. General contractors consider these workers to be company employees, at least, in the interpretation of payment to workers. (The payment to such workers is on the payroll.)

Therefore, Japanese contractors' labor cost in Table 3.9 means the labor cost paid to subcontractors who provide only workers while U.S. contractors' labor cost in Table 3.8 means the mixed cost paid to engineers originally employed by general contractors and to construction workers temporarily on the payroll or permanently employed by general contractors. In Japan, "labor cost" usually means the work done by other contractors' workers. "Labor cost" as figured in Table 3.9 is created for statistics purpose. Also, "labor cost" is usually considered a part of "subcontract cost" because as mentioned, all the workers are provided by subcontractors in Japan.

Almost 20% of wages are paid to engineers and administrative personnel and 80% is paid to construction workers in the U.S. industry as a whole (See Table 3.10). (Percentages have to be modified to apply to each type of construction firm.) In this context, subcontract cost plus 80% of labor cost incurred by a U.S. contractor correspond to subcontract cost plus labor cost for a Japanese contractor. Japanese contractors have subcontract rate of 60.4% while for U.S. contractors the subcontract rate is

Table 3.10: Breakdown of Payments to Employees in the U.S. Contructors

	1982 ($ bil)	(%)	1977 ($ bil)	(%)	1972 ($ bil)	(%)
Payments to Employees (Engineers and Administrative personnel)	18.5	23.5	11.9	21.6	7.8	19.5
Payments to Employees (Construction Workers)	60.2	76.5	43.1	78.4	32.2	80.5
Total	78.7	100.0	55.0	100.0	40.0	100.0

Source: 12.a., 12.b., 12.c.

49.04% (29.8% x 0.8 + 25.2%) as defined for Japanese contractors. Twenty percent of labor cost for a U.S. contractor should be added up to "other cost" when the Japanese-oriented deffinition is applied to U.S. contractors. It is important to keep in mind these basic differences in the notions of subcontract and labor cost in the U.S. and Japan when considering the cost structure of U.S. and Japanese contractors.

Both U.S. and Japanese contractors, as a whole, spend 25 -30% on materials. General building contractors in both countries have the lowest material cost and special trade contractors have the highest material cost. General building contractors in both countries have the highest subcontract cost and special trade contractors have the lowest. U.S. building contractors, single-family house builders (usually very small and having characteristics similar to special trade contractors) have a low rate of subcontracting and use more workforce of their own.

Although Japanese special trade contractors appear to have a higher subcontract rate than U.S. special trade contractors, this is also the combined effect of the multi-layer subcontract system and differing relationships to labor. Japanese special trade contractors subcontract to other special trade contractors while U.S. special trade contractors employ their own in-house workers (whether permanently or temporarily) and U.S. special trade contractors also recognize these workers as employees, at least on payroll. "Other cost" for the U.S. contractors is generally higher than Japanese contractors both in the industry as a whole and for each type of contractors. Given the definition applied by Japanese contractors, 20% of labor cost for the U.S. contractors must be added to to Japanese "other cost". This further increased the difference in "other cost" between U.S. and Japanese contractors. Such differences are considerable in heavy and special trade contractors. Probably, much "other cost", generally considered to be administrative cost, may be attributed to the lower productivity of large U.S. heavy and building contractors compared to Japanese contractors, as will be detailed later.

Material cost goes down as the size of firm goes up in both countries (Table 3.11 and 3.12). In contrast, subcontract cost goes up as the size of firm goes up. Small Japanese contractors, firms with capital below $8,000, still have a large subcontracting rate because of the effects outlined above.

Labor cost for U.S. contractors does not vary greatly between firms of different sizes because workers are counted in labor cost to the contractors. Labor cost for Japanese contractors (labor cost paid to subcontractors who provide only labor) goes down as the size of firm goes up because large contractors in Japan traditionally tend to treat labor costs all together and package them in the negotiation with the subcontractors providing the workers.

Table 3.11: Cost Structure of U.S. Contractors by Size of Firms (Number of Employees)

(Percentage-1982)

	Material Cost	Subcontract Cost	Labor Cost	Other Cost
Const. Industry	29.9	24.3	24.5	21.3
(# of Employees)				
1 - 4	35.8	17.3	19.3	27.6
5 - 9	35.3	18.0	24.8	21.9
10 - 49	32.1	23.3	25.4	19.2
50 - 249	27.8	28.3	23.7	20.2
More Than 250	26.0	28.1	26.9	19.0

Note: Total of percentages of material, subcontract, labor, and other costs equal 100%.

Source: 12.c.

Table 3.12: Cost Structure of Japanese Contractors by Size of Capital

(Percent, 1982)

Size of Capital	# of Employees	Material Cost	Subcontract Cost	Labor Cost	Other Cost
Construction Industry		26.0	50.3	10.1	13.6
I	1 - 9	31.1	36.1	16.3	16.5
II	10 - 19	33.1	39.3	15.2	12.4
III	20 - 29	33.3	39.8	12.1	14.8
IV	30 - 49	26.7	51.6	10.4	11.3
V	50 -100	21.9	56.9	7.9	13.3
VI	100 -199	21.4	56.5	6.9	15.2
VII	Over 200	21.4	55.1	8.0	15.5

Note: Size of capital of a firm is categorized as below;

I	Below Y 2 mil	(Below $ 8.2 thou)
II	Y 2 mil - Y 5 mil	($ 8.2 - $20.7 thou)
III	Y 5 mil - Y 10 mil	($ 20.7 - $41.3 thou)
IV	Y 10 mil - Y 50 mil	($ 41.3 - $206.7 thou)
V	Y 50 mil - Y 100 mil	($206.7 - $413.2 thou)
VI	Y100 mil - Y 1 bil	($413.2 thou-$4.1 mil)
VII	More than Y 1 bil	(More than $ 4.1 mil)

Total of percentages of material, subcontract, labor, and other costs equal 100%.

Source: 49

Generally, "other cost" for U.S. contractors is larger than that for Japanese contractors. In addition, by the deffinition applied to Japanese contractors, 20% of labor cost has to be added to "other cost". Therefore, U.S. contractors have twice as large "other cost". This is partly because they incur more administrative costs by employing more workers as employees in their firms.

3.3.3 Productivity in the Construction Industry

It is very difficult to measure productivity in the construction industry because of its character as a service industry. Also, it is further difficult to compare productivity between the U.S. and Japanese construction industries because statistics are not comparable. However, in this section a comparison will be made, first, of the value of annual construction completed per employee (1), and second, of productivity index usually applied to manufacturers.

The U.S. construction industry as a whole show higher value of construction completed per person. The U.S. had $268.7 billion in domestic new construction and 5.10 million employees and workers in the industry in 1983. Therefore,

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(1) As for Japanese employees, total construction completed by all construction firms/number of total employees or workers. As for U.S., total construction receipts received by all establishments/number of employees or workers. Although both construction completed by all construction firms and total construction receipts by all establishments have duplication because of subcontract, those figures still are meaningful to be compared as measuring productivity.

goes down as the size of a firm approaches the largest. In contrast, Japan had $217.5 billion in domestic construction and 5.41 million workforce in the construction industry in the same year. In Japan, $40,200 was attributable to each one. Therefore, the U.S. construction industry had higher productivity than the industry in Japan in terms of construction completed per employee/worker.

Table 3.13 (1) and (2) show both industries' productivity by size of firm, as measured by the number of employees. Although the U.S. construction industry shows more productivity than Japan in the smallest firms, including two thirds of all establishments, medium to large U.S. firms show less productivity than Japanese firms. Large U.S. firms are only one third to one-half as productive as largest Japanese firms.

Furthermore, the most notable aspect of the productivity of U.S. firms is that the level of productivity Lower productivity in medium to large U.S. firms, especially large firms, arises partly because U.S. firms employ more construction workers within firms and count workers as employees in their payroll so that, as defined here, the total value of a firm's product is spread across a greater number of total personnel. Japanese large firms employ only engineers and administrative personnel and use workers formally hired by subcontractors. This structural factor may distort the statistics to make Japanese firms look more efficient.

Table 3.13 (1): Construction Completed Per Employee by Type and Size of Firms in the U.S.

($ thousand per year per employee, 1982)

# of Employees	Construction Industry as a Whole	General Bldg. Contractors & Operative Builders	Heavy General Contractors	Special Trade Contractors
Total	67.1	111.6	83.1	49.1
Without Payroll	38.4	77.3	75.7	26.7
1 - 4	53.8	77.4	63.1	43.4
5 - 9	56.5	82.3	63.4	46.0
10 - 49	72.0	111.6	79.1	56.0
50 - 249	93.0	153.9	89.2	65.7
500 - 1000	n.a.	n.a.	89.1	63.0
Over 1000	n.a.	n.a.	82.4	53.9

Source: 12.c.

Table 3.13 (2): Construction Completed Per Employee by Type and Size of Firms in Japan

($ thousand per year per employee, 1982)

Size of Sales (Y mil)	Construction Industry as a Whole	General Bldg. Contractors	Heavy General Contractors	Special Trade Contractors
Below Y50	37.5 (4.0)	39.6 (4.1)	43.0 (3.2)	38.2 (3.9)
Y 50- 100	61.2 (5.6)	73.0 (4.7)	84.3 (4.1)	52.4 (6.4)
Y100- 500	102.0 (10.0)	100.0 (11.0)	148.0 (6.7)	98.1 (10.4)
Y500-5000	158.0 (62.4)	150.2 (60.2)	220.6 (46.3)	144.2 (60.9)
Over 5000	223.3 (746.7)	201.8 (510.3)	260.8 (550.6)	177.0 (390.9)

Note: The figures in patetheses are average numbers of employees in the size and type of firms.

Source: 47, 48, 66

However, the differences in productivity figures between large U.S. and Japanese large firms are too great to be attributable only to the variation in the distribution of productivity among workforce alone. In fact, U.S. medium and especially large firms have less efficient management, especially personnel management, again because of the large numbers of workers within major companies.

In the statistics used here for U.S. contractors (Census of Construction), architectural and engineering work are not included. Also, treatment of CM (construction management) which recently has gained a considerable portion of sales in large firms is not treated separately in the statistics. Therefore, the comparison made here should be understood as qualitative not quantitative.

"Traditional" productivity index in the U.S. construction industry, (modified a little for application to construction), has been slowly but constantly declining (See Table 3.14). Although a slight improvement can be observed after 1982, the level of productivity remains at around 80% of that in 1965.

In Contrast, productivity in the Japanese construction industry increased at a fast rate and recorded its peak of 190 in 1972, letting the productivity in 1965 being 100. However, since then it has remained at slightly lower level, 170 - 180, probably because of the recent shrinkage of the domestic market though having capability and resources to perform much more work.

Table 3.14: Productivity in the Construction Industries in the U.S. and Japan, 1965 - 1984

Year	Productivity Index (1965 = 100)	
	U.S.	Japan
1965	100	100
1966	97	100
1967	98	117
1968	101	131
1969	94	152
1970	88	157
1971	93	168
1972	94	190
1973	92	188
1974	81	168
1975	81	178
1976	87	174
1977	85	186
1978	82	184
1979	76	181
1980	70	168
1981	71	170
1982	75	171
1983	82	165
1984	84	n.a.

Note: Productivity index (1965 = 100) = Construction Completed per person per hour
= Total Construction Completed/ (# of Workers x Weekly Working Hours x 52 Week)

Source: 13.a, 48

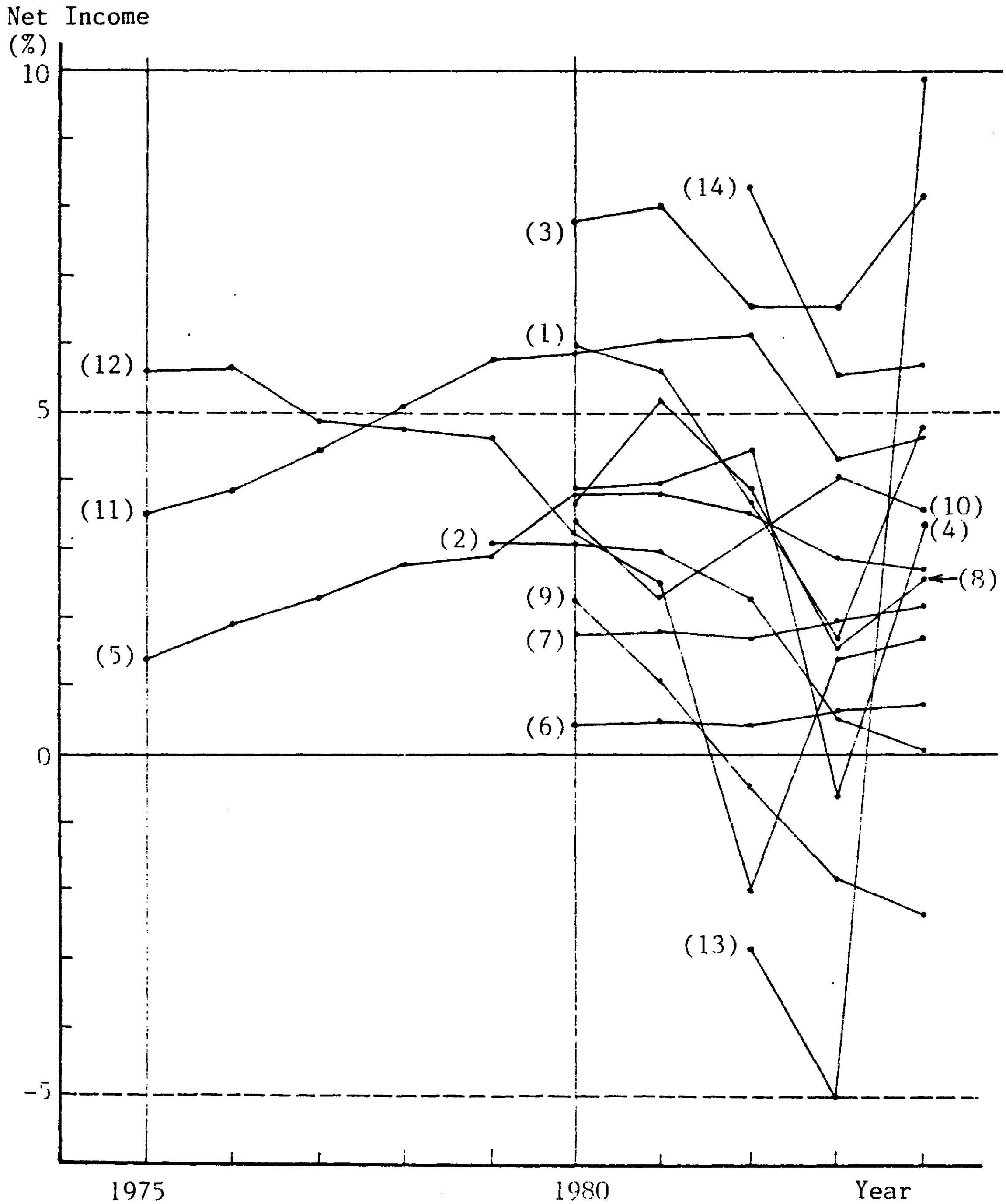
3.3.4 Profitability

Because statistics on profitability as well as details of costs to U.S. contractors as a whole are not available, this discussion on profitability will be based on selected statistics of contractors in the U.S. and both selected and industrywide statistics for Japanese contractors.

Figure 3.19 and 3.20 show characteristics of profits for contractors in both countries. U.S. contractors show generally high profitability. However, profitability differs considerably firm by firm as well as year by year. Contractors held by conglomerates, such as Kellog Rust, Inc., Stearn Catalytic, Lummus Crest and United Engineering, Co., show high profitability. while contractors with primary expertise only in construction, such as Foster Wheeler Corp, Turner Corp, and Jacobs Engineering Corp, Inc. show relatively low profitability. Small firms, such as Cenvill Co., also are gaining high profits. Contractors held by conglomerates and diversified firms have relatively moderate term-to-term fluctuation in profits while contractors with primary expertise in construction show considerable ups and downs in their profits year by year.

On the other hand, Japanese contractors show very moderate term to term changes in profitability although profits themselves are low, compared with those of U.S. contractors. Also, Japanese firms generally show the same moderation as fluctuation of their profitability. The

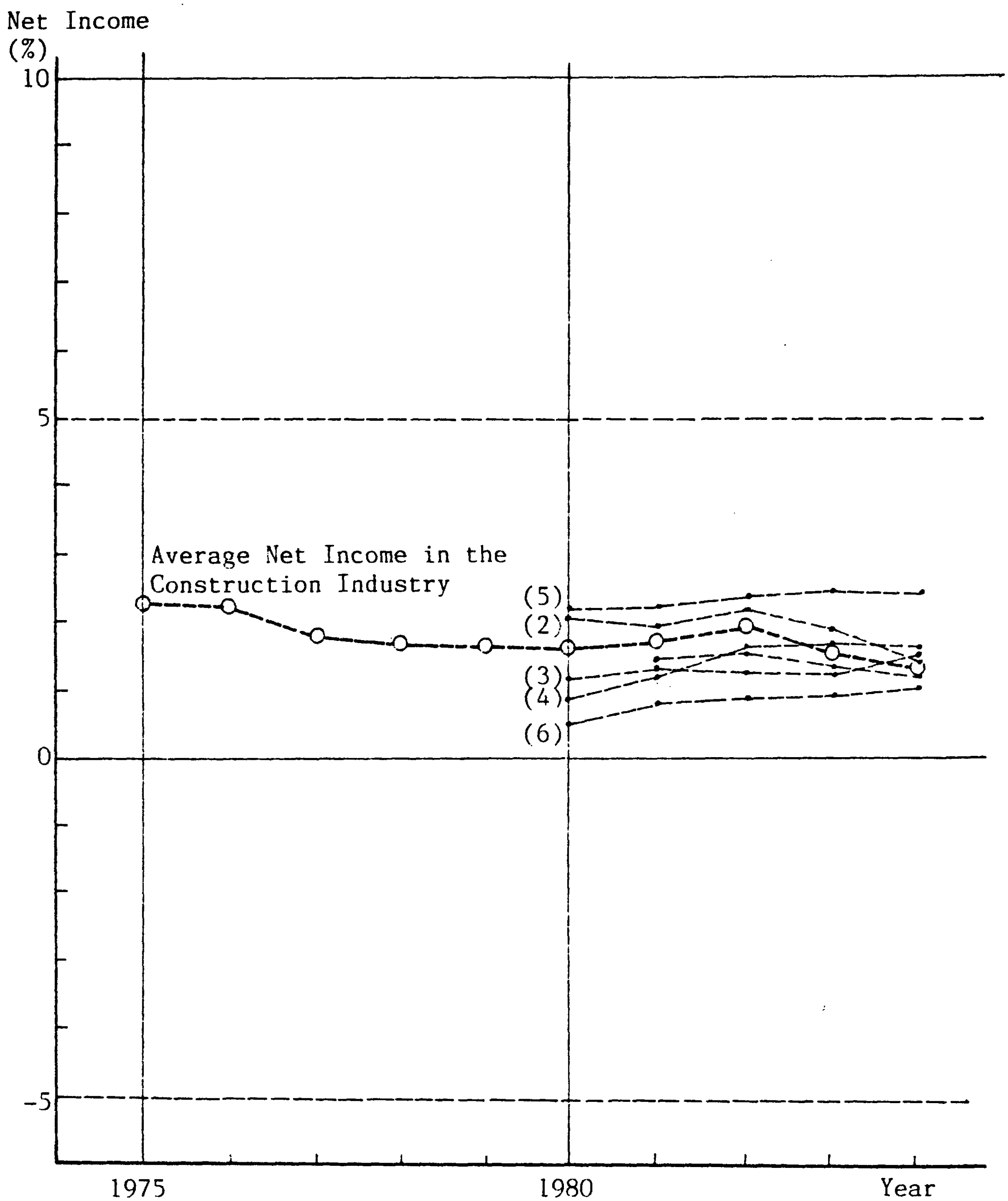
Figure 3.19 : Net Income as Percentage of Total Sales of Selected U.S. Contractors



Note: Numbers in the figure indicate the following contractors;
(1) Kellog Rust, Inc., (2) Fluor Corp., (3) Stearn Catalytic (4) Lummus Crest, Inc., (5) Foster Wheeler Corp., (6) Turner Corp., (7) Morrison-Knudsen Co., (8) Ebasco Services, (9) Dravo Corp., (10) Centex Corp., (11) United Engineering, Co., (12) Koppers Company, Inc., (13) Jacobs Engineering Group Inc., (14) Cenvill Co.

Source: 3.a,b,c,d,e,f,g,h,i,k,m,o,p,q,s,u,w and x

Figure 3.20 : Net Income as Percentage of Total Sales of Selected Japanese Contractors



Note: Numbers in the figure indicate following contractors;
(1) Taisei Construction Co., (2) Kajima Construction Co., (3) Shimizu Construction Co., (4) Ohbayashi-Gumi (5) Kumagai-Gumi, (6) Hazama-Gumi

Source: 3.j,l,n,r,t, and v

profits of individual firms parallel average industry profits with profit distributed evenly. This is probably because Japanese firms are quite similar and undifferetiated. This characteristic will be detailed later in the comparison of both countries' top contractors.

3.3.5 Detailed Composition of Costs to Japanese Contractors

The percentage of construction cost in total sales is generally high in heavy, building, and heavy and building contractors and is low in special trade contractors in Japan (See Table 3.15). Construction cost rises as the size of firms increases. The percentage of construction cost has declined for the industry as a whole, especially in building, heavy, and heavy and building contractors since 1978 but is rising for special trade contractors. Medium to large firms have been improving construction cost.

General administrative cost is small in building, heavy and heavy and building contractors while but large for special trade contractors (See Table 3.16). Also, general administrative cost diminishes as firms become large. General administrative cost has been increasing slowly in the industry as a whole, but it has been decreasing for special trade contractors.

Net income before tax (= Total sales - Construction cost - General administrative cost) has been rising in building, heavy, and heavy and building contractors but

Table 3.15: Change in Cost of Sales by Type and Size of Construction Firm in Japan

(Percentage)

Type of Firms	1978	1979	1980	1981	1982
Construction Industry	87.4	87.2	87.0	86.5	86.4
Heavy & Bldg Contractors	89.4	89.7	89.3	88.9	87.5
Heavy Contractors	87.3	87.9	87.4	87.5	86.9
Bldg Contractors	88.1	89.0	88.8	87.6	87.3
Special Trade Contractors	81.0	81.9	81.9	82.1	82.9
I	80.8	80.9	80.3	79.8	80.3
II	82.5	82.7	82.2	81.7	81.3
III	85.2	84.4	84.8	84.0	84.1
IV	88.4	87.4	87.6	86.8	86.4
V	88.7	89.7	89.1	88.6	88.1
VI	89.3	89.6	89.7	89.2	88.9
VII	90.0	89.8	89.4	89.0	89.0

Note: Figures are cost of sales as percentages of total sales in major construction firms.
Size of capital of a firm is categorized as below;

I	Below ¥ 2 mil	(Below $ 8.2 thou)
II	¥ 2 mil - ¥ 5 mil	($ 8.2 - $ 20.7 thou)
III	¥ 5 mil - ¥ 10 mil	($ 20.7 - $ 41.3 thou)
IV	¥ 10 mil - ¥ 50 mil	($ 41.3 - $206.7 thou)
V	¥ 50 mil - ¥ 100 mil	($206.7 - $413.2 thou)
VI	¥100 mil - ¥ 1 bil	($413.2 thou-$4.1 bil)
VII	More than ¥ 1 bil	(More than $4.1 bil)

Source: 49

Table 3.16: General Administrative Cost for Construction Firms by Type and Size of Firms in Japan

(Percentage)

Type of Firms	1978	1979	1980	1981	1982
Construction Industry	9.9	10.0	10.1	10.3	10.6
Heavy & Bldg Contractors	8.1	7.8	7.9	8.0	9.0
Heavy Contractors	9.6	9.5	10.1	9.5	10.3
Bldg Contractors	10.1	8.7	8.5	9.1	9.5
Special Trade Contractors	15.8	15.2	14.6	14.8	14.8
I	17.2	17.5	18.0	18.5	18.4
II	15.6	15.5	15.9	16.2	16.9
III	12.5	13.8	12.8	13.3	14.0
IV	9.4	9.8	10.0	10.2	10.7
V	8.4	7.7	7.9	8.3	8.8
VI	7.9	7.7	7.3	7.5	8.0
VII	6.4	6.3	6.4	6.6	6.7

Note: Figures are general administrative costs as percentates of total sales in construction firms. Size of capital is categorized as below;

I	Below Y 2 mil	(Below $ 8.2 thou)
II	Y 2 mil - Y 5 mil	($ 8.2 - $ 20.7 thou)
III	Y 5 mil - Y 10 mil	($ 20.7 - $ 41.3 thou)
IV	Y 10 mil - Y 50 mil	($ 41.3 - $ 206.7 thou)
V	Y 50 mil - Y 100 mil	($206.7 - $ 413.2 thou)
VI	Y100 mil - Y 1 bil	($413.2 thou -$4.1 bil)
VII	More than Y 1 bil	(More than $4.1 bil)

Source: 49

falling for special trade contractors (Table 3.17). Also, net income before tax has been falling in small firms while large firms have been gaining a little.

Heavy, building, and heavy and building contractors incur higher construction cost than special trade contractors but compensate for high construction cost by smaller administrative cost. As a result, they are making more profits than are special trade contractors. The same characteristic applies to large versus small firms.

3.4 Various Characteristics of the Construction Industries and Contractors in the U.S. and Japan

In this section, various unique characteristics of the construction industry and firms in the two countries are contrasted; those that have not been mentioned so far will be reviewed. Some of the considerable differences between the two countries could be crucial to the entry of Japanese contractors into the U.S. construction market.

3.4.1 Characteristics of the Top Contractors in the U.S. and Japan

The top ranking contractors show clear differences between the U.S. and Japan. Table 3.18 and 3.19 demonstrate some of the most important. U.S. top ranking

Table 3.17: Change in Net Income Before Tax by Type and Size of Construction Firms in Japan

(Percentage)

Type of Firm	1978	1979	1980	1981	1982
Construction Industry	2.2	2.3	2.3	2.7	2.7
Heavy & Bldg Contractors	1.9	2.3	2.2	2.9	3.2
Heavy Contractors	2.7	2.3	1.9	2.6	2.3
Bldg Contractors	1.3	2.0	2.1	2.9	3.1
Special Trade Contractors	2.5	2.1	2.7	2.4	1.6
I	1.2	1.2	1.3	1.0	0.5
II	1.3	1.6	1.1	1.2	0.9
III	1.9	1.5	1.8	1.8	1.5
IV	2.0	2.2	2.0	2.8	2.7
V	2.7	2.3	2.3	2.7	2.7
VI	2.6	2.4	2.6	2.9	2.8
VII	3.1	3.4	3.4	4.0	4.1

Note: Figures are net income before tax as percentages for total sales of major construction firms.
Size of capital of a firm is categorized as below;

I	Below	Y 2 mil	(Below $ 8.2 thou)
II	Y 2 mil -	Y 5 mil	($ 8.2 - $ 20.7 thou)
III	Y 5 mil -	Y 10 mil	($ 20.7 - $ 41.3 thou)
IV	Y 10 mil -	Y 50 mil	($ 41.3 - $206.7 thou)
V	Y 50 mil -	Y 100 mil	($206.7 - $413.2 thou)
VI	Y100 mil -	Y 1 bil	($413.2 thou-$4.1 bil)
VII	More than	Y 1 bil	(More than $4.1 bil)

Source: 49

contractors, including all of the top 10 contractors, specialize in plant and industrial facilities construction. Because most of the recent opportunities for plant and industrial facilities construction has been offered by developing countries and oil-producing countries, the percentages of foreign contracts in total contracts received by these contractors are generally very high. Also, because of the complex nature of such plant and industrial facilities construction, CM (Construction Management) contracts comprise a large portion of such contracts. Furthermore, all such plant contractors fundamentally provide customers with services on a design/construct base.

In contrast, the all top 20 Japanese contractors, like all Japanese contractors, specialize only in building and /or heavy construction. These firms do not provide engineering and construction services for plant and industrial facilities. (Such services are performed by other types of firms as listed in the middle of Table 3.19. Plant construction in Japan will be discussed later in this chapter.) Top ranking Japanese contractors as well as other contractors in Japan do not provide customers with CM. Also, as detailed in Chapter 2, these firms' major arenas are fundamentally located in the Japanese domestic construction market.

Figure 3.21 and 3.22 portray changes in the rankings of the top ranking contractors in both countries in terms of the value of annual contracts received. U.S. top ranking

Table 3.18: Detailed Business Operation of U.S. Top Contractors

(1984)

Rank	Firm	Total Contract ($ mil)	A (%)	B (%)	Type of work Plant	Bldg.	Heavy	CM (%)
1.	Kellog Rust, Inc.	10.855	83.5	79.5	xxx	x	x	25
2.	Fluor Corp.	8,353	80.8	18.3	xxx	x	x	8
3.	Bechtel Group Corp.	8,220	68.4	59.7	xxx	x	xxx	35
4.	The Parsons Corp.	7,514	73.9	40.1	xxx	x	x	83
5.	Stearn Catalytic	4,932	100	11.1	xxx	x		3
6.	Brown & Root, Inc.	3,884	85.6	33.2	xxx		x	20
7.	Lummus Crest, Inc.	3,200	100	71.9	xxx			--
8.	Stone & Webster	2,923	78.0	69.0	xxx			68
9.	Foster Wheeler Corp.	2,413	100	80.1	xxx			--
10.	Raymond Int'l, Inc.	2,347	100	59.5	xxx			76
11.	Turner Corp.	2,154	---	1.5		xxx		12
12.	Morrison-Knudsen Co.	2,086	85.6	22.2	xxx	x	xxx	43
13.	Ebasco Services	1,580	100	8.5	xxx			1
14.	Jones Group, Inc.	1,535	---	0.2		xxx	x	--
15.	Guy F. Atkinson Co.	1,499	---	25.6		xxx	xxx	--
16.	BE & K, Inc.	1,255	---	0.0		xxx		5
17.	Dravo Corp.	1,232	100	30.6	xxx			--
18.	Gilbane Bldg. Co.	1,149	---	0.0		xxx		94
19.	Perini Corp.	1,139	---	43.4		xxx	xxx	--
20.	Barton-Malow Co.	1,126	---	0.0		xxx	xxx	94

Note: "A" indicates design/construct contracts as percentage of total contracts received.
"B" indicates foreign contracts as percentage of total cotracts received.
"xxx" indicates the area of work primarily involved.
"x" indicates the area of work involved also but not so much.
CM column indicates the percentage accounted for by construction management contracts.
Figures in "Total Contract" include prime construction contracts, shares of joint ventures, subcontracts, design-contract and construction management contracts in which the firm is exposed to financial liability similar to a general contractor (greater than $500,000). Parent company's total includes susidiaries' performance. A design-contract is based on the erected value of plant including installed equipment.
Construction management contracts are based on the erected value of project managed.

Source: 18.a. - h., 3.a, b, c, d, e, f, g, h, i, k, m, o, p, q, s, u, w, x.

Table 3.19: Detailed Business Operation of Top Japanese General Contractors

(1985)

Rank	Firm	Total Contract ($ mil)	% of Foreign Contract	Type of work: Plant	Bldg.	Heavy	CM (%)
1.	Taisei Const.	4,192	6.8		xxx	xxx	0
2.	Kajima Const.	4,034	6.9		xxx	xxx	0
3.	Simizu Const.	3,998	8.9		xxx	xxx	0
4.	Ohbayashi-Gumi	3,317	5.3		xxx	xxx	0
5.	Takenaka Komuten	2,972	7.4		xxx		0
6.	Kumagai-Gumi	2,660	21.0		xxx	xxx	0
7.	Fujita-Kogyo	1,894	5.1		xxx	xxx	0
8.	Hazama-Gumi	1,540	17.2		xxx	xxx	0
9.	Toda Construction	1,488	2.8		xxx	xxx	0
10.	Tobishima Const.	1,362	4.3		xxx	xxx	0
11.	Maeda Construction	1,360	4.2		xxx	xxx	0
12.	Nishimatsu Const.	1,228	13.6		xxx	xxx	0
13.	Goyo Construction	1,186	32.1		x	xxx	0
14.	Tokyu Construction	1,171	4.7		xxx	xxx	0
15.	Sato Kogyo	1,167	11.0		xxx	xxx	0
16.	Mitsui Construction	1,065	2.0		xxx	xxx	0
17.	Kohnoike-Gumi	991	1.8		xxx	xxx	0
18.	Okumura-Gumi	982	1.3		xxx	xxx	0
19.	Sumitomo Const.	838	2.9		xxx	xxx	0
20.	Hasegawa Komuten	837	0.0		xxx		0

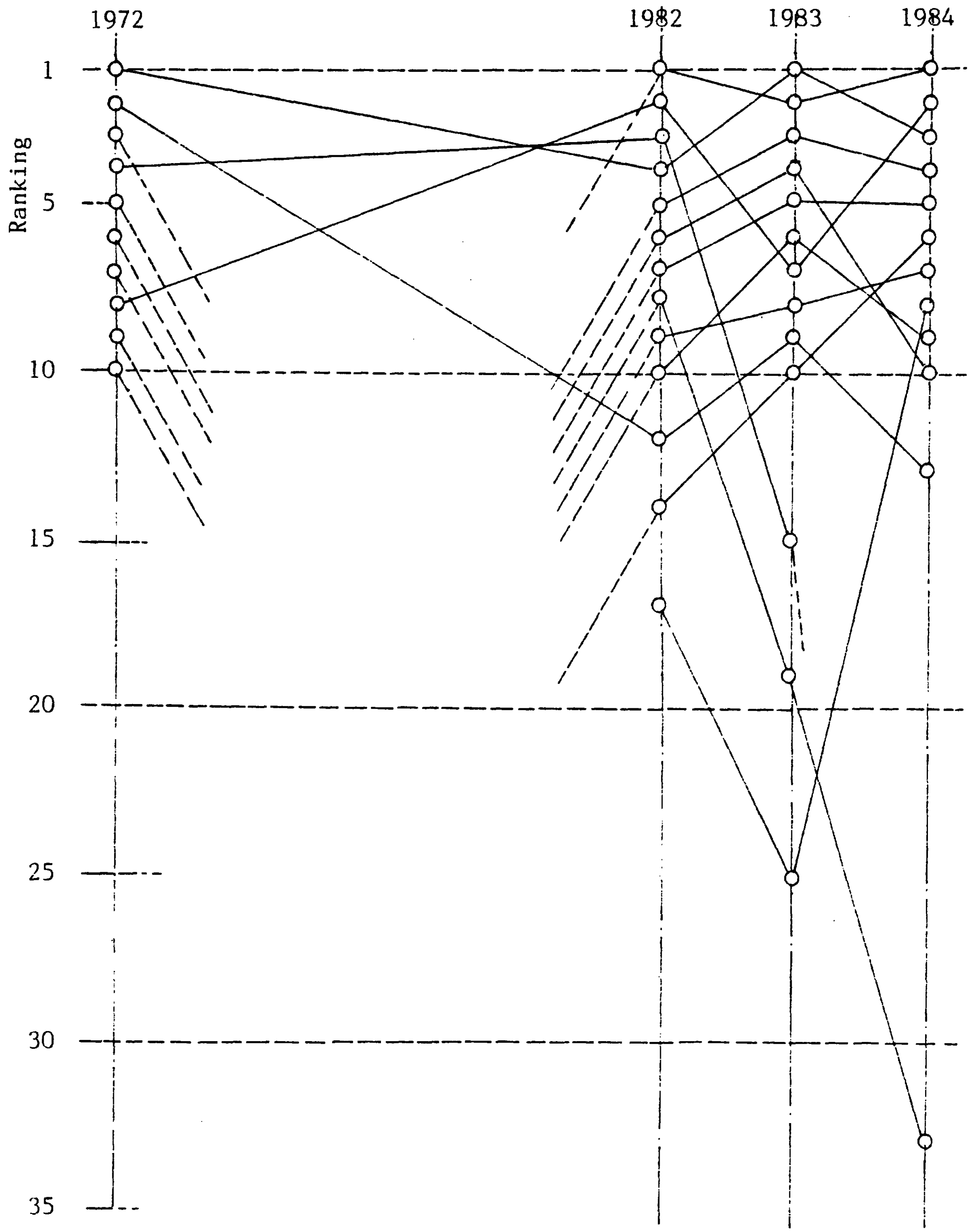
(Top Plant Design/Constructors) (1985)

Rank	Firm	Total Contract ($ mil)	% of Foreign Contract	Type of work: Plant	Bldg.	Heavy	CM (%)
1.	Chiyada Chemical	1,321	82.0	xxx			0
2.	Nikki (JGC Corp.)	1,314	58.0	xxx			0
3.	Toyo Engr. Corp.	748	86.0	xxx			0

Note: "xxx" indicates the area of work primarily involved. "x" indicates the area of work involved also but not so much.CM column indicates the percentage accounted for by construction management contracts.
Figures in "Total Contract" include prime construction contracts, shares of joint ventures, subcontracts, design-contract and construction management contracts where the firm is exposed to financial liability similar to a general contractor (greater than $500,000). Parent company's total includes susidiaries' performance. A design-contract is based on the erected value of plant including installed equipment. Construction management contracts based on erected value of project managed.

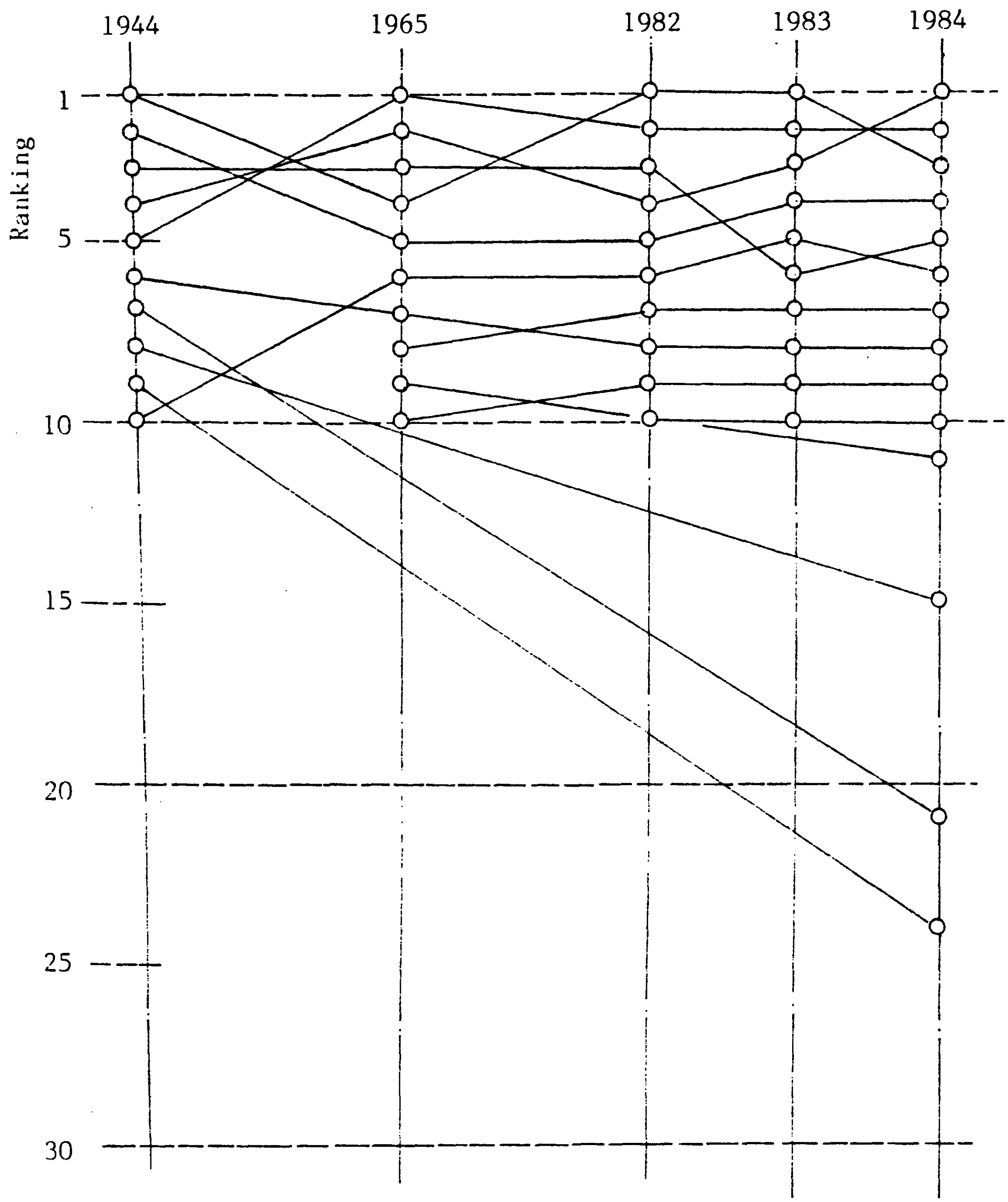
Source: 3.j, l, n, r, v.

Figure 3.21 : Change in the Rankings of the U.S. Top Contractors



Note: Rankings are based on the rankings in ENR(Engineering News Record).
Souece: 18.a,m,n,o

Figure 3.22 : Change in the Rankings of the Japanese Top Contractors



Note: Rankings are based on value of annual contracts received.

Source: 3.j,l,n,r,t,v,51

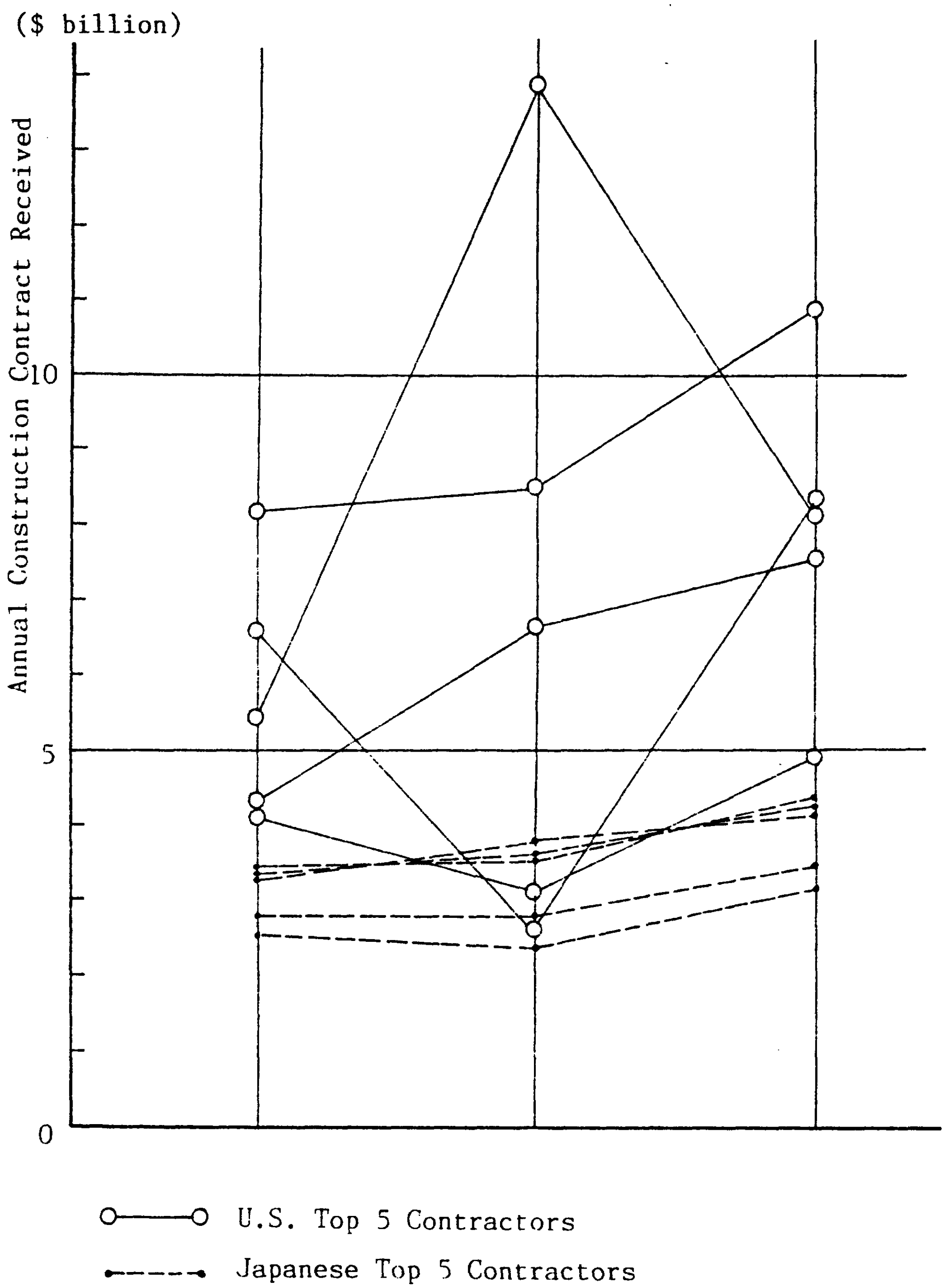
contractors fluctuate considerably year by year. For example, Brown and Root, Inc. was ranked No.6 in 1984, but was No.7 in 1983 and No.14 in 1982. Stone & Webster was ranked No.8 in 1984, but was No.25 in 1983 and No.17 in 1982. Moreover, only two firms in the top 10 in 1972 were still in the top 10 in 1984.

Japanese contractors, on the contrary, are very stable. Six firms from the top changed places only among themselves between 1982 and 1984. Firms at No.7 through No.10 remained the same places during this period. All the top 10 firms in 1965 were still in the top 10 in 1984 and surprisingly, seven out of the top 10 firms in 1944 were still among the top 10 in 1984. The other three firms in the top 10 in 1944 were still within the top 25 in 1984.

Figure 3.23 also shows the clear contrast in the degrees of fluctuation in the value of annual contracts received by the top five contractors in both countries. The value of contracts received by U.S. top five contractors fluctuate significantly year by year while the value of contracts received by Japanese contractors has been very stable. These Japanese firms are competing each other with very narrow margin.

Probably the major reason for the comparatively wide fluctuation in the rankings and value of contracts received among U.S. firms is because they specialize in plant and industrial facilities construction. Such projects are generally very large in scale so that the acquisition or

Figure 3.23 : Change in the Annual Construction Contracts Received by U.S. and Japanese Top 5 Contractors



Source: 3.a - x

loss of a particular contract may affect considerably the value of a firm's total annual contract. Also, because the majority of such contracts are offered by foreign countries, a change in the situation of the world economy or of the economy in a client country will affect the availability of projects considerablly.

The importance of wide year-by-year fluctuation inevitably determines the way in which U.S. contractors are operated and maintained. As mentioned, some of the top 20 firms are owned by large holding companies (conglomerates), or are highly diversified within themselves. These modes of operation protects these firms from the risk inherent in year-by-year fluctuation. Table 3.20 describes details of the business operations of U.S. and Japanese contractors. Among the U.S. contractors in the table, the small number of contractors which performing mainly or only engineering & construction include Foster Wheeler Corp. (98.6% of its sales is from construction. Percentages of other firms in the parentheses below indicate amount of sales from engineering & construction.), Turner Corp.(82.4%), Centex Corp.(88.2%), and Jacobs Engineering Group, Inc.(100%). However, these firms are different from Japanese contractors in the following points; Foster Wheeler and Jacobs Engineering Group, Inc. provide construction and engineering services, but in plant and industrial facilities which Japanese contractors do not touch, such as chemical processing plants, energy-related facilities, fertilizer

Table 3.20: Detailed Structure of U.S. and Japanese Contractors-(1)

	Kellog Rust	Fluor Corp.	Stearn Catalytic	Lummus Crest	Foster wheeler
Rank	1	2	5	7	9
Parent Firm	The Signal company		Air Products Co.	Combustion Engr. Co.	
Areas of Exper-tise	Engr. & Const-ruction (Metal, Energy, Mining) Special Chemical Mfg.	Engr. & Const-ruction, Metal,Coal Mining Operation Oil&Gas drillion	Engr. & Const-ruction (Gas, Chemical, Energy) Equipment of Air-plane	Engr. & Const-ruction (Gas, Process, Energy), Electro-nics Engr.	Engr. & Const-ruction (Process Plant, Energy) Real Estate
($ mil)					
Asset	5,511	3,892	2,327	2,508	897
Sales	6,005	4,401	1,735	3,057	1,327
Contract (by ENR)	(10,855)	(8,353)	(4,932)	(3,200)	(2,413)
(%)					
Income	4.8	0.02	8.1	3.3	2.7
Property & Equipment in Assets	16.9	60.1	68.2	55.7	24.7
(% in Sales)					
Const.	n.a.	72.8	n.a.	n.a.	98.6
Real Estate	n.a.	0.0	n.a.	n.a.	1.4
Others	n.a.	27.2	n.a.	n.a.	0.0
Total	100.0	100.0	100.0	100.0	100.0

Source: 18.a. - h., 3.

Table 3.20: Detailed Structure of U.S. and Japanese Contractors-(2)

	Turner Corp.	Morison-Knudsen	Ebasco	Dravo	Centex
Rank	11	12	13	17	23
Parent Firm			Enserach		
Areas of Expertise	Construction, Real Estate Stone Production	Engr. & Construction, Ship(Gas, Operation Mfg. of Railway-cars)	Engr. & Construction, Gas distribution, Oil Production, Oil Field Operation	Engr. & Construction (Natural Resource), Cargo Production, Pipe Mfg.	Construction, Const. Material Production, Production
($ mil)					
Asset	514	830	3,363	540	846
Sales	1,694	2,022	3,545	845	1,215
Contract (by ENR)	(2,154)	(2,087)	(1,581)	(1,232)	(1,014)
(%)					
Income	0.8	2.2	2.6	-2.4	3.6
Property & Equipment in Assets	3.1	27.8	65.4	38.0	18.7
(% in Sales)					
Const.	82.4	77.5	24.8	43.1	88.2
Real Estate	11.9	0.0	0.0	0.0	0.0
Others	5.7	22.5	75.2	56.9	11.8
Total	100.0	100.0	100.0	100.0	100.0

Table 3.20: Detailed Structure of U.S. and Japanese Contractors-(3)

	United Engr.	Kopper	Jacobs Engr.	Cenvill	Maccor-mick
Rank	109	50	47	251	349
Parent Firm	Raytheon				
Areas of Exper-tise	Engr. & Const-ruction, Airplane Parts Mfg.	Const-ruction, Chemicals Product-ion, Elec-tric Appliance Mfg.	Engr. & Const-ruction, (Power, Fertilize, Mineral, Hazardous, Oil)	Const-ruction, Real Estate, Community Services	Const-ruction,
($ mil)					
Asset	3,600	1,167	98	111	21
Sales	5,996	1,816	220	84	54
Contract (by ENR)	(195)	(380)	(457)	(121)	(60)
(%)					
Income	5.7	1.6	9.9	5.7	2.5
Property & Equipment in Assets	26.3	49.6	17.7	10.1	1.4
(% in Sales)					
Const.	11.3	38.9	100.0	61.9	100.0
Real Estate	0.0	0.0	0.0	0.0	0.0
Others	88.7	61.1	0.0	38.1	0.0
Total	100.0	100.0	100.0	100.0	100.0

Table 3.20: Detailed Structure of U.S. and Japanese Contractors-(4)

	Tiasei	Kajima	Shimizu	Ohbayshi	Kumagai	Hazama
Rank	1	2	3	4	6	8
Parent Firm						
Areas of Expertise	Construction (Heavy, Bldg.)	Construction (Heavy, Bldg.)	Construction (Heavy, Bldg.)	Construction (Heavy, Bldg.)	Construction (Heavy, Bldg.)	Construction (Heavy, Bldg.)
($ mil)						
Asset	4,757	4,972	3,980	3,881	3,782	1,513
Sales	5,040	4,304	4,226	3,066	2,695	1,475
Contract (by ENR)	--	--	--	--	--	--
(%)						
Income	1.02	1.45	1.46	1.61	2.32	1.01
Property & Equipment in Assets	8.1	5.9	4.7	4.5	3.7	8.5
(% in Sales)						
Const.	91.0	95.2	98.8	97.1	92.8	98.2
Real Estate	7.4	4.8	1.2	2.9	7.2	1.8
Others	1.6	0.0	0.0	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

plants, and hazardous waste facilities. Also Jacobs Engineering provides construction services on a CM basis. Turner Corp. and Centex Corp. are perhaps the closest to Japanese contractors in terms of range of expertise, such as building construction, real estate, and design services related to building construction. However, they differ from Japanese contractors in the role they play and the coverage they provide in construction projects, as will be discussed later in a separate section.

Diversified firms' sales from construction and engineering are smaller, c.f. Fluor Corp.(72.8%), Morrison-Knudsen(77.5%), Dravo Corp(43.1%), Kopper Co.(38.9%). Contractors held by conglomerates show an even smaller percentage of construction and engineering sales, c.f. Ebasco Services(24.8%), United Engineering, Co.(11.3%). (Percentages of Kellog Rust, Inc., Stearn catalytic, and Lummus Crest, Inc. are not provided in their annual reports.) Because these diversified firms and conglomerates holding construction firms operate plant and/or other industrial facilities themselves, and sometimes manufacturing other products not related to construction, their assets are generally quite large and include a high proportion of property and equipment.

Japanese contractors' stability comes fundamentally from the bidding system in Japan and the similarity among Japanese contractors as well as their orientation to Japanese domestic building and heavy construction market.

The scale of domestic building and heavy construction projects is not large compared to foreign plant and industrial facilities construction. Therefore, the availability of one particular project does not seriously affect firms' total performance. The performance of Japanese firms depends on an accumulation of small to medium projects.

The bidding system provides Japanese contractors with stable amount of work. Because bidding system will be discussed in more detail later, only one form, Special Nominative Bidding, the most important for the top ranking contractors, will be discussed here. In this bidding system, a client chooses a particular contractor which the client believes to be the most suitable for the project reliable and negotiates a price. Because more than 70% of total contracts of large firms are made through this bidding method, each top ranking contractor tries to develop close relationships with its own particular clients (often privately) as well as to enhance its reputation for technological proficiency and efficient management.

Also, Japanese firms are fundamentally similar and not differentiated from each other. Firms of the same size and recently even of different sizes of firms perform the same types of building and heavy construction except plant construction. Each company possesses comparable technology. Any innovation attempted by one firm will soon be tried by other firms. All the large firms have their own in-house design departments (including architectural, structural, and geotechnical sections). All of them have in-house research laboratories and perform R&D individually, spending 0.5% to 1.0% of total sales. All of them provide their customers with a variety of vertically integrated services in more or less the same way. (Difference in the provision of services between U.S. and Japanese contractors will be discussed in the separate section later.) This close similarity among firms promotes great conservatism in defending the territory each firm has carved out in the market. As a result, Japanese contractors coexist with very narrow but stable profit margins.

3.4.2 Coverage of Activities by Participants in Construction Projects

Construction is composed of various, complex activities, including 1) finding a project, 2) feasibility study and schematic planning, 3) actual design, 4) construction of a facility, and 5) operation and maintenance. Coverage of these activities, the role of participants, and the identity of the participants themselves differ between U.S. and Japanese construction. Table 3.21 and 3.22 portray the participants and their coverages in the two countries. In the U.S., the participants, each usually an independent organization selected on the basis of bidding price and qualifications, are gathered together on a project-by-project basis with little provision for ensuring organizational compatibility and leave little room for continuity of working relationships.

In addition, each participant generally comes into the project only when he is absolutely needed. In U.S. construction, the most powerful or leading participant is an architectural or engineering firm acting as the owner's agent. The owner may have his own staff in architecture or engineering, but usually has to hire an architect. Because architects and engineers are highly specialized, no one architect or engineer will be able to cover all aspects of design and engineering. An owner usually must hire several architects and engineering firms or one architect plus several specialty engineering firms. Because of this fragmentation, architects or engineers, while very influential in projects in the U.S., don't necessarily control the project from beginning to end.

General contractors in the U.S. simply construct the facility as the drawings indicate or as architects or engineers direct. Cooperation between a general contractor and an owner or between a general contractor and an architect during a project is usually rare. Subcontractors and suppliers may serve a general contractor, but they do not share the responsibility of the general contractor. This poor cooperation among participants, especially between a design firm and a general contractor or

Table 3.21: Major Participants, Their Function in Steps in the U.S. Construction

	Conception	Analysis & Planning	Design	Construction	Operation & Maintenance
Owner	Input: market/needs analysis, feasibility /economic analysis, site evaluation & selection Outputs: needs statement, schedules, plans, finance		monitoring, reviewing, approving		start-up, planning & implementation
Investor			financing		
Architect, Engineer			Inputs: design & engr., alternative Outputs: planning specification, contracts	monitoring reviewing, approving, changes	resolution of operating problem modernization /upgrading
Design/ Constructor	Inputs: market/needs analysis, feasibility /economic analysis, site evaluation & selection Outputs: needs statement, schedules, planning, finance				
General Contractor /Sub-Contractor				Inputs: site & resource mgt. Outputs: physical	alterations, major repair, deficiency correction
Operator/ User					Inputs: operation, mfg Outputs: operating facility

Source:

Table 3.22: Major Participants, Their Function in Steps in Japanese Construction

	Conception	Analysis & Planning	Design	Construction	Operation & Maintenance
Owner	Input: market/needs analysis, feasibility /economic analysis, site evaluation & selection		monitoring, reviewing, approving		start-up, planning & implementation
Investor	Outputs: needs statement, schedules, plans, finance		financing		
Architect /Engineer			Inputs: design & engr., alternative Outputs: planning specification	monitoring reviewing, approving, changes	resolution of operat- problem modernization /upgrading
General Contractor	Inputs: market.needs analysis, feasibility /economic analysis, site evaluation & selection Outputs: nees statement,		Inputs: design & engr. analysis, alternatives Outputs: plans, contracts	Inputs: site & resource mgt. Outputs: physical facility	alterations, major repair, deficiency correction
Subcontractor				Same as General Contractor	
Operator/ User					Inputs: operation, mfg Outputs: operating facility

between an owner and a general contractor, usually creates a huge amount of claims from a general contractor. Some of them end up in court. Also, such poor cooperation probably reduces productivity, and causes final construction often to go well over original budget and fail to meet completion dates.

Vertical integration, in which architects and engineers form a single firm, is one way these probles may be avoided. This type of firms have been increasing in number and share of the design market. For example, in 1985, design contracts won by engineer-architect firms accounted for 40% of the U.S. design-only market occupied by the top 500 design firms. (Source: 18.o.) Also, engineer-architect firms dominated 24% of the design market. Therefore, engineer-architect and architect-design firms dominated two-thirds of the market. Architecture firms captured only 7% of the market.

In the U.S., plant and industrial facilities construction is predominantly carried out by design/constructors which are the most vertically integrated type of firms in the U.S. construction industry as described in Table 3.21. This type of firm performed most successfully. For example, 133 design contracts based on design-construct were received by U.S. design-constructors. They earned $27.3 billion in 1984, an amount 50% larger than the design-only contracts.

In addition to these vertically integrated firms, the field of Construction Management (CM) is helping alleviate the effects of poor cooperation between the diverse participants in U.S. projects. A CM firm coordinates a project from the beginning to the end as an agent of the owner.

Among the participants in U.S. construction, a design/constructor may be the most comparable to Japanese contractors in terms of the range of services offered. However, Japanese contractors not only provide more services but also maintain closer relationships with other participants and take more responsibility for the entire project.

As mentioned above, large Japanese contractors have their own in-house design departments which are much larger than usual design firms. These departments cover not only architectural, structural, geotechnical, mechanical, and electrical design but also nuclear, electronics, and sometimes biological fields. Also, having budgets of 0.5 to 1.0% of the firms' total sales, these labs can perform R&D using the most modern facilities, some of which are larger than facilities in universities. These research labs are not only helping to solve field problems, but also to create new markets for the future by developing technology in the fields their clients may enter in the future. Large contractors often operate real estate departments or subsidiaries which not only execute development but act as sales agents for developed facilities.

Furthermore, each Japanese general contractors works with a particular group of subcontractors on an on-going basis. There traditionally have been close relationships between general contractors and subcontractors. These subcontractors provide skilled workers as demanded by their general contractors. Therefore, mmeting deadline for projects is a great strength of Japanese construction industry. (Of course, because reputation is so important among these very similar firms, they make major efforts to meet deadlines.)

Furthermore, power and authority of design firms to control projects are weak in Japan; general contractors inevitably have to take full responsibility.

As a result, Japanese general contractors are in touch with projects from the beginning to the end. For example, they study the needs of owners, search for projects, look for sites (sometimes provide sites out of their own stocks of land), perform feasibility studies for clients, provide finance needed for the projects, of course provide construction service, and even find tenants to occupy the completed facilities. It is no exaggeration to say that the Japanese construction industry which would be otherwise diverse and fragmented is organized and integrated by general contractors.

3.4.3 Plant Construction in Japan

As already mentioned, separation of plant construction from other construction activities in Japan may be one of the most significant ways in which differs from the U.S. construction industry. This fact also has confusion and bias against the Japanese construction in the construction industries of other countries. Plant and industrial facilities construction has been performed by firms other than the well-known top ranking contractors in Japan. The firms listed in the middle of Table 3.19 are performing plant and industrial facilities engineering and construction, basically on a design/construct basis.

The meaning of "plant" is very vague in Japan and thus, "plant" construction has neither been recognized as a distinct class of work nor involved as a separate unit in any classification of industries. The notion of "plant" appears only in MITI's (Ministry of International Trade and Industry of Japanese government) statistics on "plant export". Therefore, there has been no statistics on domestic production of plants. Usually, a "plant" is divided into all its parts and components which are then recorded in economic statistics as products in numerous industries. This is why plant construction has not been recognized as a part of construction in Japan.

However, plants are actually one of the key export products of Japan. In 1981, the total amount of plant export was $12 billion, 8.1% of Japan's total exports and equalled almost half the export value of automobiles, the No.1 export commodity. Also, the amount of plant export was three times larger than the amount of overseas construction in that year (See Table 3.23).

In Japan, plants can be divided into several categories:

1. Heavy electric plants
2. Communication plants
3. Synthetic fiber plants
4. Chemical and oil plants
5. Steel plants
6. Paper, pulp plants
7. Cement plants

Many types of plant engineering firms specialize in one of the types of plants listed above. Such plant engineering firms are listed in Table 3.24. General contractors in Japan take part only in the building and heavy construction portion of a plant project; they act as subcontractors of the plant engineering firms.

3.4.4 Subcontracting System

The unique multilayer subcontracting system of Japan provides one of the important differences between the U.S. and Japanese construction industries. As mentioned in

Table 3.23: Plant Export and Overseas Construction in Japan

	Value of Japan's Total Plant Export ($ mil)	Value of Plant Export as Percentage for Japan's Total Export (%)	Value of Overseas Construction for Japanese Contractors ($ mil)
1966	327	3.3	N.A.
1970	965	4.8	117
1975	5,241	9.2	1,082
1980	8,932	6.5	2,239
1981	12,313	8.1	4,166
1982	10,986	7.9	3,980
1983	5,992	3.9	4,446

Source: 51

Table 3.24: Firms Providing Plant Engineering Services in Japan

Type of Firm	Name of Firm
1. Firms which originally were oil refinery or chemical processing firms	Nikki(JGC Corp.), Chiyoda Chemical, Toyo Engineering
2. General machinery firms (Mainly ship-building, heavy machinery firms)	Mitsubishi Heavy Industry, Ishikawajima-Harima Heavy Industry (IHI), Kawasaki Heavy Industry, Mitsui Ship-Building, Hitachi Ship-Building
3. Engineering department of steel firms	Shin-Nippon Steel, Nippon Steel, Kobe Seiko
4. Engineering department of heavy electric or communication machinery firms	Hitachi Seisakusho, Toshiba, Mitsubishi Electric, NEC, Fujitsu
5. Machinery and plant department of general trading firms (Mainly serving as coordinators)	Mitsubishi-Shoji, Mitsui-Bussan, Marubeni, Itochu-Shoji

Source: 51

comparing the cost structures of contractors in both countries, the subcontract rate does not differ essentially for heavy and building contractors or for large contractors in the two countries despite differences in the definitions of subcontract and labor, but does differ considerably for special trade contractors and small contractors. This difference arises from the multilayer subcontract system in Japan.

Although general contractors in Japan take full responsibility for projects and engineers from general contractors control entire projects, they do not execute any work physically. Instead, they employ subcontractors for each type of work, such as concrete work, excavation, carpentry, roofing, or interior finishing. These subcontractors perform the physical work.

There are two reasons why the multilayer subcontract system exists in Japan. Firstly, by using subcontractors, contractors or subcontractors, both large and small firms, can minimize their own resources, and thus protect themselves from risks created by fluctuations in available work. Furthermore, because it is rare to have many projects in one particular region, general contractors large an small are wise to use local subcontractors. Secondly, by using labor forces and equipments only at the time general contractors or subcontractors need to use them, they can perform more rationaly and efficiently. This concept prevailed throughout the construction industry in Japan.

Even small subcontractors or special trade contractors consistently use smaller subcontractors.

Most importantly in Japan, each large general contractor acts as an umbrella under which many subcontractors are layered, each serving a particular general contractor. In the U.S. construction industry, a general contractors gathers together the subcontractors required for a given job on an ad hoc basis, without establishing any ongoing working relationship. In Japan, intimate relationships usually exist between a general contractor and subcontractors in various specialties. The relationships between a general contractor and the first layer of subcontractors especially have been maintained often for a long time and are very strong.

These relationships have contributed the efficiency and productivity of general contractors, especially of large general contractors which have significantly higher productivity, compared to smaller firms (See Table 3.13 and 3.14). The enormous productivity of large Japanese contractors, ability to bring in projects on time, flexibility to perform many types of projects, and willingness to assume considerable responsibility for an entire project, are all dependent on the efforts of numerous tiny subcontractors, located far beneath the umbrella held by each contractor.

3.4.5 Bidding System

The bidding systems in the two countries also show clear differences. The bidding system in the U.S. is sustained fundamentally by free open competition, though large contractors in the U.S. increasingly are receiving contracts on a negotiation basis (except in public projects).

In contrast, Japanese contractors are highly dependent upon negotiation. There are fundamentally three types of bidding methods in Japan. They are;

1. Open Competition Bid (Ippan Kyoso Nyusatsu)
2. Nominative Competition Bid (Shimei Kyoso Nyusatsu)
3. Special Nominative Bid (Tokumei Nyudatsu)

An open competitive bid is fundamentally the same as the open bid system in the U.S. Any firm can take part in this system if it meets certain conditions. Although this type of bidding system seems to provide the soundest way of choosing contractors, most bids are not made in this way except in purchasing machines or equipment on small-scale projects because this system is believed to create excessive competition among bidders.

The nominative competition bid is the method used most frequently both in private and public projects. In this type of bid, a client nominates a certain number of firms (usually below 10) which the client considers capable and suitable for the project. Then, contractors nominated bid against each other for the job.

As for public construction, almost all projects are contracted for using this method because public facilities need to be of the highest quality possible within the project budget. It is important to chose a firm having sufficient technology, management ability and financial capability to build excellent facilities.

In this system, the public client develops a list of contractors on the basis of scores given contractors for various characteristics, such as its annual construction contract amount, capital composition, level and number of engineers and administrative personnel, profitability, length of time in business, past records of projects by type and size, adequacy of construction machines and equipment, safety record in performing past projects, degree of employee welfare and so on. In order to be nominated, general contractors are always making efforts in all of these areas. Research and development by Japanese contractors are also aimed at this objective. Moreover, this system is being used to support the entire Japanese construction industry by providing small projects to small firms, medium-size projects to medium-size firms, and large projects to large firms.

The special nominative bid is used only by private clients. In this type of bid, a client nominates only one contractor considers to be the best suited to the project and asks the nominated contractor to submit an estimate for the project. The client and the general contractor negotiate not only the price but also various conditions. Finally, after both of them agree on everything, they make a contract.

Large general contractors in Japan have enjoyed this bidding system. Apparently they have comparative advantages over small to medium-size firms in financial, technological, and managerial ways, so that the percentage of contracts received through this system by the top ranking contractors account for more than 70% of their total contracts received. This is why it is very important for contractors to establish and maintain close relationships with their clients, not only on a business basis but even on a private basis between the top managements of a client and a general contractor.

Like the nominative competition bid, the special nominative bidding system has provided the Japanese construction industry, especially large contractors, with a very useful system for coexistence. As mentioned in the comparison between the top 10 contractors in both countries, Japanese contractors are fundamentally homogeneous but have been able to coexist. One of the reasons is the functioning of the bidding system. By establishing relationships with particular customers individually, large homogeneous Japanese contractors have been able to avoid aggressive invasion of other contractors' territories.

3.4.6 Labor Unions

Labor unions in both countries also are clearly different from each other. Although recently unions in the U.S. have been losing their grip on the construction industry, they still have a considerable effect on the industry. Labor unions in Japan are comparatively weak and small because management has been based on close relationships between employers and employees, who have enjoyed such benefits as life-time employment and seniority salary systems. More importantly, the relationship between contractors and workers is different from the U.S., because the close relationships between general contractrors and their own subcontractors provide general contractors with all the workers needed to perform construction projects.

In the U.S., corporate management is fundamentally founded on the direct relationship between general contractors and workers. There is no such buffer between them comparable to that provided by subcontractors in Japan. The United Automobile Workers Union and United Steel Workers have developed enormous bargaining power. Since the 1920s, labor unions in the U.S. construction industry have dominated this industry also, providing a degree of stability to the highly variable and unstable demand market for construction. The characteristics of construction unions include; 1) organization on a craft or craft-industrial basis, and the concept of exclusive jurisdiction of each union over specific work operations; 2) extensive organization and financing of unions at all levels; 3) considerable autonomy of locals in the conduct of their affairs, particularly in the area of collective bargaining.

Contractors in each area have joined together in trade association (e.g. Associated General Contractors of America (AGC)). Contractors associations frequently serve as the bargaining unit in union contract negotiations, which controls competition among contractors and gives them greater strength in negotiating with the various unions.

However, unions in the U.S. have been rapidly losing their power to dominat industry. For example, union contractors (e.g. contractors which utilize union labor) accounted for 60 to 70% of the total number of contractors in 1970, but the percentage declined to 35% in 1980. This occurred first because union contractors no longer competed with non-union contractors in cost competition, especially in the area of union wage rate and fringe benefit to workers which had troubled union contractors. Second, wage rates did not vary with skills so that individuals were not motivated to compete inside the unions. Third, union contractors were controlled by strict jurisdictional lines, for example, sharply restricted use of helpers or workers. As stated above, unions in the U.S. are fading as a whole, but they still a serious concern in certain areas, particularly in the Northeast and Atlantic regions.(1)

In Japan, only 783,000 out of 5,270,000 people in the construction industry in 1984 were involved in unions. Union members accounted for 14.9% of the total population in the construction industry. This percentage is very small compared to 35% union memberships in the U.S.construction industry. In addition, all the existing Japanese unions are very weak and do not possess any significant bargaining power. There are four types of unions in the Japanese construction industry (Members often join several unions simultanously so that the total number of union members can not be over 783,000). They are:

1. Firm-based unions -- unions operated on a firm by firm basis and fundamentally for employees of general contractors.
2. Individual unions -- unions joined by individual workers in the construction industry
   e.g. Zenkoku-Ippan(123,000 members)
   Kensetsu-Ippan(68,000 members)
3. Compounded unions -- joined by employees and workers in 1 and 2 but fundamentally composed of technical workers in local construction firms
   e.g. Zenken-Soren(351,816 members)
4. Industry-based union-industry-wide unions

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(1) According to ENR (Nov.5), the exact reasons and patterns of the open shop's gains vary by type of construction and geography. Part of the open shop's current strength is due to the large amount of new construction now concentrated in the sunbelt, never a union stronghold.

e.g. Kensetsu-Roren(652,000 members)
Sohyo-Zennikken(15,659 members)
Nikken-Kyo(66,000 members)
(Source: 51)

Although there are several unions as shown above, they are closer to social groups rather than to bargaining unions. Members meet to discuss current concerns, but they do not have the power or tradition for bargaining with general contractors. Exceptions are firm-base unions created by employees (not workers) of general contractors to negotiate their salaries. As mentioned at the beginning of this section, general contractor do not bargain directly with workers in Japan. Subcontractors provide workers. In addition, general contractors and subcontractors maintain close relationships. Similarly, subcontractors and workers are also closely linked often through personal relationships. Therefore, Japanese general contractors have not confronted workers. As a result, there has been almost no strikes in the Japanese construction industry. This coherent web of relationships linking general contractors and workers has helped Japanese general contractors perform work of high quality with enormous safety, relatively low cost, and on-time completion, and high responsibility to clients in the domestic Japanese construction market.

3.4.7 Management, Operation and Ownership of Japanese Contractors

The construction industry is probably one of the most conservative and least modernized industry in Japan in terms of operation and management. One typical example of such characteristics of the construction industry is management by owner-family, which still prevails throughout the industry. Because construction firms did not need capital investment as intensive as manufacturers did, most construction firms in Japan were originally initiated by owners' funds. The owners and their families managed the firms for a long time. At present, in the majority of construction firms in Japan , owners of capital and management of the firms are not still separated. In other words, the owner of equity in the firms are managing the firms. For example, 30% of equity in Kajima Construction, ranked at No.2 in 1984, is owned by the Kajima family. Total equity owned by the Kajima family and the employees exceeds 50%. Takenaka Komuten, ranked No.5 in 1984, has not issued stock to the public. The majority of stocks is owned by the Takenaka family and its employees. Among the top 50 contractors in Japan, 70% are headed by descendants of the founders and the founders' families still own large portion of stocks. The percentages increase inversely to the size of firms. Firms in which management and ownership of equity are clearly separated are still rare in Japan today. Also, many contractors were named after their founders and, in the conservative spirit, still use the names, which include Kajima, Shimizu, Takenake, Ohbayashi, Kumagai, Fujita, Toda, Sato, Maeda, Okumura, all of them the top-ranking firms in Japan.

However, among Japanese contractors, modernization, in such forms as separation of management and ownership of equity, has been progressing year by year, as firms grew and large amounts of capital became necessary. Table 3.25 shows changes in percentages of the numbers of stocks owned by management and individuals that include owner family members. Since 1965, stocks were increasingly owned by banks, life, and non-life insurance firms. Table 3.26 shows such trends. Financial institutions and insurance firms have been investing more and more in firm stocks, including stocks of contractors. At present, several banks are major owners of equity in contractors as shown in Table 3.27. Consequently, Japanese contractors have begun to have source of funds, and with that source, they are strengthening their relatively weak financial structures typified by their high debt-to-equity ratios as discussed in Chapter 2. This is one way that Japanese firms can survive with net incomes only 1%.

Table 3.25: Change in Ownerships of Equity of Japanese General Contractors

	Number of Stocks Issued	Percentage of Stocks Owned by Individuals (%)	Percentage of Stocks Owned by Management (%)
1965	2,059,338	63.1	14.5
1970	4,047,362	54.6	11.0
1973	7,227,665	49.5	8.9
1974	7,704,030	48.9	8.1
1975	8,345,144	48.5	7.9
1976	8,951,700	49.0	7.0
1977	9,272,942	45.8	6.6
1978	9,495,917	46.0	6.0
1979	9,845,648	45.7	5.6
1980	10,126,467	44.0	5.5
1981	10,779,788	41.9	5.4
1982	11,284,516	40.9	5.0
1983	11,709,471	40.5	4.7

Source: 51

Table 3.26 Change in Number of Stocks Owned by Financial Institutions and Insurance Firms in Japan

(1985)

	Number of Firms Investing in Stocks	City Banks: Number of Stocks Owned by City Banks (million)	City Banks: Percentage of Stocks Owned by City Banks (%)	Trust Banks: Number of Stocks Owned by Trust Banks (million)	Trust Banks: Percentage of Stocks Owned by Trust Bank (%)
1970	99	877	21.7	499	12.3
1973	123	1,836	25.4	1,134	15.7
1975	129	2,281	27.3	1,409	16.9
1980	133	3,120	30.8	1,820	18.0
1981	134	3,338	31.0	1,954	18.1
1982	136	3,516	31.2	2,066	18.3
1983	141	3,666	31.3	2,073	17.7

	Life Insurance Firm: Number of Stocks Owned by L.I. Firm (million)	Life Insurance Firm: Percentage of Stocks Owned by L.I. Firm (%)	Non-Life Insurance Firm: Number of Stocks Owned by N.L.I.Firm (million)	Non-Life Insurance Firm: Percentage of Stocks Owned by N.L.I.Firm (%)
1970	161	4.0	74	1.8
1973	421	5.8	181	2.5
1975	486	5.8	223	2.7
1980	795	7.9	311	3.1
1981	847	7.9	334	3.1
1982	912	8.1	355	3.1
1983	1,000	8.5	368	3.2

Source: 51

Table 3.27 City Banks Which Are Major Owners of Equity in Construction Firms in Japan

(1985)

Fuji Bank	Daiichi-Kangyo Bank	Sumitomo Bank	Mitsubishi Bank
(1)			
Nishimatsu Const., Goyo Const., Tekken Const., and 3 others	Ando Const.	Kajima Const. Asanuma-Gumi, Tomoe-Gumi, Daiwa House, Taiho Const.	Takasago-Netsugaku
(2)			
Tobishima Const., Maeda Const., Totetsu Industry, and 3 others	Shimizu Const., Hazama-Gumi, Sato Industry, and 5 others	Okumura-Gumi	Tekken Const., Katsumura-Gumi and 3 others
(3)			
Taisei Prefab, Takasago Netsugaku	Asahi Kogyo, and 5 others	Matsumura-Gumi, Morimoto-Gumi	Toda Const. and 3 others

Note: Banks above are the owners of the largest number of stocks in construction firms in (1), the second largest number of stocks of firms in (2), the third largest number of stocks of firms in (3).

Source: 51

3.4.8 The Housing Industry in Japan

In Japan, residential construction was originally performed by tiny house builders, using the traditional Japanese-style wooden structure. General contractors have not impinged upon this area of construction except in some cases of condominium construction and large scale of public housing projects. Residential construction plays no part in the businesses of general contractors. In fact, this market is still considered by people in the industry as a special area of construction like plant construction.

However, in economic terms residential construction actually is a very important portion of Japanese construction industry. As mentioned early in this chapter, the value of residential construction accounts for more than 30% of the value of Japanese total construction. Also, several residential construction firms are as large as general contractors.

Types of residential construction firms and their shares in residential construction market in Japan are presented in Table 3.28. In Japan, there are essenentially three types of residential construction firms. They traditional Japanese-style wooden house builders. They are mostly small builders who originally were carpenters. This type of firm shares 60 to 65% of the entire Japanese residential construction market. Prefabricated house builders comprise another type of firms. They originally

Table 3.28 House Builders and Their Share in Japan

(1985)

Type of builder	Characteristics	Share of Market
Traditional Japanese-Style Wooden House Builder	Fundamentally small builders who originally were carpenters	60 - 65
Prefab House Builder	Specialising prefab houses using pre-cast concrete, but recently introducing 2 x 4 houses successfully	12 - 13
Condominium Builders	Fundamentally performed by general contractors	25

Note: Share indicates value of construction buildt by each type of builder as percentage of total value of housing construction in Japan.

Source: 51

began erecting houses out of precast concrete panels. Because this type of firm needed large facilities to produce precast concrete panels and needed their own designers for prefab houses, the size of these firms is much larger than traditional wooden house builders. The last type of firm is a general contractor, constructing condominiums and large-scale housing. Although many general contractors are involved in this type of construction, Hasegawa Komuten is the leader and has unique expertise in condominium construction. This firm provides vertically integrated services from planning and land development through sales and operation of them by investing their equity. Large firms in each type of residential construction are listed in Table 3.29.

3.5 Research and Development in the Construction Industry

This section will be devoted to research and development (R&D) in the construction industry in the U.S. and Japan because R&D is perhaps one of the most important key to the future of the construction industry. In order to clarify the R&D stances of the construction industries of the two countries, R&D statistics not only for other industries but also for other advanced countries will be compared.

3.5.1 Scale of R&D in Advanced Countries

Among the advanced countries, the U.S. spends by far the most on R&D in terms of both scale and growth. Growth of U.S. R&D expenditure was especially significant after 1975 (See Figure 3.24). R&D expenditure in the U.S. in 1983 amounted to $87,7 billion in current dollars. The value of R&D in the U.S. was 3.2 times larger than R&D expenditure in Japan of $27,4 billion and 4.8 times and 7.9 times larger than R&D expenditure in West Germany and France respectively.

However, the differences between the U.S. and the other three countries are actually less in constant dollars because inflation was more significant in the U.S. than in the other three countries (See Figure 3.25). Differences further shrink when the value of defense related R&D is subtracted from total R&D expenditure in the U.S. R&D (excluding defense-related R&D) in the U.S. was only about two times larger (much smaller than 3.2 times) than the R&D expenditure in Japan.

R&D expenditure in Japan, West Germany, and France grew considerably in real terms between 1965 and 1975 while growth of R&D expense in the U.S. almost stopped during the period. However, since 1975, R&D expenditure in the U.S. has been growing faster than that in the other three countries. In real monetary terms, the gap between the U.S. and other three countries has continued to widen.

Table 3.29: Large House-Builders in Japan

(Traditional Japanese-Style House Builder)

Name of Firm	Total Sales ($mil)	Total Asset ($mil)	Net Income ($mil)	Number of Employee
Shokusan Jutaku Sogo	459	863	-0.6	2,510
Taihei Jutaku	426	n.a.	0.5	3,117
Kobori Juken	162	235	1.4	674

(Prefab House Builder)

Name of Firm	Total Sales ($mil)	Total Asset ($mil)	Net Income ($mil)	Number of Employee
Sekisui House	2,085	2,640	1.7	8,342
Daiwa House Industrial	1,443	1,449	2.2	6,374
Misawa Home	556	606	1.7	1,158
National House Indust.	477	327	1.2	2,108 (1)
Mitsui Home	401	n.a.	n.a.	1,158
Taisei Prefab	257	179	1.2	1,084 (2)

Note: (1) An affiliate of Matsushita Electric Industrial and Matsushita Electric Work.
(2) An affiliate of Taisei Construction.

(Condominium Builder)

Name of Firm	Total Sales ($mil)	Total Asset ($mil)	Net Income ($mil)	Number of Employee
Hasegawa Komuten	878	1,691	2.6	1,688 (3)

Note: (3) Although many medium to large general contractors in Japan engage in condominium construction, Hasegawa Komuten is the expert and leader of this field. This firm is operating an integrated construction business from planning to sales, and is now placing emphasis on development and built-for-sale buildings.

Source: 51

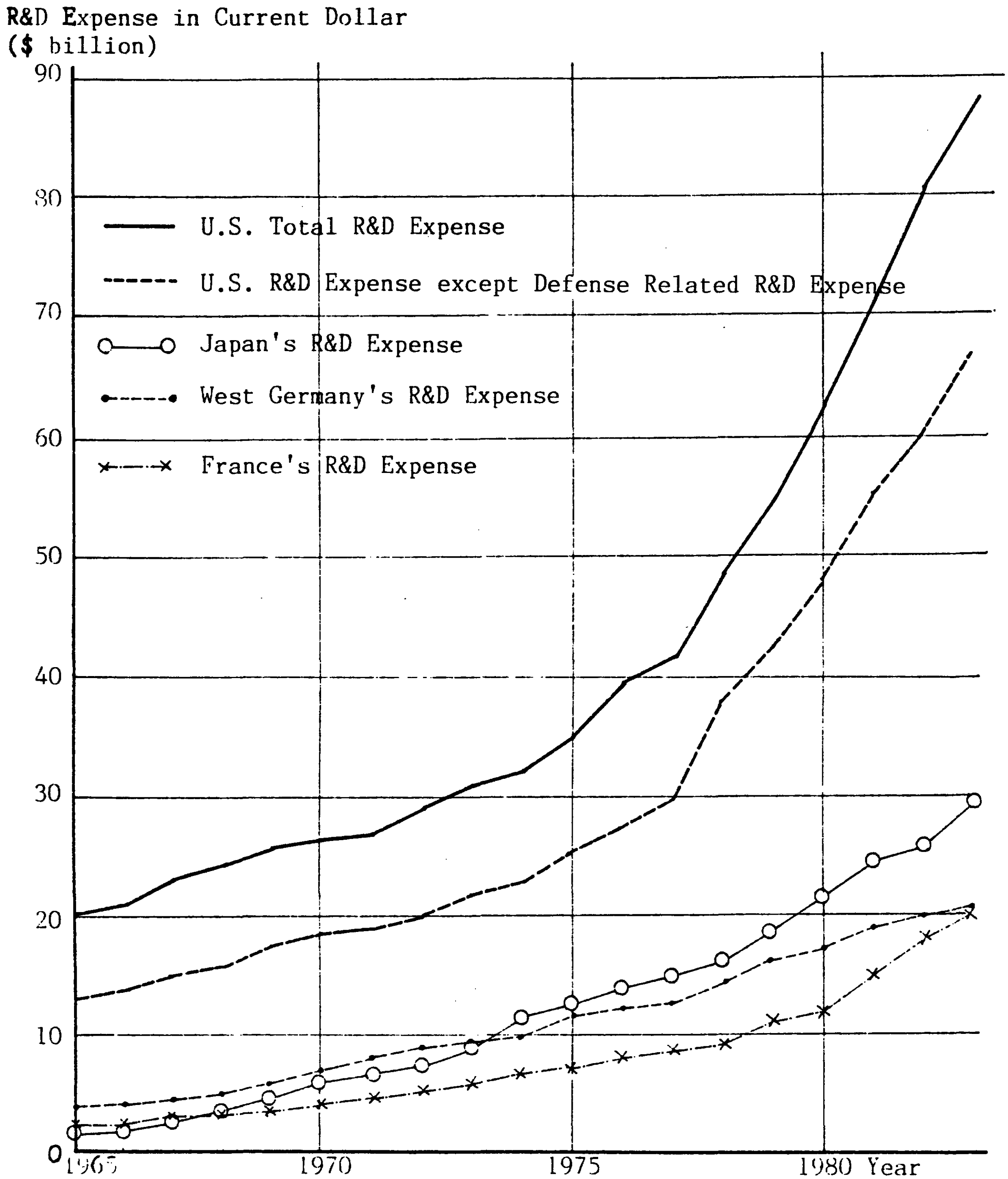
Figure 3.26 shows the rate of growth in R&D expense in these four countries. Although rates of growth in Japan, West Germany, and France were much higher than that in the U.S. before 1975, rates of growth in the four countries have been at almost the same level since then. Only in Japan has the rate of growth been slightly higher than the rate of the U.S. Therefore, the differences in R&D in real monetary terms has been actually expanding because with the same growth rate, originally large values grow faster than do lower value in absolute value.

The number of researchers in the U.S. stayed between 500,000 to 600,000 between 1965 and 1975, but the number has been increasing since 1975 as the real R&D expenditure in the U.S. has expanded. The rate of growth after 1978 was especially remarkable (See Figure 3.27). The number of researchers in Japan has been increasing at a constant rate and reached 340,000 in 1983, almost half the number as in the U.S. Numbers of researchers in both West Germany and France have been increasing at a very low rate (now about 100,000 each) and are still far fewer than in U.S. and Japan.

3.5.2 Components of R&D in Advanced Countries

Research and development are two separate, though related, processes. Research can be divided further into basic and applied research. The shares of these

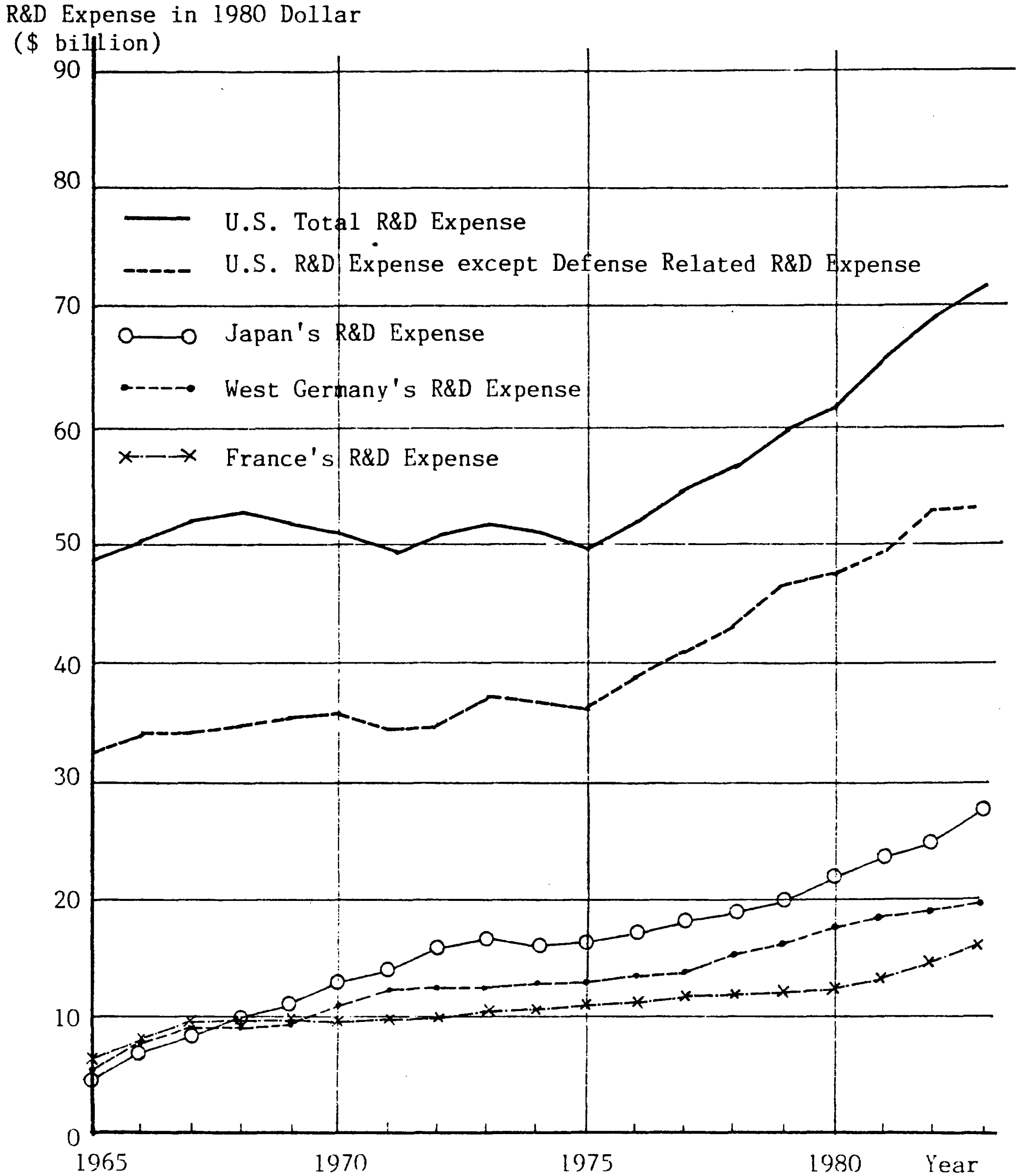
Figure 3.24 : R&D Expense in Advanced Countries in Nominal Term



Note: Average exchange rate in 1980 was used for each currency as below; $1 = ¥220.54, $1 = DM2.26, $1 = £4.12
Japan's R&D includes only R&D in "natural science and technology" while other countries' R&D includes both R&D in "natural science and technology" and "human and social science".

Source: 65

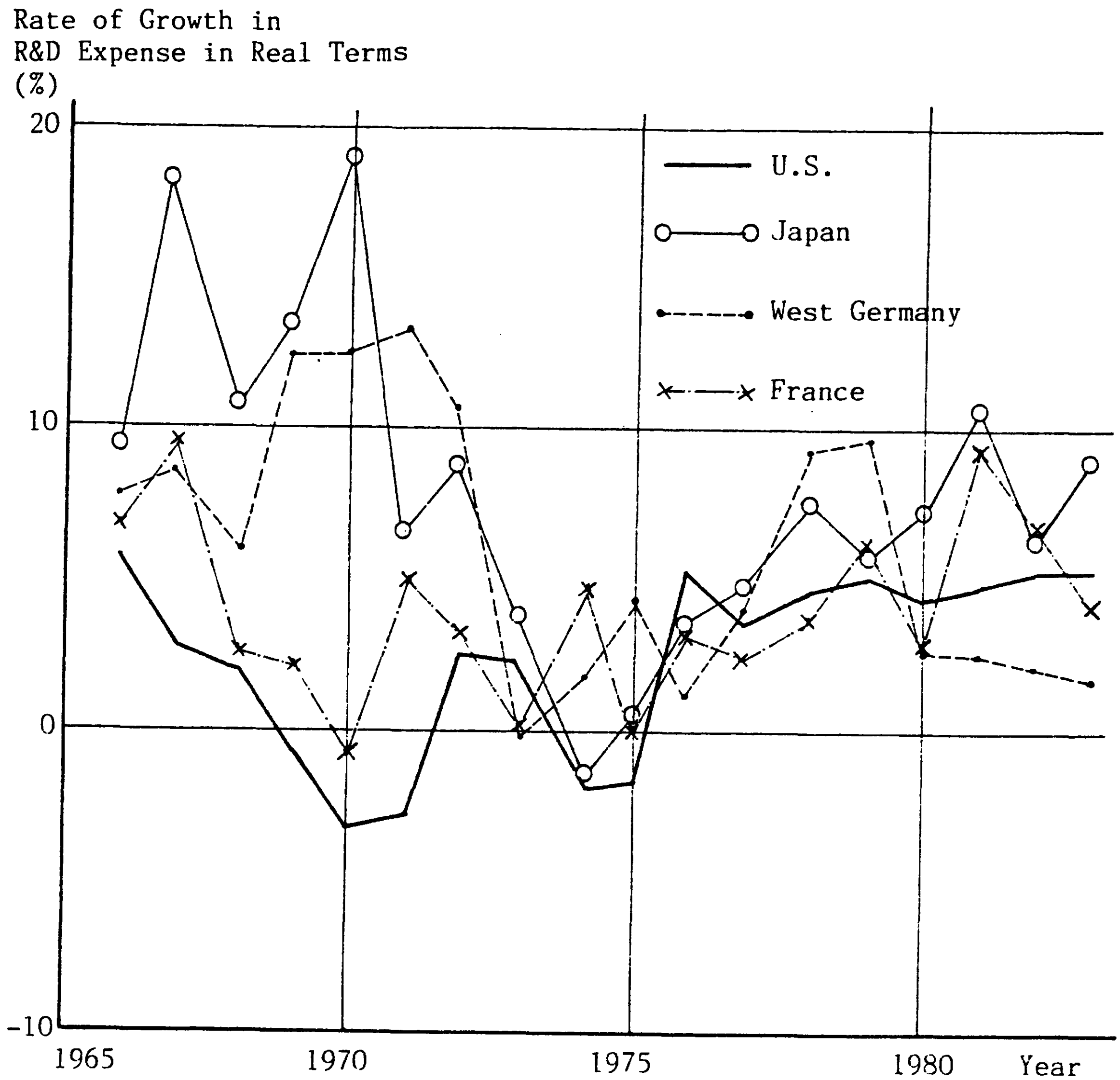
Figure 3.25 : R&D Expense in Advanced Countries in Real Terms



Note: Average exchange rate in 1980 was used for each currency as below;
$1 = ¥220.54, $1 = DM2.26, $1 = f4.12
Japan's R&D includes only "natural science and technology" while other countries' R&D includes both"science and technology" and "human and social science".

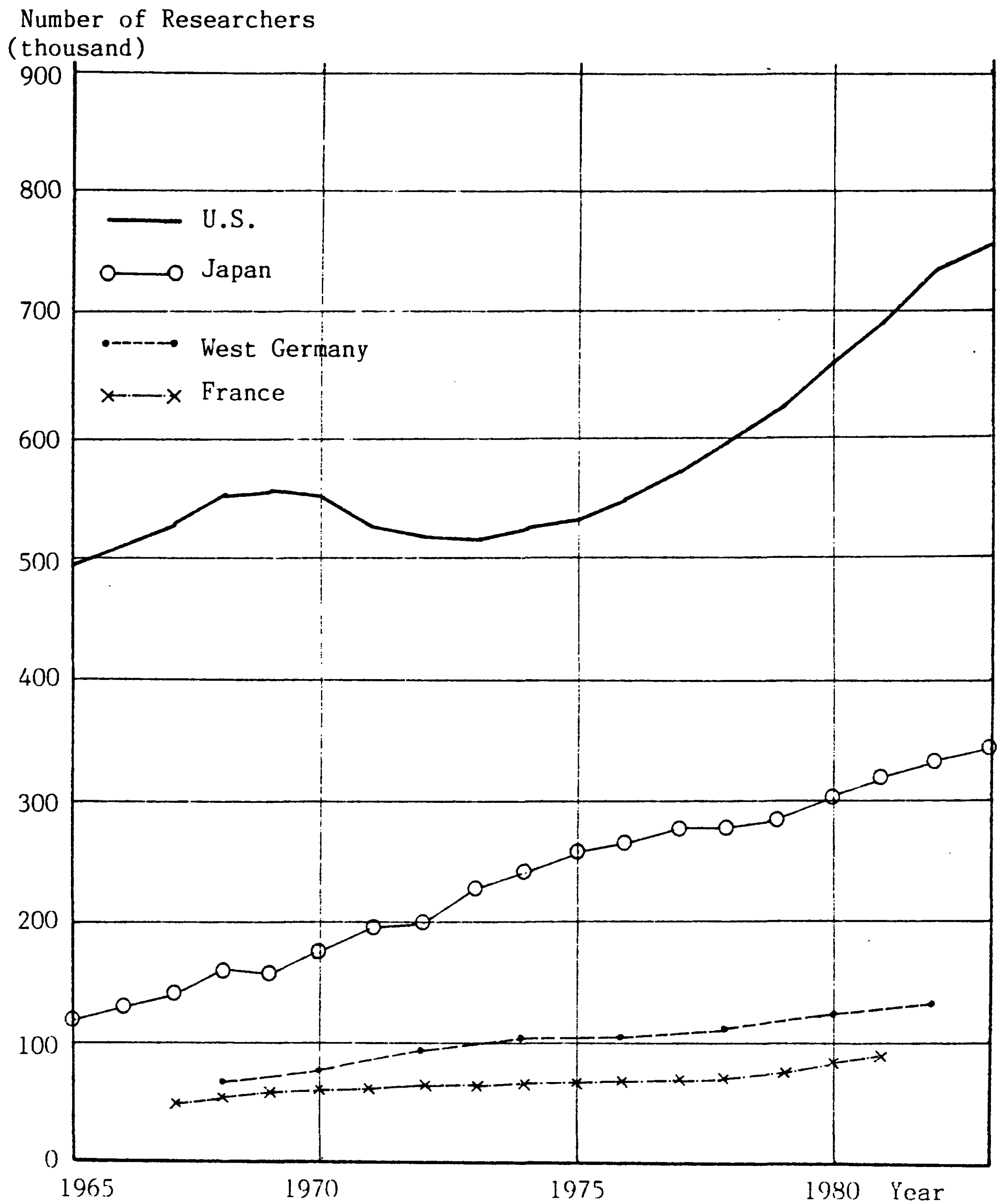
Source: 65

Figure 3.26: Rate of Growth in Real R&D Expense in Advanced Countries



Source: 65

Figure 3.27 : Researchers in Advanced Countries



Source: 65

components in R&D expenditure differ among the four advanced countries.

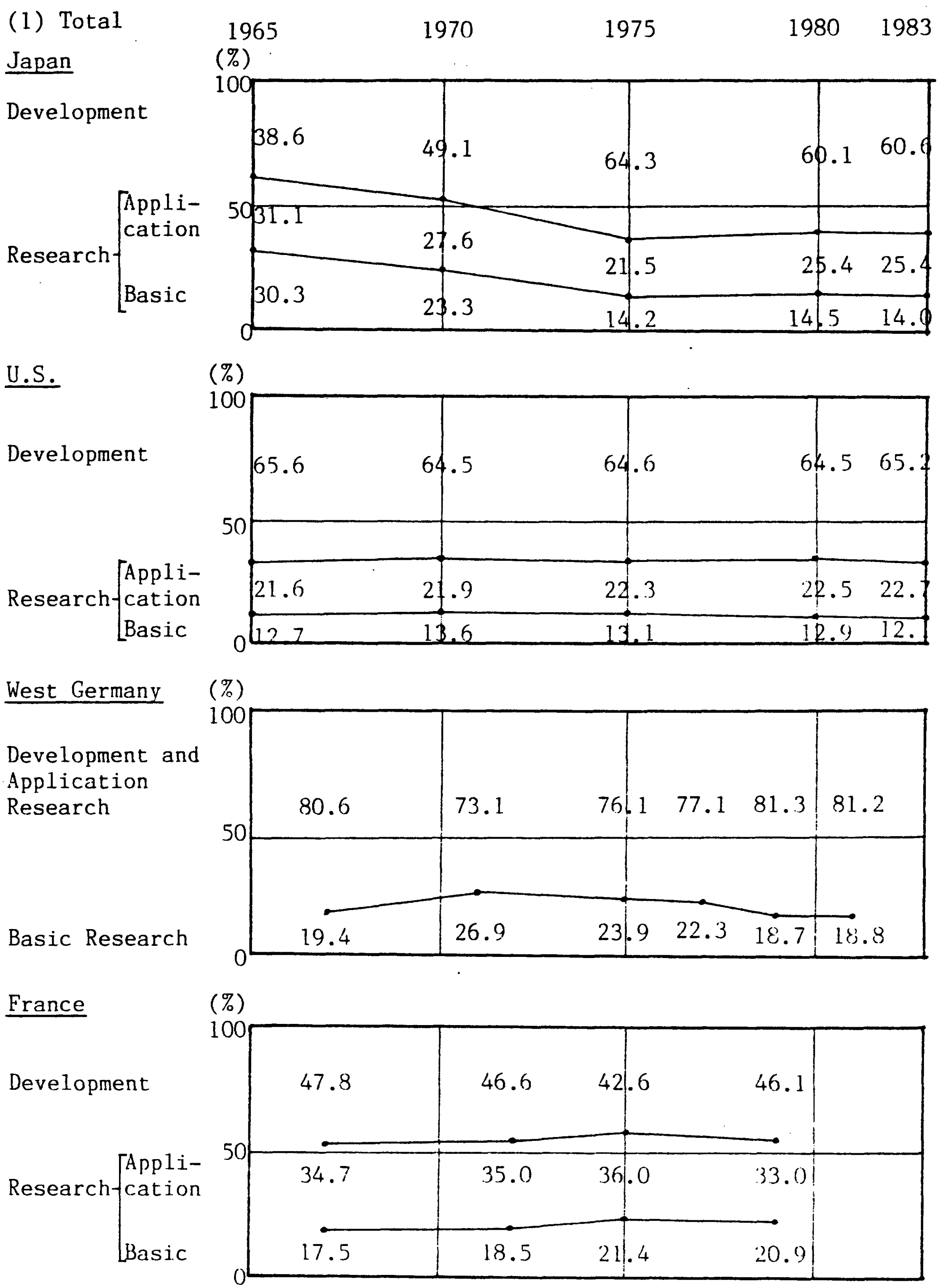
In the U.S. as a whole, the share of the components has not changed since 1965 (See Figure 3.28). The share of development has been around 65% while shares of basic and applied research have been 12 to 13% and 22 to 23%, respectively.

In Japan, the share of development was 38.6% in 1965 but it grew between 1965 and 1975, reaching 64.3%. Since 1975, the share of development has remained at 60%. In contrast, research expenditure in 1965 accounted for more than 60% but shrank to 35% in 10 years. The share of basic research declined by half and the share of applied research by one third in the period. Since 1975, basic research has constantly accounted for about 14% and application research for 25%. Japan puts more emphasis both on basic and applied research but less emphasis on development than does the U.S. Although Japan is usually believed to put emphasis on development, the opposite is actually true.

In France, the percentage of research is more than 50%. Also, percentages of basic research in France and West Germany are much higher than in the U.S.and Japan.

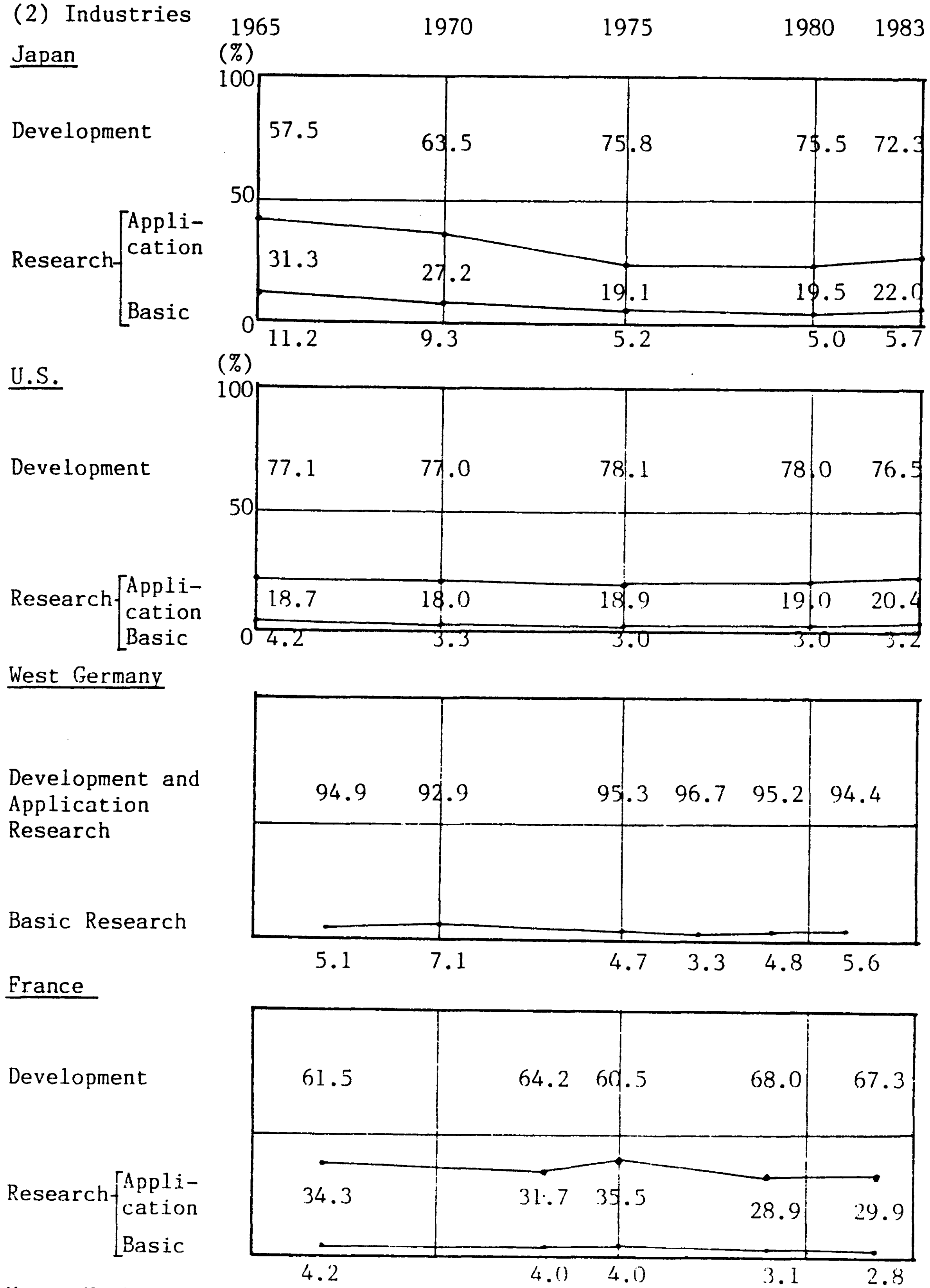
In terms of components of R&D in the industry, the percentage of each component remained roughly constant in the U.S.. U.S. industry has consistently performed development, and less research (See Figure 3.29). In Japan, the development component of R&D in industry was

Figure 3.28 : Components of R&D Expense in Advanced Countries-(1)



Note: Numbers in the figure indicate percentages of components for total R&D expense.
Source: 65

Figure 3.29 : Components of R&D Expense in Advanced Countries-(2)



Note: Numbers in the figure indicate percentages of components for total R&D expense.

Source: 65

57.5% in 1965 but expanded to 75.8% by 1975. Conversely, research, which accounted for 42.5% in 1965, shrank to 24.3% in 1975. In industrial R&D, Japan again show more emphasis in research than the U.S.. In France, research accounted for a higher percentage than in either the U.S. or Japan.

3.5.3 R&D Expense and Finance by Organization in Advanced Countries

In the U.S., Japan, and West Germany, around 70% of R&D is performed by industries (See Figure 3.30). In France, R&D performed by industry accounts for slightly below 60%. In the four countries, R&D has been performed by industries as indicated by the growth of the percentage of R&D by industries between 1965 and 1980s. In Japan and West Germany, universities performed the second largest amount R&D. In the U.S., R&D by universities has grown since 1965 and to equal the percentage performed government organizations.

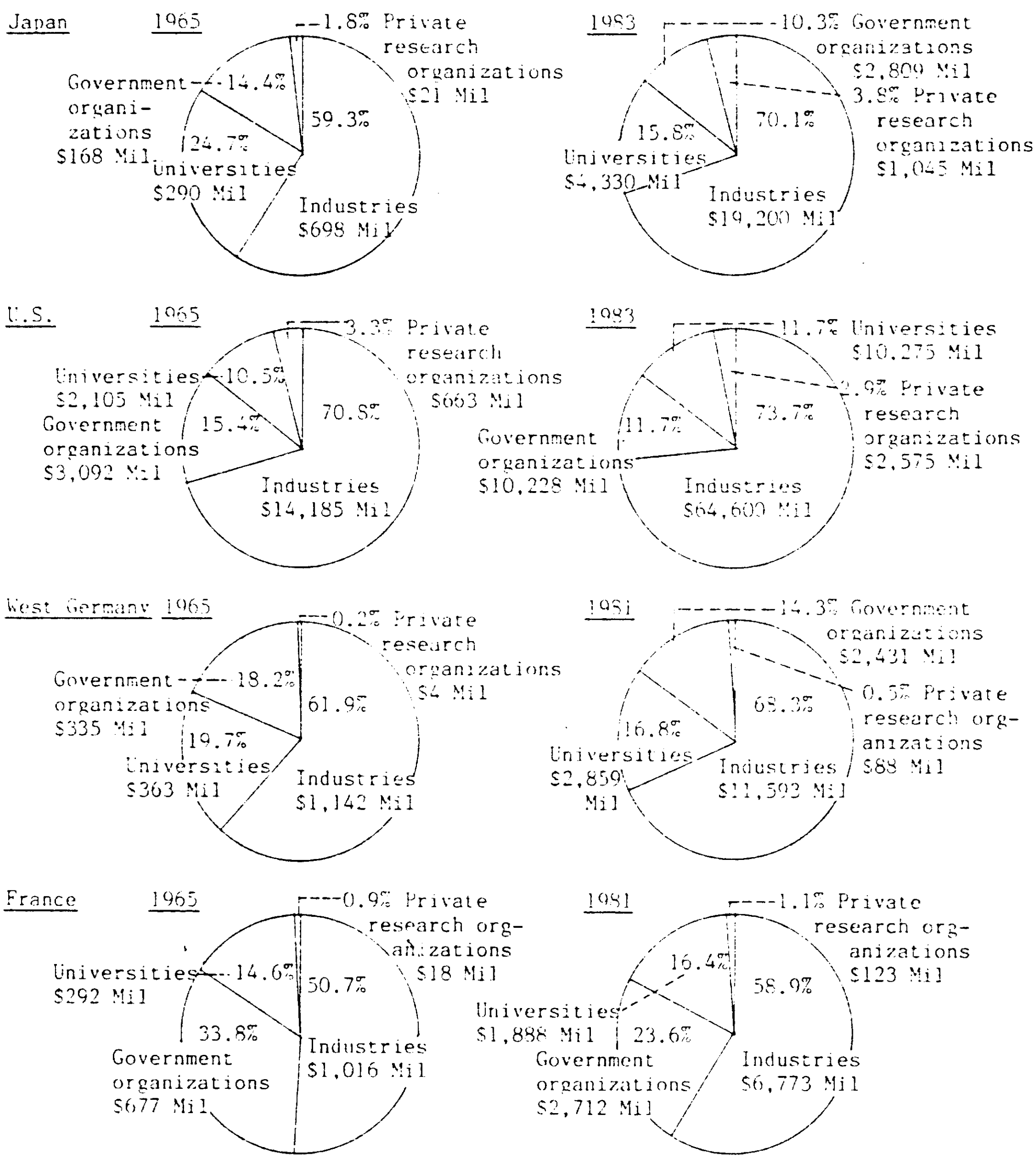
Among the four countries, the percentage of R&D financed by government is largest in the U.S., accounting for 46% of the total R&D expenditure because of the huge government financing of defense and space programs. The percentage is smaller in West Germany and France and the smallest in Japan, accounting for only 22.1% in 1980.

The financing of R&D by industry is largest in Japan, accounting for 98.1% while the percentages in the other three countries range from 67 to 80%.

As shown above, Japan's R&D has been essentially achieved independently by industry. Because of this characteristic, Japan's R&D is advanced for products, such as electric machinery, electronics, machinery, home appliances, automobile and so on. (Of course, Japan's R&D is advanced in the field specially relevant to Japan's geographical conditions, such as disaster prevention, seismic or geotechnical engineering, and so on.) However, it is not so advanced in fields, such as 1) artificial satellites, rockets, airplanes, and deep sea investigation , for which systematic R&D must be performed on a scale to large for industry; 2) CAD, CAM, data base, which require an enormous amount of basic technology difficult to achieve individually, 3) resource-related areas for which private firms in the industries have little demand, and 4) assessment of safety of chemicals or biotechnological and genetic research, requiring long-term development of technology and having unclear benefits.

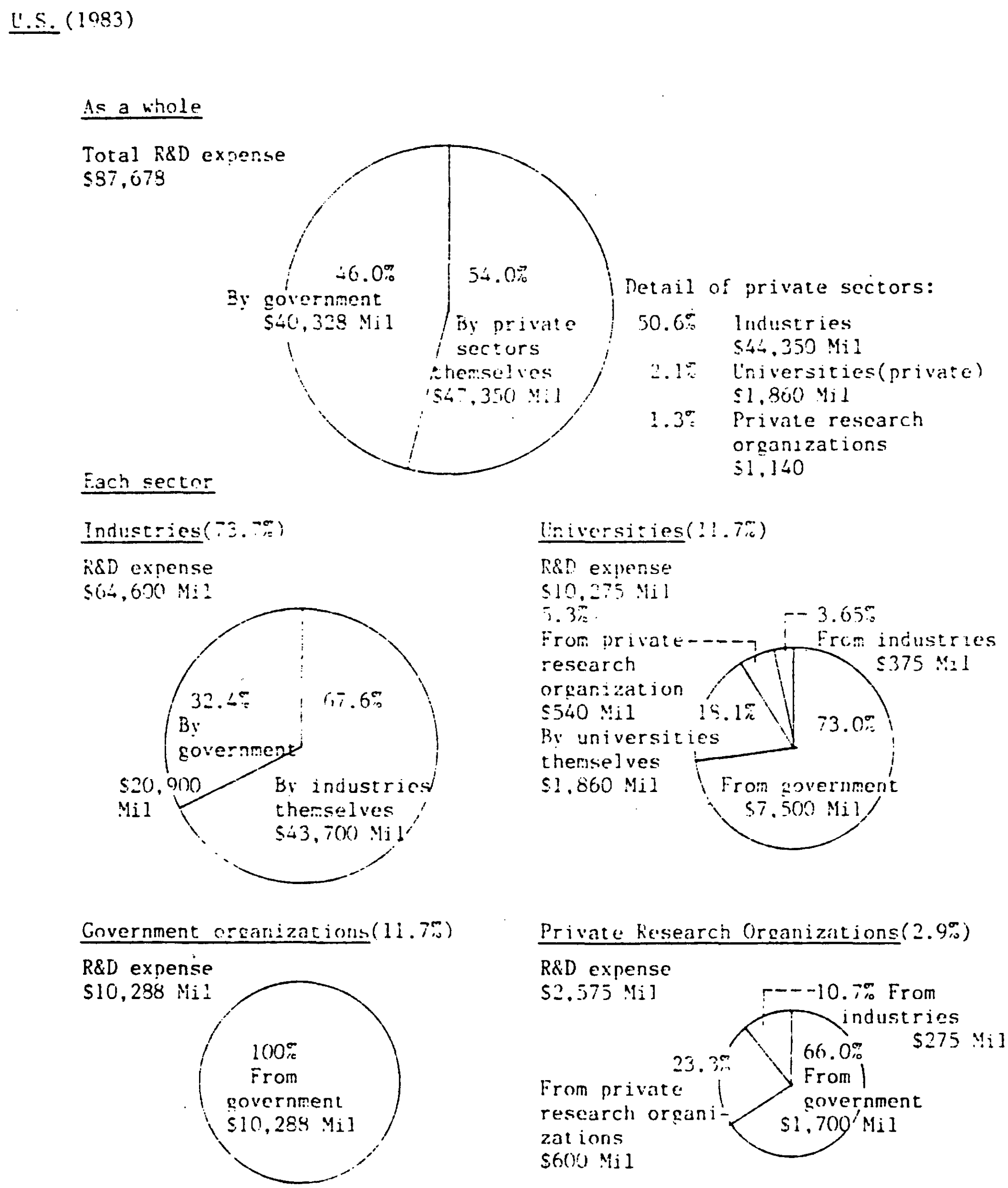
However, the domination of R&D by industry has been changing recently. The amount of R&D funding from government in 1983 was 2.5 times more than in 1978 because R&D in Japan has been tending toward basic research on a scale so large that industry can no longer afford to risk it (See Figure 3.32). Also, research funds granted by industry to both universities and to government have been growing at 25 to 30% a year recently.

Figure 3.30: R&D Expense by Organization in Advanced Countries



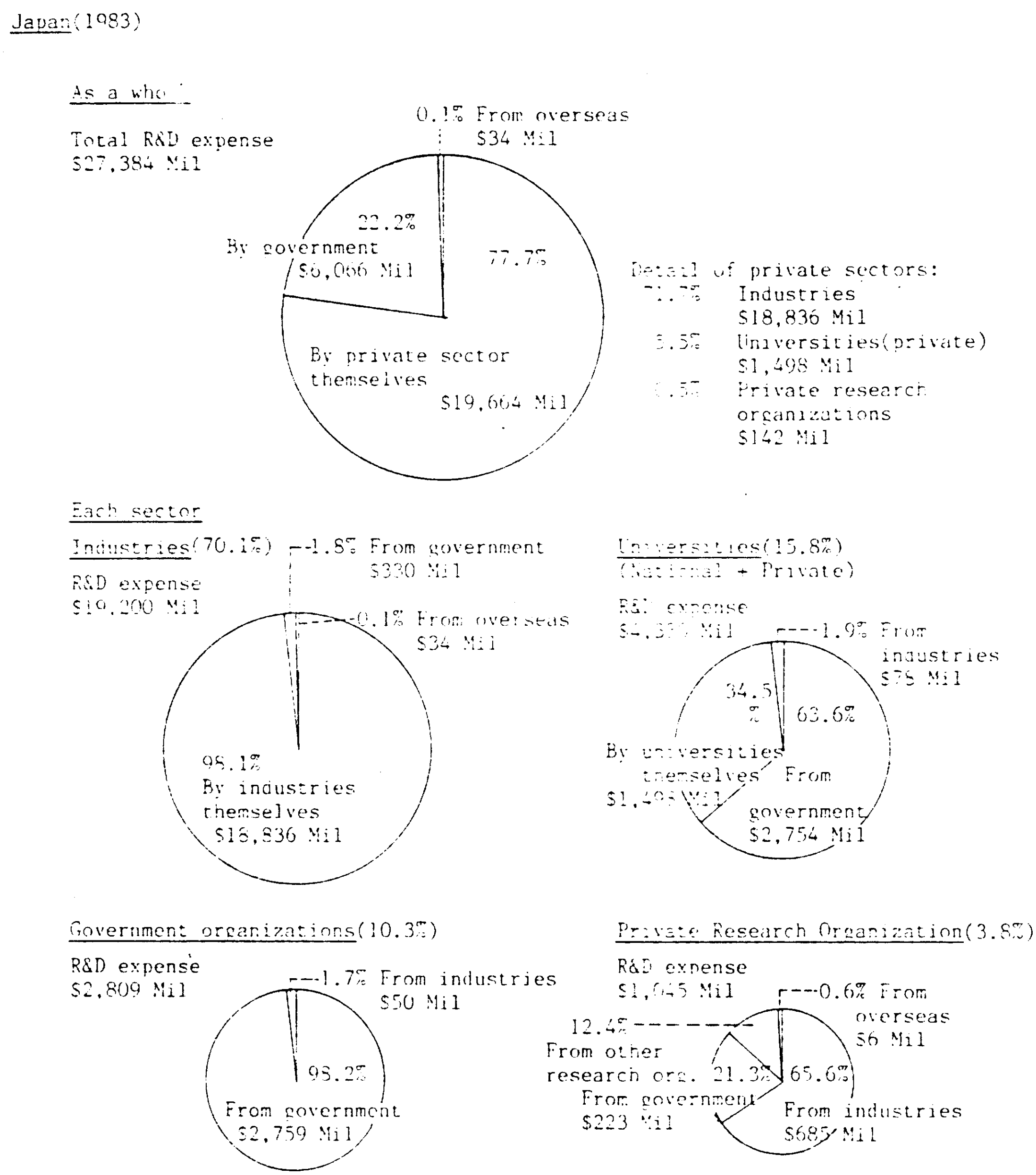
Source: 65

Figure 3.31(1): Finance of R&D in the U.S.



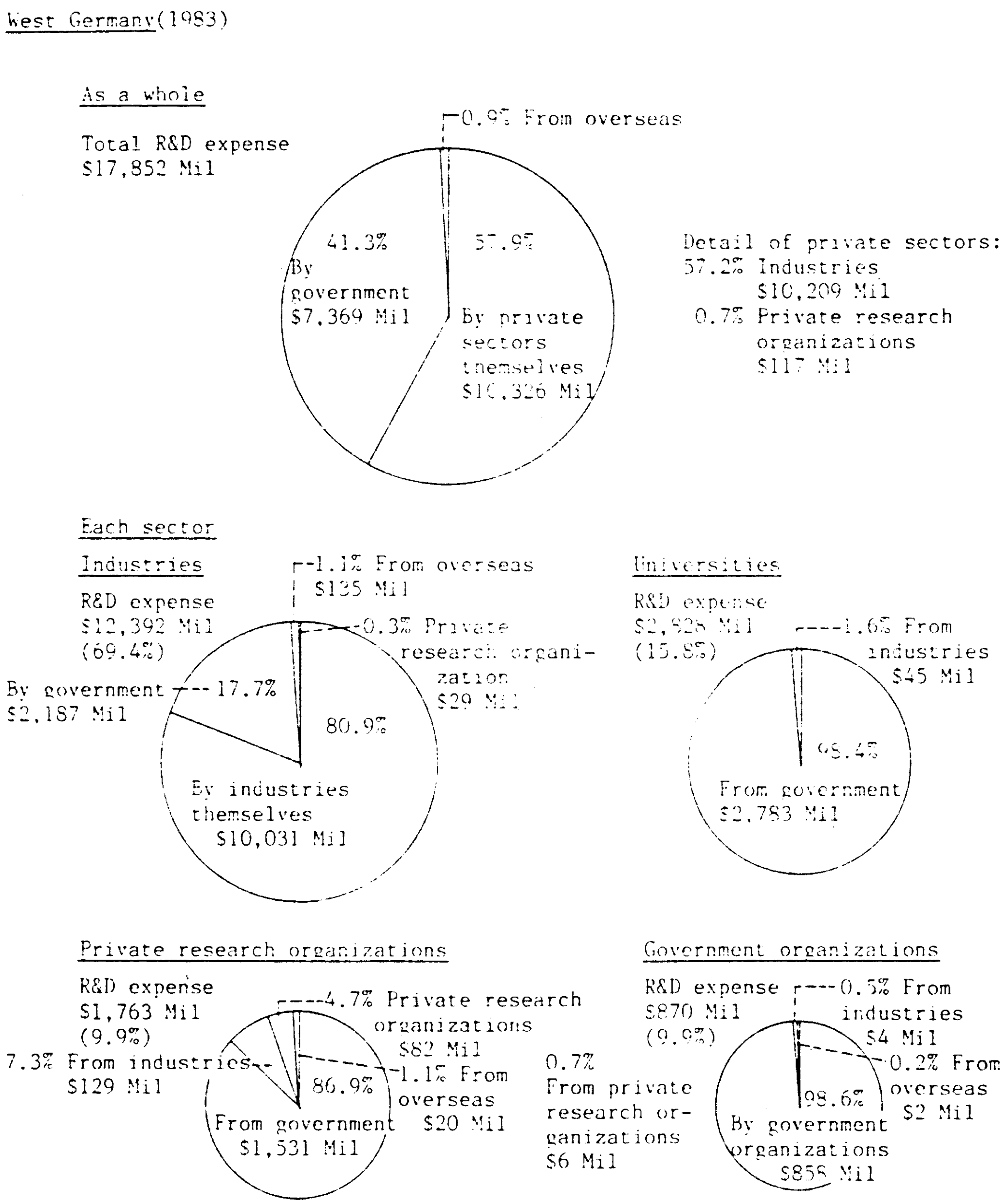
Source: 65

Figure 3.31(2): Finance of R&D in Japan



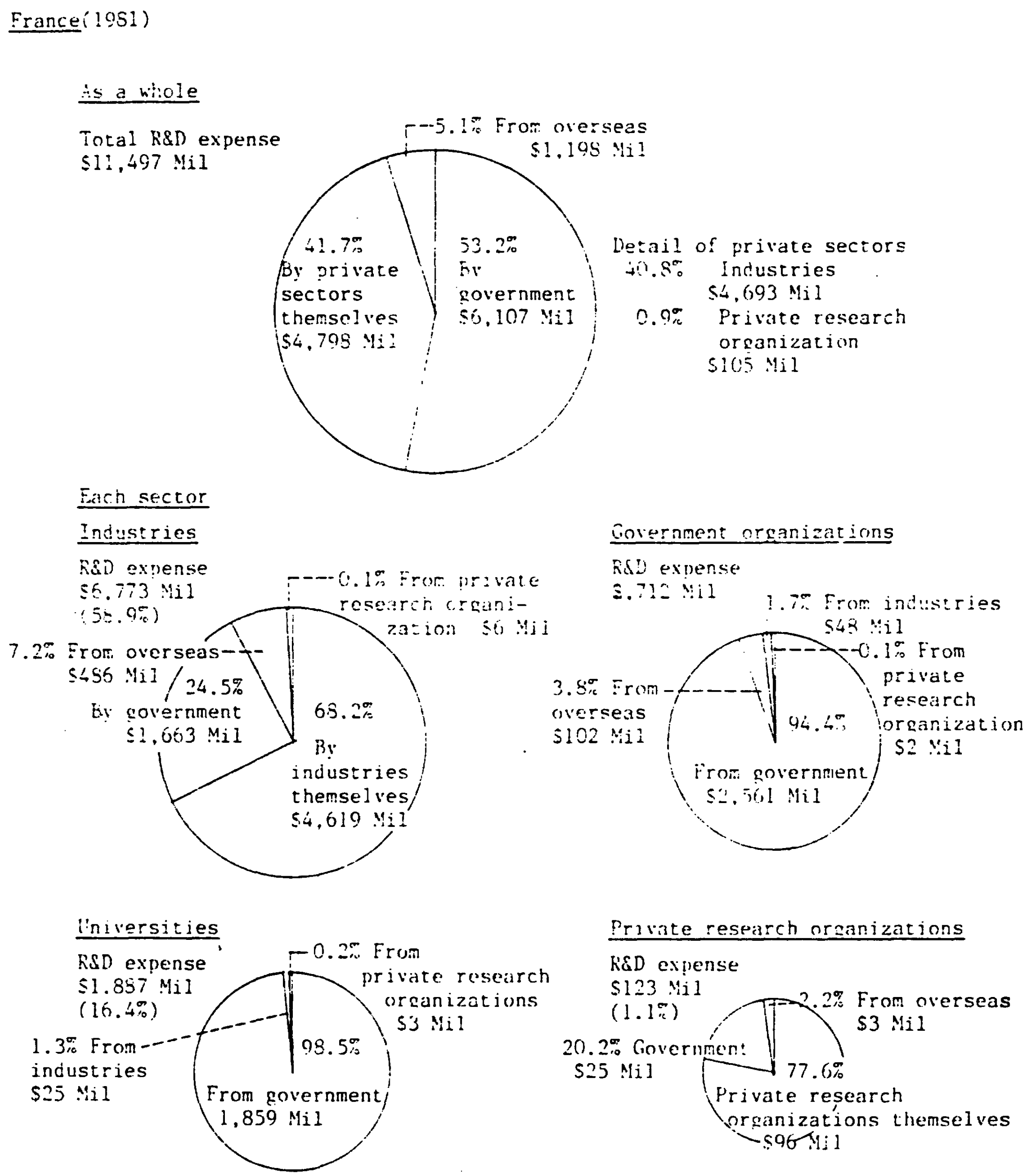
Source: 65

Figure 3.31(3): Finance of R&D in West Germany



Source: 65

Figure 3.31(4): Finance of R&D in France



Source: 65

Note:

<u>Japan</u>

1. R&D expense includes only the expense in natural science and technology.
2. Each organization means as follows:

<u>Financing side</u>

Industries	--- Firms and corporations which do not specialize in research and development
Government	--- Central and local governments, national and other public research institutes, national and other public universities
Universities	--- Private universities, including colleges
Private research organizations	--- Non-profit private research organization

<u>Expending side</u>

Industries	--- Same as financing side
Government research organization	--- National and other public research organizations, and special corporations specializing in research and development
Universities	--- National, public, and private universities
Private research organizations	--- Same as financing side

<u>U.S.</u>

1. R&D expense includes both the expense in "natural science and technology" and "Human and social science".
2. Each organzation means as follows:

<u>Financing side</u>

Industries	--- Industries literally
Government	--- Federal government, their research organzation
Universities	--- Private universities
Private research organizations	--- Non-profit private research organizations

<u>Expending side</u>

Industries	--- Industries, including government financing research institutes operated by government
Government research organizations	--- Research organizations operated by federal government
Universities	--- State and private universities, including government financing research institutes operated by government

West Germany

1. R&D expense includes both the expense in "natural science and technology" and "human and social science".
2. Each organization means as follows:

Financing side

Industries	--- Industries, including public corporations
Government	--- Federal and local governments
Private research organizations	--- Non-profit research organizations and research organization subsidized by government

Expending side

Industries	--- Same as financing side
Government research organizations	--- research organizations operated by central, state, and local governments
Private research organizations	--- Same as financing side

France

1. R&D expense includes both the expense in "natural science and technology" and "human and social science".
2. Each organization means as follows:

Industries	--- Industries literally
Government	--- Central government
Private research organizations	--- Non-profit research organizations, including private universities

Expending side

Industries	--- Same as financing side
Government research organizations	--- National research organizations
Universities	--- National universities
Private research organizations	--- Same as financing side

3.5.4 R&D in Industries

R&D in Industries in Japan

Based on the ratio of R&D to total sales, Japanese industries fall into three groups;
Group A: industries with ratios of more than 4%
Group B: industries with ratios of between 1.8% and 4%, and
Group C: industries with ratios of more than 4%
(See Table 3.30).

Industries in Group A are generally those emphasizing high-tech products, e.g. communication, electronics, electric instrumentation, medicine, electric machinery and equipment, and precision machinery.

Group B is composed of industries producing high value-added products, e.g. automobile, ceramics, and general machinery.

Group C industries include the former key industries, e.g. steel, textile, oil refinery, and non-manufacturing industries such as public utilities, construction.

The rate of R&D to total sales in the entire industry has been increasing. For example, the ratio rose from 1.39 in 1975 to 1.97 in 1983, led mainly by the increases in manufacturing industries. The ratio for Group A industries increased most significantly, both in the amount of R&D expediture and in the share of R&D expenditure by any of the three groups in the nation-wide R&D effort in Japan

Table 3.30: R&D Expense as Percentage of Total Sales in Firms by Industry in Japan

(Percent)

Industries	1975	1980	1983
All Industries	1.39	1.48	1.97
Food	0.49	0.58	0.70
Textile	0.71	0.77	0.90
Pulp, Paper	0.49	0.41	0.63
General Chemical	2.46	2.55	3.34
Oil Refinery	0.18	0.18	0.26
Steel	1.05	1.14	1.60
Non-Ferrous Metal	1.01	1.03	1.49
Metal Products	1.10	1.15	1.30
General Machinery	1.74	1.90	2.57
Gen.Elec.Machnery	3.29	3.35	4.40
Commun/Electonics	4.17	3.94	4.85
Automobile	1.77	2.38	2.89
Precision Machine	2.74	3.02	4.02
Construction	0.49	0.46	0.53
Public Utility	0.27	0.32	0.39

Source: 65

(See Table 3.31).

The construction industry, which did not perform a significant amount of R&D until early 1960s, began investing considerably more in late 1960s. In 1973, the industry ranked No.11 in terms of the amount of R&D spending. However, due to the relatively large scale of R&D by high-tech industries since then, the position of the construction industry fell to No.14 in 1983 although its share of R&D expenditure in the total R&D expenditure in Japan did not change (2.2%).

In Japan, $19 billion were spent on R&D in 1983. The electric machinery industry spent $6 billion, 31.1% of Japan's total R&D. General chemical was second and the automobile industry was the third (Table 3.32).

Among firms conducting R&D, the general machinery industry has the most number (2,240 firms), accounting for 12.7% of the total number of firms (17,646 firms) conducting R&D. Electric machinery and general chemical industries are the second and third, respectively.

In terms of number of researchers, the electric machinery industry has the largest number (68,243 in 1983), accounting for 33.9% of the total number of researchers in Japan. The general chemical industry has the second largest group, followed by automobile and general machinery industry.

In the construction industry, 1,319 firms performed R&D using 4,604 researchers and spent $427 million on R&D. The

Table 3.31: Ranking of R&D Expense by Industry in the U.S. and Japan

U.S. (1978) Industry	R&D ($mil)	R&D % in Total Sales (%)	R&D % in Total U.S. R&D (%)	Japan (1983) Industry	R&D ($mil)	R&D % in Total Sales (%)	R&D % in Total Japan's R&D (%)
1. Aircraft, Missile	7,700	12.3	23.1	Communication, Electronics	4,036	4.9	21.0
2. Automobile	3,782	3.3	11.3	Automobile	2,551	2.9	13.3
3. Office machine, Computor	3,129	7.7	9.4	Electric machinery	1,927	4.4	10.0
4. Chemical	1,835	3.5	5.5	General Machinery	1,312	2.6	6.8
5. Other machinery	1,340	2.1	4.0	Chemicals	1,254	3.3	6.5
6. Medicine	1,281	6.3	3.8	Medicine	1,220	9.9	6.4
7. Optical, medical, equipment	1,248	5.8	3.7	Steel	784	1.6	4.1
8. Oil refinery	1,071	0.8	3.2	Transport, Communication, Public utility	759	0.4	4.0
9. Steel	546	0.5	1.6	Precision machinery	669	4.0	3.5
10. Rubber	485	1.9	1.5	Ceramics	477	1.8	2.5
14.	---	---	---	Construction	427	0.5	2.2

Note: Statistics on R&D by U.S. construction industry are not available.
Source: 65

Table 3.32: R&D Expense and Number of Researchers by Industry in Japan

(1983)

Industries	Number of Firms Conduct-ing R&D	R&D Expense ($ mil)	Number of Researchers	R&D Expense Per Researcher ($ thousand)
All Industries	17,646	19,201	201,137	95.5
All Mfg Industries	16,101	17,925	190,608	94.0
Construction	1,319	427	4,604	92.7
Food	1,354	468	8,096	57.8
Textile	1,128	215	2,933	73.2
Pulp, Paper	322	108	1,532	70.7
General Chemical	2,100	3,261	35,822	91.0
Oil Refinery	143	210	1,572	133.5
Rubber Products	164	243	3,492	69.6
Ceramics	804	477	4,473	106.7
Steel	152	784	4,907	159.7
Non-Ferrpis Metal	236	311	3,185	97.8
Metal Products	1,949	349	4,404	79.2
General Machinery	2,240	1,312	17,024	77.1
Electric Machinery	2,096	5,963	68,243	87.4
Automobile	678	3,008	18,615	161.6
Precision Machinery	722	669	8,270	80.8
Transportation, Communication, Public Utility	57	759	5,207	145.8

Source: 65

number of such firms in the construction industry accounted for 7.5% of the total number of researchers. The number of researchers in construction accounted for 2.3% of the total, and R&D expense in the construction industry accounted for 2.2% of the total R&D expense in Japan.

In terms of R&D expense per researcher, transportation, communication, public utilities, steel, and automobile have relatively high amounts because expensive large-scale plant and equipment are necessary in research for these industry.

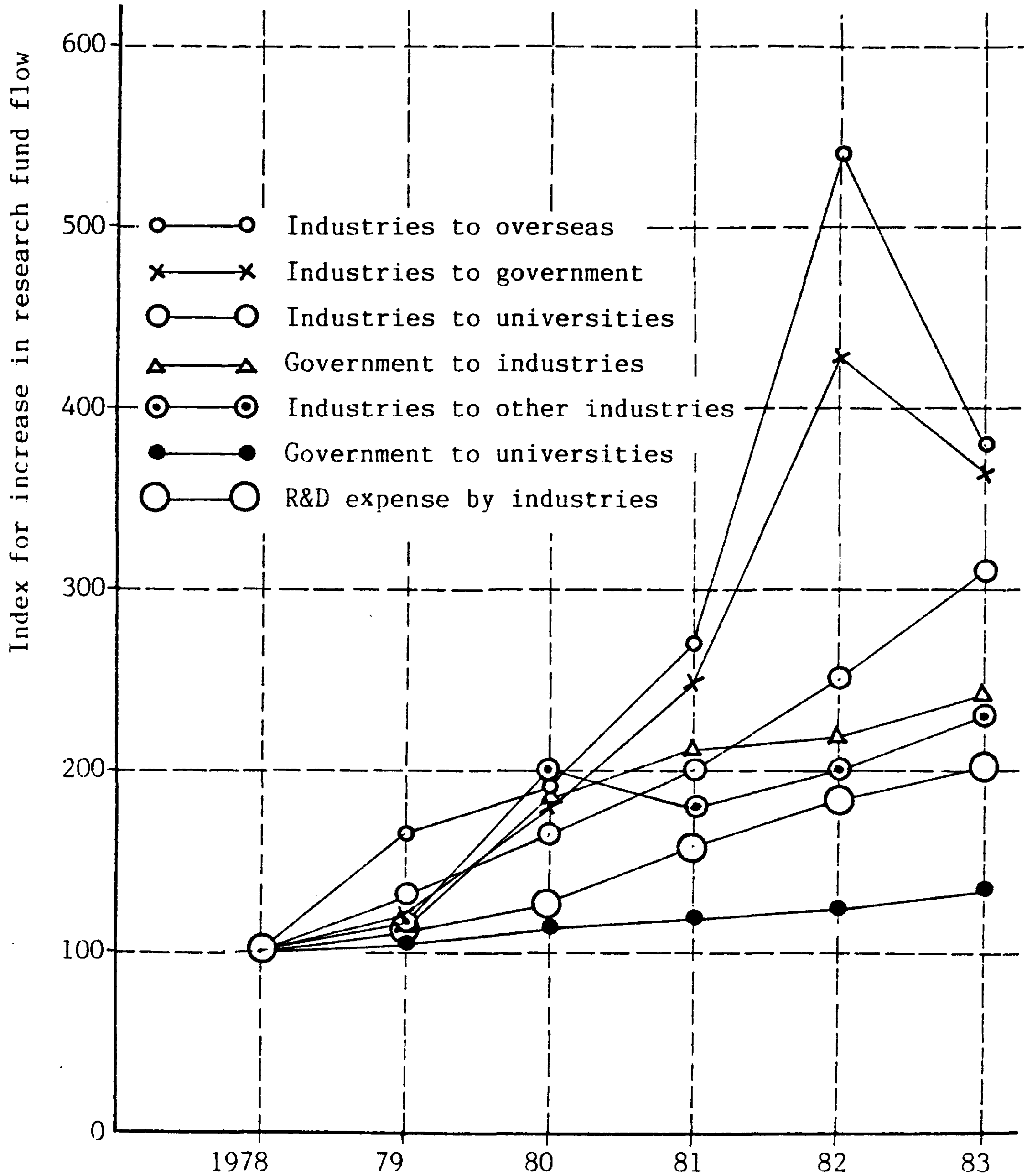
Industries in Group A possess 300 to 800 researchers per 10,000 employees and 500 on average. The number ranges from 300 to 600 in Group B and below 200 in Group C (See Figure 3.33). The more intensively industries depend on advanced and new technology, the more human resources they need in R&D.

The construction industry unfortunately is located in Group C in Figure 3.33, staying at a low level in both dimensions. Also, the rates of growth in both dimensions are not significant compared to industries in Group A and B.

Figure 3.34 shows characteristics of R&D by industry. In industries producing metal products, general machinery, electrical machinery and equipment, automobile, and precision machinery, weight on basic research in R&D is low because their emphasis is on application, adaptation, and further development of given technologies.

On the other hand, industries like medicine, food, chemicals, textiles, and ceramics place a relatively high weight

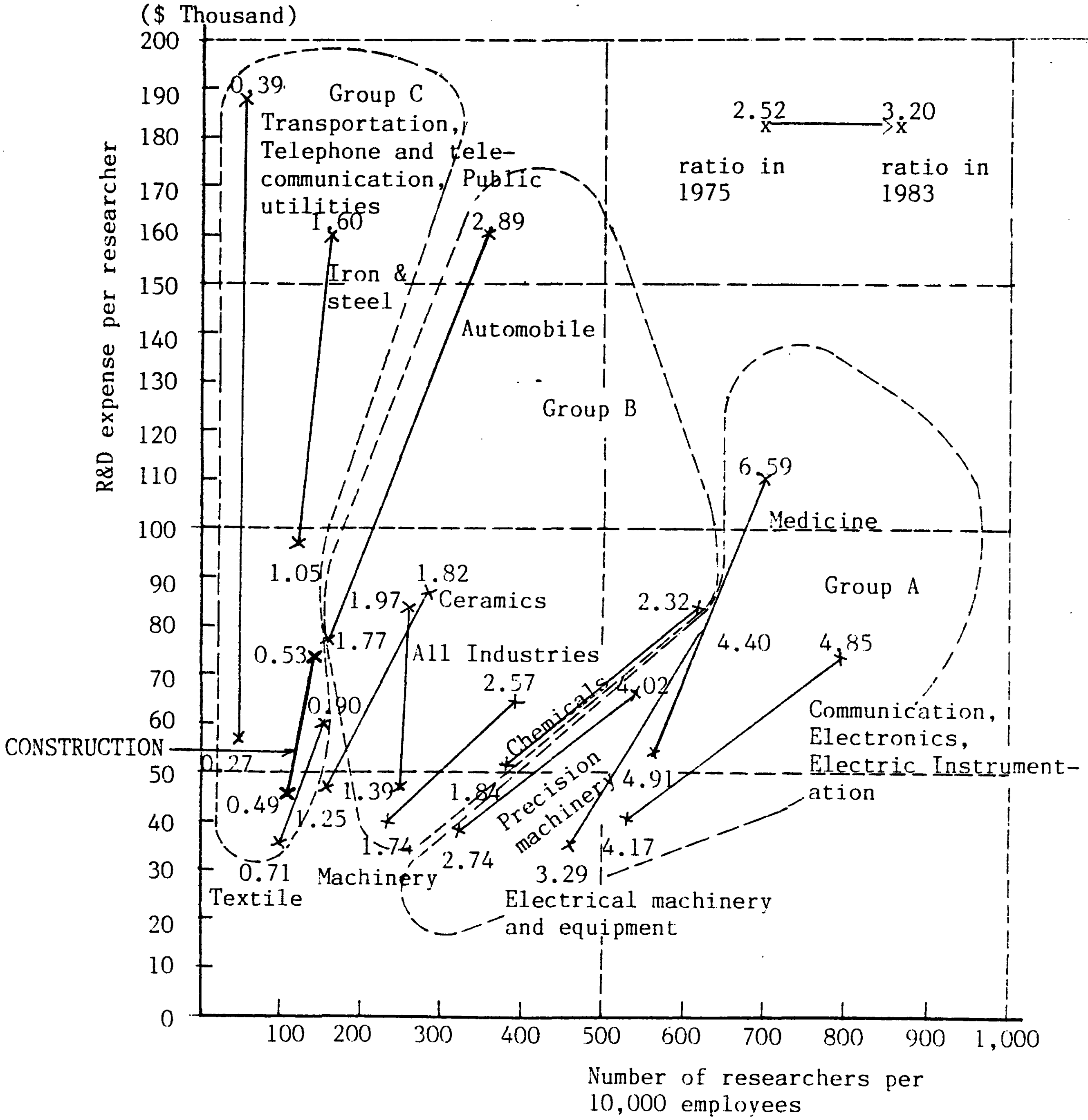
Figure 3.32 : Increase in Research Funds Flow in Japan



Note: Indexes are calculated with the index in 1980 being 100.

Source: 65

Fugure 3.33 : Grouping of Japanese Industries by R&D Expense per Researcher and Number of Researchers per 10,000 Employees

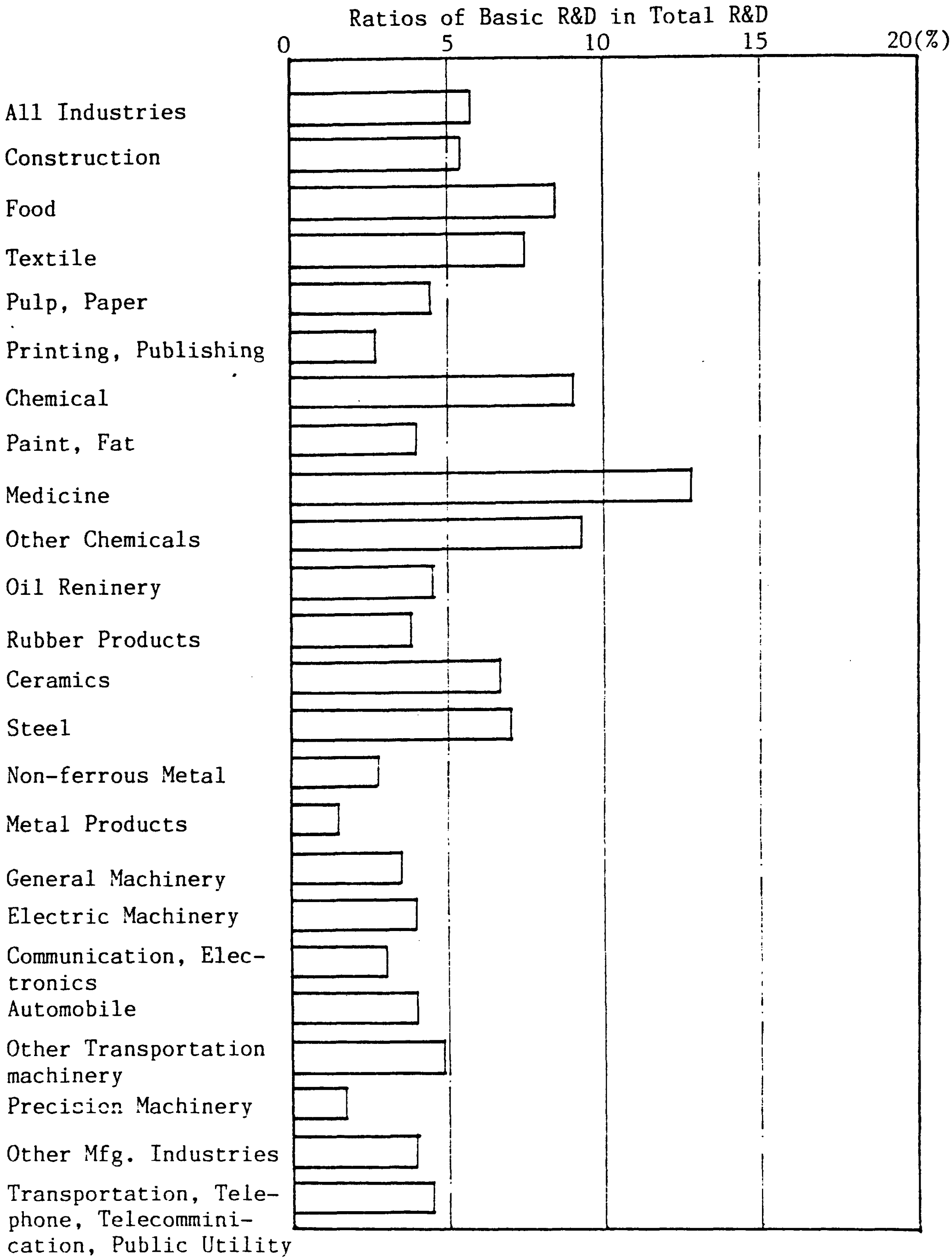


Note: Numbers in the picture indicate the ratio of R&D expense vs Total sales.

The statistics in the picture is based on private firms. (Public corporations and public enterprise corporations are excluded.)

Source: 65

Figure 3.34 : Ratios of Basic R&D in Total R&D in Japanese Industries



Note: "Ratio of basic R&D" means ratio of fundamental research and development of an industry to its totak R&D.
Source: 65

on basic research. The construction industry is located at around the middle of the two extremes.

R&D in Industries in the U.S.

In the U.S., the industry with the largest of expenditure, faster rising level of funding, and the largest number of researchers is the aircraft and missile industry which is closely linked with the defense and space programs. R&D in this industry in 1979 accounted for 23.1%, financed 75.8% by federal funds. In the U.S., 20.5% of all researchers are working in this area (See Table 3.31 and 33). The automobile industry spent the next amount in R&D and the office machine and computer industry was the next.

Taking R&D as a percentage of total sales, again firms in the aircraft and missile industry had the largest rate of 12.3%; firms in the office machine and computer industry ranked next, spending 11.7% out of their sales. Firms in medicine, communication, and optical and medical equipment also had high percentages.

R&D as a percentage of total sales in the entire U.S. were more than two times higher than in Japan comparing 1980 figures from Japan to 1978 figures in the U.S. The percentages were higher in the U.S. in communication, office machine and computers, general machinery, medicine, automobile, etc. but lower in steel, home appliances, non-ferrous metal, etc.

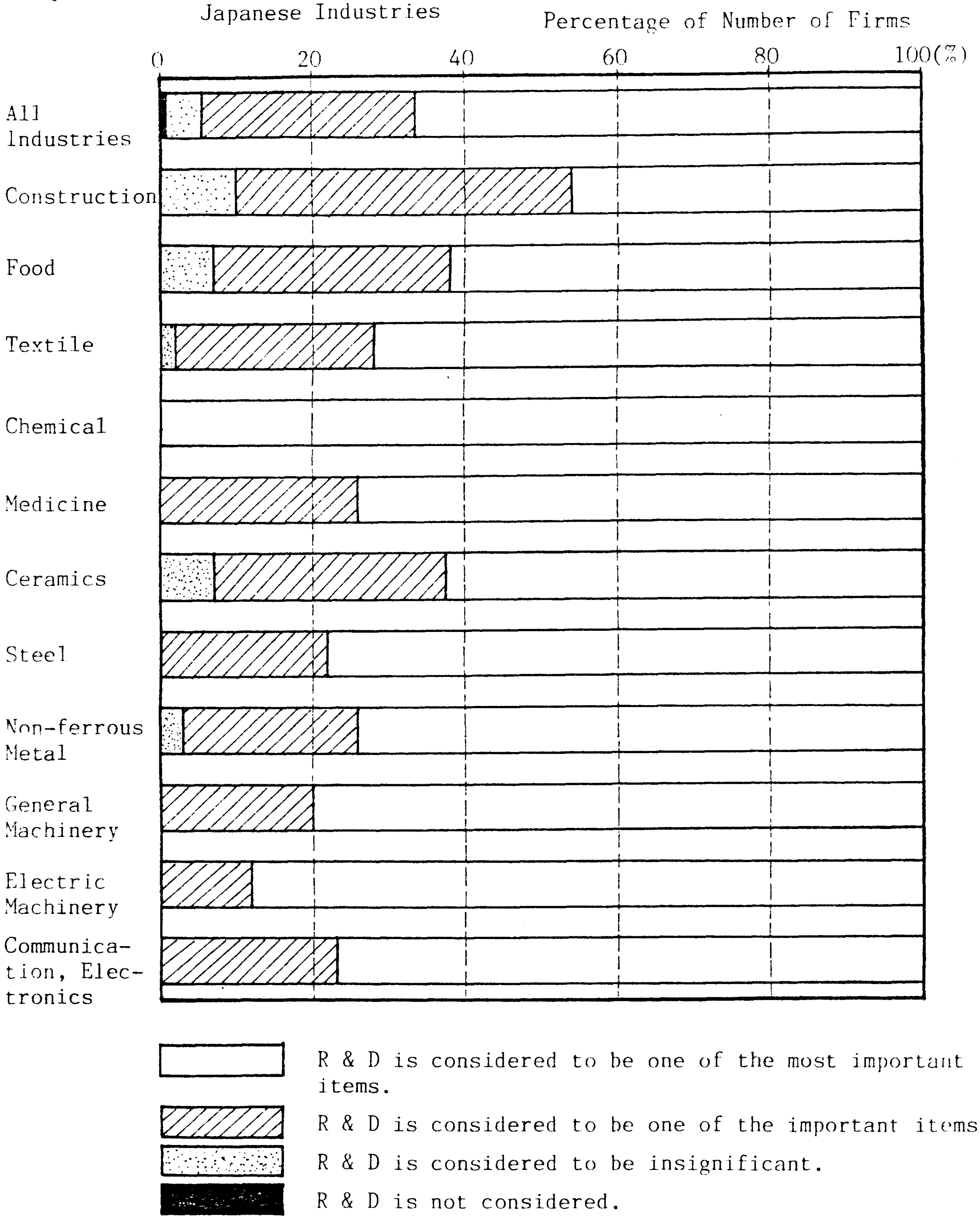
In the construction industry in the U.S., R&D is not significant enough to be mentioned, especially in industries. It is not comparable to any of the leaders in this regard.(Source: 65)

3.5.5 R&D in Firms' Strategies in Japan

In terms of strategic planning in firms, top management in 66.5% of Japanese firms considered R&D to be one of the most important issues in their management strategies (See Figure 3.35). One hundred percent of top management of firms in the medicine industry consider R&D to be centrl to their firms' strategies. Also, the majority of top management in electric machinery, communication, electronics, general machinery, steel, and non-ferrous metal industries consider R&D to be very important. Although the construction industry is not as enthusiastic as some, the attitude of construction firms to R&D is, as a whole, positive because 67% of top management in construction firms consider R&D to be is one of the most important issues and 27% consider R&D as an important issue.

A large number of Japanese firms are, with matured or very competitive markets, making efforts to diversify, in which R&D is the most important key. Current types of diversification going on now or in the near future in Japan are categorized below by the degree of diversification:

Figure 3.35 : Position of R&D in Managerial Strategies in Japanese Industries



Source: 65

1. Entry into other related fields through already possessd technology; e.g.

   Food to medicine

   Medicine to food

   Chemicals, communication, electronics to instrumentation

2. Backward diversification, in which firms enter the fields of materials they handled in their original fields; e.g.

   Communication, automobile, precision machinery to ceramics

3. Forward diversification, in which firms take over the manufacturing stage in fields they previously supplied; e.g.

   Steel to metal products

   Electric communication to medical machinery

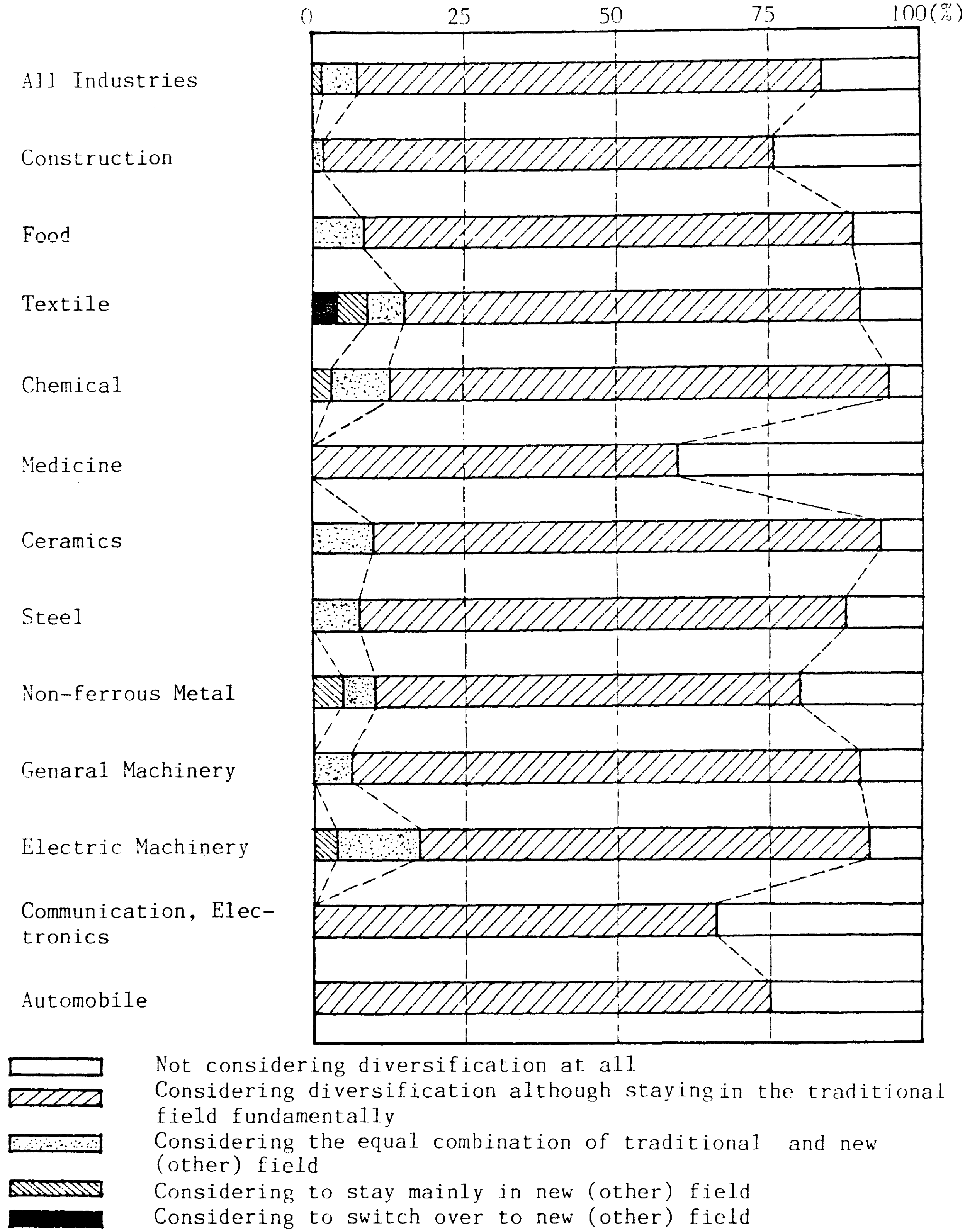
4. Mixture of original technology with technologies in other fields; e.g.

   Steel to compounded material

The basic attitude toward future diversification for firms in Japan is to diversify while staying fundamentally in their traditional fields. Seventy five percent of Japanese firms expressed this feeling (See Figure 3.36). This fundamental attitude is reflected in each of the four types of diversification outlined above.

However, firms in some industries, such as textile, chemical, non-ferrous metal, electric machinery, and steel,

Figure 3.36 : Strategies for Future Diversification in Japanese Industries



Source: 65

Table 3.33: R&D by Industry in the U.S.

Industry	R&D ($mil)	R&D as % of Sales (%)	% of R&D Financed by Firm (%)	% of R&D Financed by Federal Government (%)	(1978) Number of Researchers (thou)
Total	33,400	3.1	66.2	33.8	469.9
Food	428	0.4	n.a.	n.a.	7.5
Textile	86	0.4	n.a.	n.a.	1.7
Lumber & Wooden Products	136	0.7	100.0	0.0	2.3
Pulp, Paper	394	1.0	89.8	10.2	8.2
Chemicals	1,835	3.5	81.1	18.9	22.1
Medicine	1,281	6.3	n.a.	n.a.	21.1
Oil refinery	1,071	0.8	88.9	11.1	13.4
Rubber	485	1.9	n.a.	n.a.	n.a.
Stone, Clay, Glass	330	1.3	n.a.	n.a.	n.a.
Steel	546	0.5	98.1	1.9	3.6
Non-ferrous metal	283	0.9	91.9	8.1	4.6
Metal Products	397	1.1	90.7	9.3	9.3
Office machine, Computer	3,129	11.7	82.4	17.6	46.1
Other machinery	1,340	2.1	97.0	3.0	19.2
Radio, TV	54	1.1	100.0	0.0	1.0
Communication	3,251	7.7	58.0	42.0	51.2
Automobile	3,782	3.3	88.1	11.9	30.4
Other Transport Equipment	131	1.4	n.a.	n.a.	1.2
Aircraft & Missile	7,700	12.3	24.2	75.8	96.1
Optical & Medical equip.	1,248	5.8	85.6	14.4	16.3
Non-mfg industries	1,094	3.1	54.8	45.2	????

Source: 65

are taking a more positive attitude towards diversification. In textiles especially, 5 to 6 % of firms are trying to enter completely new fields. Firms in the textiles, chemicals, non-ferrous metal, and steel industries are in the markets which are no longer growing. Firms in electric machinery have two main reasons to diversify, first to escape from severe competition in their existing markets, and second to develop new markets which they can do quite aggressively because of their proven ability to utilize R&D.

Many firms in the construction industry are considering diversification but in a very conservative way. For example, 75% of firms in the construction industry are thinking about diversification but hoping to stay in their traditional arena while 25% of firms are not thinking about diversification at all.

3.5.6 R&D Activities in the Japanese Construction Industry

As stated so far, although R&D activities performed by Japanese construction firms are not as significant as by firms in high-tech industries, construction research activities are advance comparing to firms in other non-manufacturing industries. Furthermore, Japanese construction firms are performing an enormous amount of R&D compared to U.S. competitors, which usually do not have any such activities.

Moreover, as far as top Japanese contractors are concerned, the features of their research activities are far more significant than the above stated statistics would indicate. These top contractors usually have their own large research labs employing 100 to 250 researchers. Some of these firms have more than 300 researchers and their annual R&D budgets per researcher range from $200,000 to 800,000. (Source: 10)

In addition, their research covers all types of engineering relating to all types of building and heavy construction. For example, a typical research facility in a top Japanese contractors have includes;

1. Fully equipped soil mechanics laboratories with microcomputers to control and monitors of experiments;
2. Static test facilities with massive reaction floors and abutment walls
3. Two directional, computer-controlled wind tunnels for bridge and high-rise building aerodynamics;
4. Facilities for smoke-stack diffusion tests and micro-climate analysis around models of urban building development;
5. Large sound-proof rooms for testing acoustic materials and designs for highway, railway, and industrial noise suppression;
6. Hydraulic temperature apparatus for experiments with structures for holding liquid natural gas and similar materials;

7. Solar energy systems for hot water, space heating and cooling as well as thermal analysis of various types of exterior materials for buildings;
8. Facilities for developing and testing electrical and mechanical systems, especially for building lighting HVAC;
9. Material laboratories for plain and reinforced concrete, masonry, soil grout compounds;
10. Biochemical laboratories with environmental control rooms, electron microscopes, mass spectrometers for both chemistry and environmental pollution control;
11. Fire-testing loboratory;
12. Large hydraulics laboratory.

(Source: 10)

In addition, these physical facilities are staffed by reseachers with graduate degrees from the top universities, most of them with advanced degrees. They engage in independent research and publication much like researchers in universities and in the advanced laboratories of high-tech industries.

R&D performed by Japanese contractors fall into four main categories:

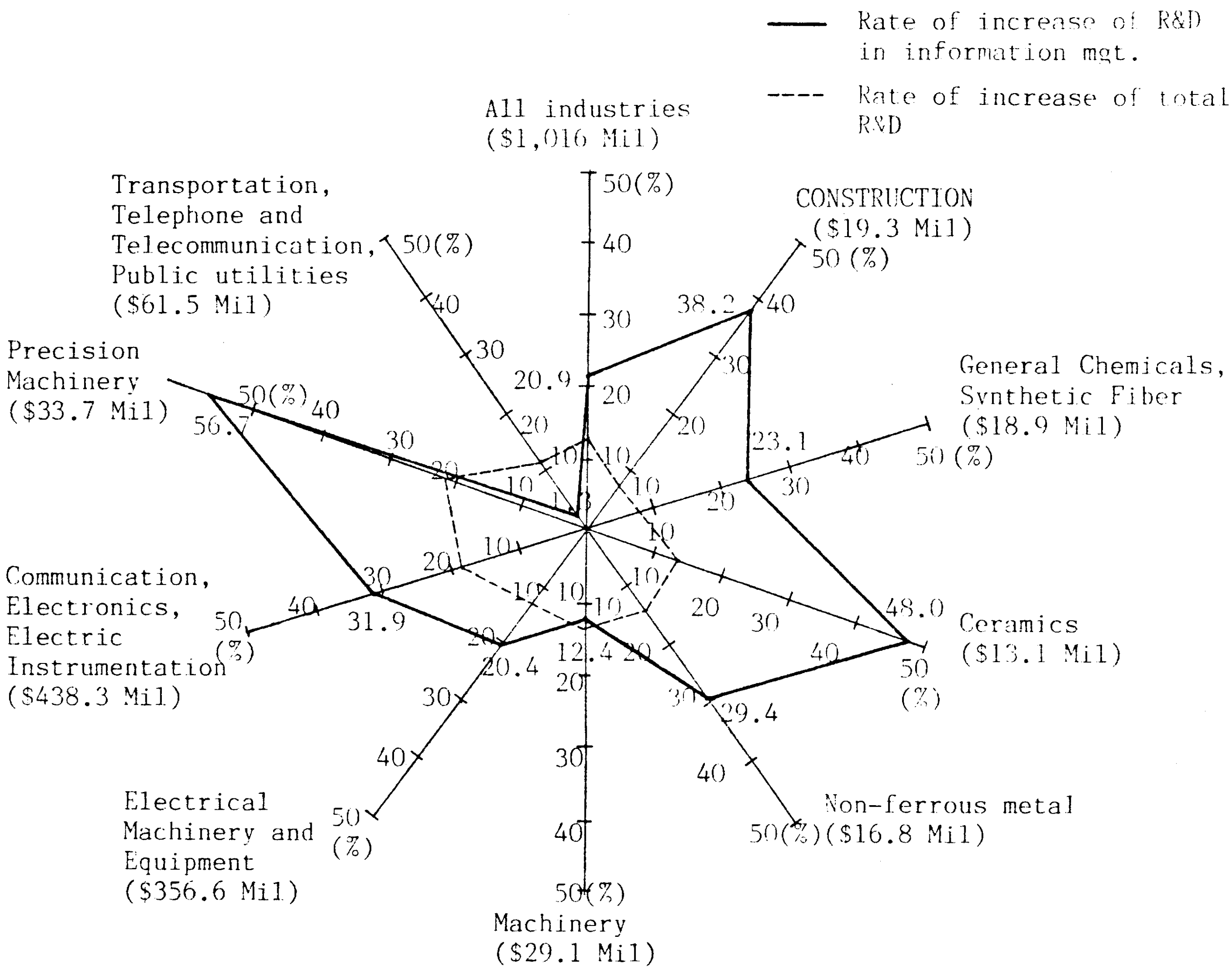
1. Siting problems which the technical expertise of the lab can help solving;
2. Research studies initiated by researchers themselves with the approval of management, whether or not the results have short-term applicability;

3. Research to support high-level corporate strategy, possibly including future entry into new market; and
4. Research done for outside clients.

Originally, most research by Japanese contractors was of the type in category 1. However, as their strategy is developing, research types 2 and 3 have begun to be equally important to their shown in the R&D. Also, in competing among the homogeneous contractors in Japan, it is advantageous for a firm to be able to prove to its clients the firm's ability to perform complex total engineering projects. For example, contractors are spending large amount of money on advanced technology, such as management information systems (See Figure 3.37). Their R&D is also aimed at developing new methods and ways of building with new structures and new materials with the intention of gaining an edge in marketing areas into which client are moving.

Construction firms have a mixture of incentives to conduct R&D. To some extent, research raises a company's status in the very homogeneous construction industry. The favorable publicity that a company gains from publishing its research attracts further jobs from clients. The recognition of a firm's research lab aids the process of the prequalification documentation for bids on major public projects, a precess described above in the section on the Japanese bidding system.

Figure 3.37: Annual Rate of Growth of R&D Expense in Information Management



Note: 1) Increase rates are based on the average between 1975 and 1983.

2) Firms with capital of more than ¥100Mil (almost $ 0.42 Mil; $1 = ¥237.5) are focused on.

3) The amounts within the parentheses are R & D expenses on information management in 1983.

4) The industries picked up here are the ones which expended more than ¥ 3 Bil ($ 12.6 Mil) in 1983 on R & D in this field.

Source: 65

New technology is universally considered to be the short cut to more productive, economical or effective construction designs and procedures.

The labs also develop quantitative data to determine whether new designs meet Japan's strict building codes and to substantiate data for document claims for changed conditions at sites.

There are also tax incentives for corporate R&D. However, the greatest incentives come from Japan's rigid physical and social constraints. Japanese contractors have to face mountainous and volcanic land, complicated rock types and a lot of groundwater, frequent earthquakes result from the geological conditions, world's strictest regulations to preserve the quality of air and water, to prevent noise, vibration, soil contamination, and land settlement.

Given the established potential of R&D and the incentives stated above, Japanese contractors are becoming increasingly heavily involved in R&D. The top contractors are especially interested because they see vertical integration services as one of their corporate strategies for obtaining contracts in the severely competitive domestic and overseas construction markets.

Chapter 4

Analysis of Strategies for Japanese Construction Firms to Enter U.S. Construction Market

Based on the information developed in argument in Chapters 1 through 3, Chapter 4 will analyze the potential of the U.S. construction market for Japanese contractors and the strategies that Japanese construction firms should adopt to successfully enter it.

First, general entry strategies and methods for entering a new market are discussed. Secondly, after comparing the advantages and disadvantages of Japanese firms and their U.S. counterparts in the U.S. market and summarizing what Japanese firms have done so far, the most promising and appropriate strategies will be recommended. The differing conditions depending upon types, and marketing potential of special segments of the U.S. construction industry will be considered.

4.1 General Strategies for Entrying a New Market

Entry strategies should involve comprehensive plans. Such a plan includes the objectives, goals, resources, and policies that will guide a firms' international business operation over a period long sufficient to establish sustainable growth in a foreign market.

There are two types of potentially successful strategies for entering a new market, depending upon the types of market (See Table 4.1). They are;

Option 1: Acquire a part of the market by providing the same services or products already offered by counterparts in the new market. That is, simply steal shares from the existing counterparts.

Option 2: Acquire a part of the market by comparative advantages over the counterparts already in the new market.

Option 1 works well in a market in which none of the existing firms are fundamentally different from each other and a small share of the market is held by each firm. A new entrant provides exactly the same features as those already provided by the existing firms. A simple example may be a market in which 10 firms compete and each has a share of 10% of the total market. A new entrant steals a share of 5% of the market by providing customers with exactly same products or services, then makes the share of the first 10 firms go down to 9.5%.

In Option 2, there are three strategic way in which a new entrant might outperform the existing firms;

a. Overall cost leadership,

b. Differentiation, and

c. Focus.

Overall cost leadership requires superior efficiency which may be achieved through economies of scale, greater experience, innovative technology created by massive R&D, managerial and technological cost reduction by vertical

Table 4.1: Entry Strategies and Modes

Entry Strategies:

Option 1	Obtain shares by providing the same products or services as counterparts in the target countries
Option 2	Obtain shares by providing comparatively advantageous products or services over counterparts in the target countries in the areas of: a. Overall cost leadership, b. Differentiation, or c. Focus.

Entry Modes (Measures):

Option I	Products entry mode -- methods to make entry through products or commodities a. Export entry mode i. Export through agent/distributor ii. Export through subsidiary/branch iii. Franchising b. Investment entry mode i. Joint venture ii. Sole venture
Option II	Contractual entry mode -- methods to make entry through services or intangible goods a. Licensing b. Franchising c. Contract production (construction)

integration, tight cost and overhead control, avoidance of marginal customer defaults, and so on.

The "differentiation" strategy requires a firm to provide products or services perceived to be unique or especially attractive to customers. Design, brand image, technology, features, customer service, net work or other dimensions may be involved. Ideally, a firm differentiates itself in several ways. However, While the differentiation strategy does not allow the firm to ignore cost control, this is not the primary strategy target.

The "focus" strategy is a strategy that involves focusing on a particular customer group, segment of the product line, or geographic market. While the low cost and differentiation strategies are generally aimed at achieving industrywide objectives in the new market, the focus strategy targets a particular group. The entering firm tries to serve its narrow strategic target more effectively or efficiently than companies involved in more general competition. A firm deploying this strategy must either differentiate itself from others to better meet the needs of its particular target, or provide the most competitive costs for its particular target, or both.

No one strategy will work well necessarily in all types of markets or all segment of a market, nor is it effective for all types of entrants. However, some of these strategies may be used simultaneously and may work effectively to increase effects in a combined form under some circumstances. The use of these strategies by Japanese contractors entering the U.S. construction market will be discussed later in this chapter.

4.2 General Entry Modes

Entry modes are the ways in which a firm uses its resources to enter foreign market. Entry strategies are fundamentally plans, entry modes are concrete methods to be used in implementing entry strategies.

Modes of entering a new market fall into two essential groups, based on what is provided (See Table 4.1).
They are;

I. Products entry mode

II. Contractual (or Services) entry modes

The products entry mode is most applicable by manufacturers, that is, firms which produce commodities or tangible goods. The contractual entry mode is applied by firms which provide customers with services or intangible goods. This entry mode is generally most appropriate to construction services traditionally provided by contractors working on a contractual basis.

The products entry mode can be subdivided into:

a. Export entry mode

b. Investment entry mode

The export entry mode can be subdivided into three;

i. Joint venture

ii. Sole venture

iii. Acquisition

Firms that adopt the export entry mode stay in their home countries and export products or goods to the target countries through mediators or agents located there, through the firms' branches or subsidiaries, or sometimes through franchised dealers.

In the investment entry mode, firms may establish a new company in the target country or set up a joint venture with a foreign firm located there, and provide products or services through the new entity. Firms may also acquire a foreign firm which has been operating a similar business in the target country, then introduce its own products or services utilizing the marketing resources of the acquired firm. In this entry mode, firms hold equity through investment in firms in the target country.

The contractual entry mode may take several forms:

a. Licensing

b. Franchising

c. Contract production (construction)

Licensing is most useful to firms which possess particular expertise or technology for production, operation, services, and so on. These firms grant companies in a target a country the right to use such particular expertise or technology on a fee basis.

Franchising enables firms having comparative advantages in technology, expertise, features, capital, resources, management and so on to give companies in the target countries the authority to use these special advantages on a fee basis.

Contract production is usually appropriate for firms which provide services on a contract basis or produce large-scale machinery, equipment, or facilities as one single units on a contract or order basis. Of course, construction contracts received through bids are included in this mode.

The applicability of these modes depends not only on the goods and services a firm can provide to customers but also on the ways in which the firm is doing business. Becuse of the practical nature of entry modes, they should be chosen after establishing suitable entry strategies.

A firm's choice of entry strategies and modes for entering a target country will be the net result of several, often conflicting, forces. The variety of forces, the difficulty of measuring their strengths, and the need to anticipate their directions over a given planning period combine to make the choice of entry strategies and modes complex process with numerous trade-offs among alternatives.

4.3 Advantages and Disadvantages of Japanese Construction Firms entering the U.S. Construction Market -Adaptation of Entry Strategies and Modes to Japanese Contractors and U.S. Construction Market

In order to develop strategies and modes for Japanese contractors seeking entry into the U.S. construction market, it is necessary to summarize the strengths and weaknesses of Japanese general contractors compared to the U.S. counterparts. Analysis will then turn to whether these strengths and weaknesses should shape the strategies and modes of Japanese firms seeking entry into the U.S. construction market.

As closely reviewed in Chapter 3, the Japanese construction industry is one of the largest in the world. Construction investment in 1984 amounted to $218 billion, 70% of the vallue of new U.S. construction put in place in the same year. The construction industry has been one of the most important industries in Japanese economy; construction investment accounts for slightly below 20% of Japan's GNP. In this industry, there are more than 514 thousand establishments, more than 60% of which are small firms. It is very fragmented industry.

However, although the Japanese construction industry is fragmented and may look poorly integrated to outsiders, it actually is integrated, organized, and coordinated very well by general contractors. While in the U.S. construction industry architects or engineering firms (though recently displaced by the designer/constructor firms) are customarily responsible for controlling projects, in Japan general contractors play this key role.

Japanese contractors, especially large ones, are vertically integrated in their functions and organizations. Each firm operates not only a construction division but also a research lab, departments of plannning and design (architectural, structural, mechanical, geotechnical, electrical, and so on), procurement, safety control, and even real estate (both development and sales).

Furthermore, each Japanese general contractor has its own multilayers of subcontractors under its umbrella. There traditionally have been close relationships between a general contractor and its subcontractors. These subcontractors provide skilled workers on demand and function not only as buffers of fluctuations in the amount of available work but also as regulators of cost and schedule control. The relationship between a general contractor and subcontractors can be termed "quasi-vertical integration".

Moreover, the vertical integration and performance of Japanese contractors has been facilitated by weak labor unions, the bidding system (especially the special nominative bid), strong relationships between general contractors and clients, (another quasi-vertical integration), and relatively cheap material and labor cost.

Also, Japanese general contractors are backed by financial institutions and insurance firms which have invested in the contractors' stocks. (A quasi-vertical integration between a general contractor and financial institutions). Therefore, there is a strong vertical integration around Japanese contractors, from the bottom layer of multi-layer subcontractors through clients and through financial institutions, and the Japanese general contractor is pivotal to the integrated functioning of the construction industry.

Through this vertical and quasi-vertical integration, Japanese general contractors provide clients with vertically integrated and carefully detailed services. They often manage projects from beginning to end including such functions as study of the needs of clients, search for projects and suitable sites, feasibility study, negotiation with community, financing, design, of course construction service, and even finding tenants for clients. In addition, Japanese general contractors have excellent records of safety and on-time completion, without overruns of contract prices.

Among these superior capabilities, those originating from the unique social systems characterizing the Japanese construction industry might be lost to them in the U.S. construction industry. Because Japanese general contractors would not have their own fully controllable subcontractors, they would no longer have buffers that

Japanese subcontractors provide for workload, schedule, and labor cost in Japan. Japanese contractors would have to use U.S. subcontractors that used to working on a job-by-job basis with general contractors. U.S. subcontractors are primarily interested in their own profits and, rather than acting as buffers to protect the general contractor, would be likely to act in self-defense.

Japanese general contractors would also have to pay higher wages in the U.S. than in Japan whether workers are open shop or union workers. Also, Japanese contractors have to use U.S. suppliers, and U.S. materials that are relatively expensive. Therefore, Japanese general contractors would lose their overall cost leadership over U.S. counterparts. That is, they could not establish a strategy based on overall cost leadership--Option 2.a. (See Table 4.1).

Japanese contractors would lose the privileges they enjoy in the unique Japanese bidding system, especially the special nominative bid. Because they fundamentally have to face open bidding in the U.S., work volume could fluctuate considerably. This would affect Japanese general contractors negatively. They could not provide construction services at discount prices because of unstable profit margins. Rather, they would have to concentrate only on the projects that seem to be profitable, as U.S. contractors are doing.

Among Japanese contractors' superior capabilities, their internal organizational structures would continue to serve them well in the U.S. construction market. For example, the vertically integrated services that characterize Japanese general contractors would be an advantage that Japanese contractors could have over U.S. counterparts. Such a wide range of vertically integrated services differentiate Japanese firms from their U.S. counterparts. This factor points to the "differentiated" and "focus" strategies as potentially applicable (See Option 2.b. + 2.c., Table 4.1).

The differentiation strategy through vertically integrated services could be strengthened by combining it with the focus strategy. At present, Japanese firms do not specialize in plant and industrial facilities construction. Japanese general contractors have to focus on a particular segment of building and heavy construction. For example, by utilizing their expertise in providing vertically integrated services, e.g. planning, land development, construction, sales of housing, maintenance, security, insurance on a guaranty basis, even financing of a project and financing of tenants or buyers, a large Japanese firm could exercise a strong competitive advantage over the highly fragmented group of small house builders in the U.S. housing industry. (Option 2.b + 2.c, Table 4.1)

A combination of vertically integrated housing construction and franchising provide an even comparative advantage. According to the model created by Prof. Fred

Moavenzadeh, the highly fragmented U.S. housing industry can be effectively aggregated through franchising.

In this model, a large firm establishes a brand name and a franchising organization, and provides U.S. small house builders with advanced technology, cheap materials(through scale of economy), ample workers, capital, attention to local codes and regulations and even information from and connection with local authority on a fee basis. These integrated services are not available to a small firm working alone.

Working together, a large number of such small house builders would, under the brand name of the franchiser, provide customers with vertically integrated services. Because this system is maintained on a fee basis between a franchiser and franchisees, it would create more effects on profit of franchisees by providing customers with high quality of housing on a guarantee basis. If small firms (franchisees) have to do fewer repair and fewer claims are made against them by customers, small firms can cut costs from their maintenance, guarantee, and insurance services (Option 2.b. + 2.c. + Option II.b., Table 4.1).

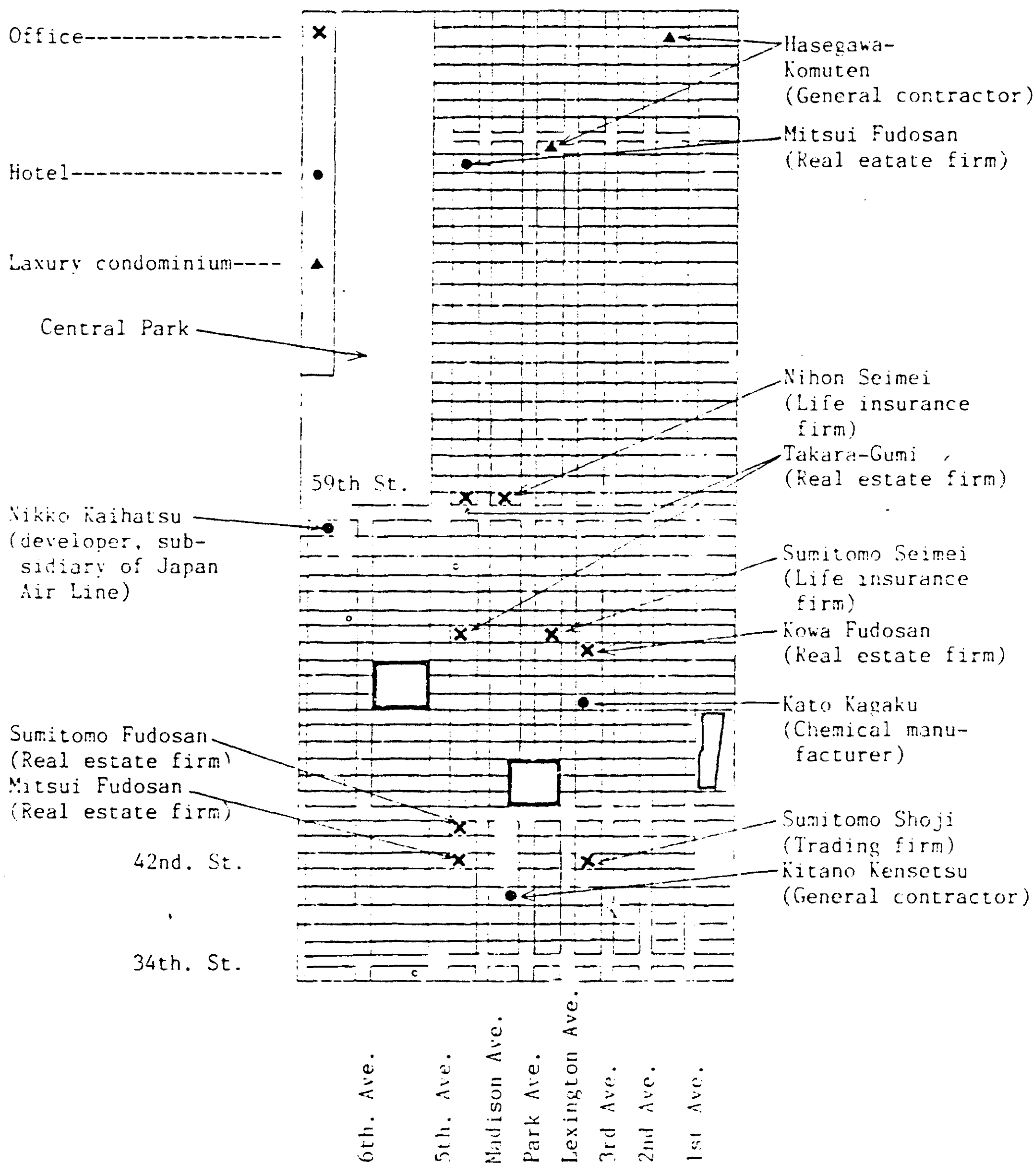
Also, Japanese contractors' technologies developed through their R&D could be an advantage. Japanese contractors could find cost advantages in focusing on the areas in which they are already very strong, e.g. in geotechnical engineering, an area involving special technologies for shields, underground LPG tanks, dams, sewage systems, etc. In such particualr areas, they could provide cost leadership as well as excellent performance through advanced technology. (Option 2.b. + 2.c. + Option II.c., Table 4.1)

The relatively strong financial structure of Japanese contractors could be an advantage. Although their financial structures are weaker than those of firms in the high-tech industries in Japan, they are generally stronger than those of U.S. counterparts, and have the added security of the fund pipes from Japanese financial institutions and insurance firms as mentioned in Chapter 3. Furthermore, compared to the large Japanese general contractors entering U.S. building and heavy construction market, U.S. firms in such fields are usually small. Large U.S. contractors have considerable expertise in plant construction. In addition, most of their work is now performed in foreign countries. U.S. firms other than plant contractors are small and financially weak. The combination of Japanese contractors' financial power and the idea of privatizing now public utilities could provide an effective strategy.

Highways and water resources in the U.S. are mostly operated by federal and local governments. Japanese general contractors could privatize such facilities (a kind of acquisition, as categorized among the entry modes) and operate and maintain them with more efficiency than the public sector can, while their cash-poor U.S. counterparts could not. By forming joint ventures with other Japanese contractors, Japanese financial institutions, Japanese cash-rich firms, or U.S. cash-rich firms, the effect could increase dramatically (Option 2.b. + 2.c. + Option I.b.iii, Table 4.1). The firms could increase cost reductions by adopting more vertically integrated forms, e.g. by financing and constructing a facility, such as a small water resource facility, by themselves or through forming a joint venture. (Option 2.a. + 2.c. + Option I.b.i. + I.b. iii).

Japanese contractors' financial strength could be combined with an investment mode of entry, in the form of purchasing real estate in the U.S. Investment in assets in the U.S. has attractive features for Japanese firms. For example, in the U.S. there is no tax for acquired real estate (4% in Japan), 20% of acquisition tax by short-term (below 10 years) transfer (46% in Japan), 10% of tax on acquisition price for short-term transfers in purchases by a foreign firm registered in the U.S., a tax shield through 15 years of depreciation although possible change is expected after 1987, (65 years in Japan), and a high rate of income from tenants because of the much higher value of buildings in the U.S. (As is well known, land price in Japan is extremely high compared to construction cost or cost of buildings, and has still been increasing at a very high rate.) (Source: 73) Examples of real estate purchased recently by Japanese firms in Manhattan are shown in Figure 4.1. Many firms have been rushing to obtain property in Manhattan for investment purposes. Some Japanese firms have

Figure 4.1: Investment in Assets in Manhattan by Japanese Firms



Source: 73

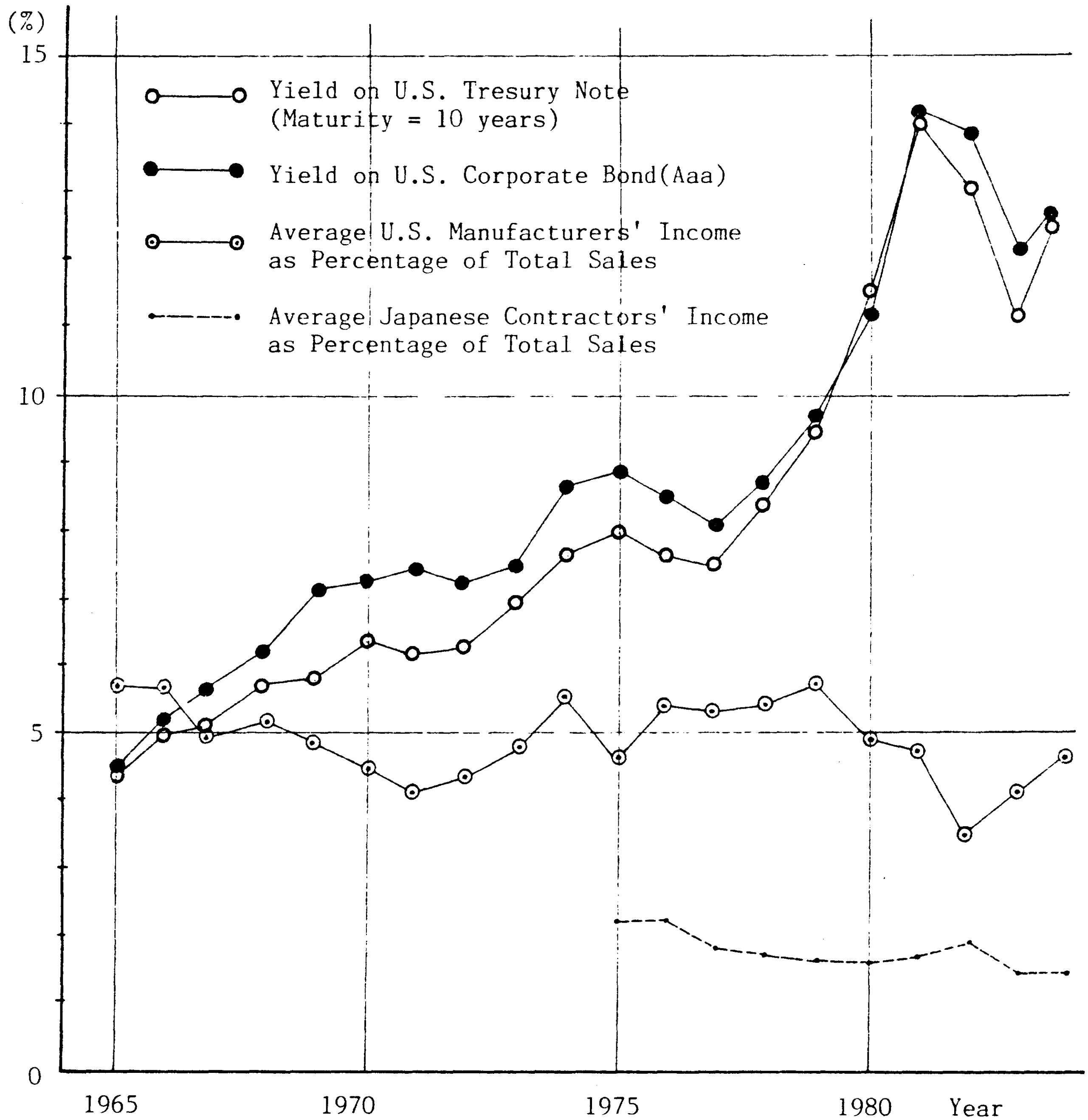
demolished buildings and built hotels, condominiums, and office complexes (Option I.b., Table 4.1) A Japanese general contractor even performed construction by itself (Option I.b. + II.c., Table 4.1).

Investment in U.S. stock market is another investment strategy. Profiting from investment in stocks is controversial because nothing tangible is produced through such investment. However, the yields from such investment, whether they are government or corporate bonds, could be far higher than the yields from more familiar forms of production or other business in Japan, considering the generally low yields of Japanese firms and the high rate of return in stock market (See Figure 4.2). In addition, high interest rates in the U.S. since the late 1970s support this strategy. (As long as interest rates in the U.S. are kept at a high level, return on stocks and bonds will remain at a high level because of market mechanisms.)

Such a strategy will help Japanese construction firms create more diversified or safer portfolios. Recent aggresive investment by Japanese firms has been aimed at this point. Japanese firms invested $49.6 billion of savings in the U.S. capital market in 1984 (See Fig 4.3). Such funds came mostly from Japanese life and non-life insurance firms, city and trust banks, and many manufacturing firms that were making large profits (Source 17.a, b.) (Option 1.b., Table 4.1).

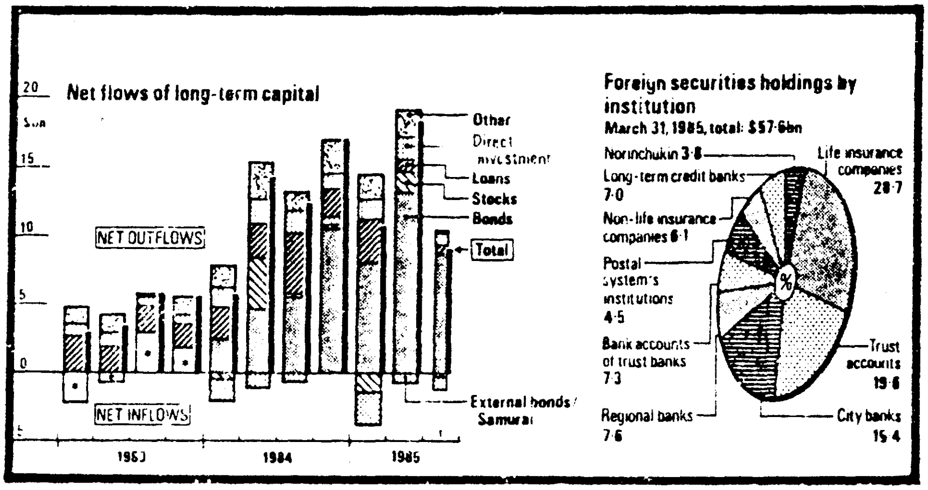
One strategy for new firms could be to follow other

Figure 4.2 : Rate of Corporate and Government Bond in the U.S. and Rate of Corporate Income in the U.S. and Japan



Source: 58,70

Figure 4.3 : Outflow of Japanese Savings



Source: 17.b

Japanese firms' direct investment in the U.S. Many number of Japanese firms have been pursuing production or business in the U.S. Construction contracts received by Japanese contractors so far fundamentally fell into this type of strategy. It is very likely that Japanese customers in the U.S. will continue to choose Japanese contractors for convenience. Because of the strict protectionism of the U.S. government against Japanese products, many Japanese manufacturing firms are planning direct investment in the U.S. Therefore, this strategy is still one of the most important for Japanese contractors though nothing is new in this strategy and much contracts cannot be expected (Option 2.b. + 2.c. + Option II.c., Table 4.1).

One extreme strategy could be Option 1, that is, to obtain shares by providing exactly the same features of products or services as U.S. counterparts. Probably, the most appropriate method would be to acquire U.S. contractors, engineering firms, architecture firms, or engineer/constructors. As shown above, because one of the disadvantages for Japanese contractors could be lack of familiarity with systems and mechanisms in the U.S. construction industry, e.g. other parties, laws, codes, regulations, local community and authority in the U.S., such a problem would be alleviated by using U.S. firms (Option 1 + Option II.c.)

All of these disadvantages for Japanese contractors could be solved the most easily through acquistion of a U.S.

firm (Option 1 + Option II.c.). Furthermore, Japanese contractors which do not have capability to engineer and build plant and industrial facilities could gain this capability through acquiring a U.S. firm which expertise the field (Option 1 + Option I.b.iii + II.c.).

In order to ensure profits, CM (Construction Management) contracts might be crucial because they enable a general contractor to maintain a certain rate of fee at least. Receiving contracts on a design/construct basis might also be effective stablilizing profits because a general contractor can avoid several problems that arise between a general contractor and subcontractors (Option 2.c.-focus on type of service).

It is also important to select appropriate geographical market segments and types of construction. For example, office buildings in the sunbelt zone have enormously high vacancy rates because of the construction rush precipitated by the tax shield through depreciation and investment tax written into the present tax code. Firms are still rushing even now to take last-minute advantage of these tax provisions. Because it is highly probable that firms (often developers) financing new office building projects in such a saturated area might fall into bankruptcy, the selection of an advantageous geographical segment of the market and type of project is crucial. Large cities with significant vacancy rates as of December 1985 included: suburban Houston 31%, downtown Dallas 17.8%, suburban Dallas 23.5%, Atlanta

20%, San Diego 23.4%, Los Angeles 18%, and San Jose 21.2% (Option 2.c.-geographical focus). (Source:11.a.)

Furthermore, Japanese contractors should focus on projects of a specific size, type, and complexity. A firm of a particualar size can best perform projects of a scope and nature familiar to the firm. It is wise to market projects of a size, type, and complexity commensulate with the amount of resources a Japanese general contractors is able to maintain, especially in the U.S. This focusing strategy should be employed for any construction whether Japanese contractors provide differentiated services or not (Option 2.c.-focus on size, type, and complexity of project).

As the foregoing discussion suggests, Japanese firms have many options. After observing what Japanes firms have done in the U.S. so far, we will recommend systematically the best entry strategies and modes.

4.4 What Japanese Firms Have Done in the U.S. Construction Market

So far Japanese firms have not performed spectacularly in the U.S. construction market. Table 4.2 shows the overseas investment by Japanese firms. Only five construction firms appear, and they rank below 40 in scale of investment. The amount invested by these five firms were very low. These statistics include all investment in

Table 4.2: Ranking of Overseas Investment or Finance by Japanese Firms

Rank	Firms	(1983) Amount of Investment or Finance by Japanese Firms ($ mil)
1.	Mitsubishi-Shoji	1,496
2.	Nihon Asahan Aluminum	1,270
3.	Marubeni	1,220
4.	Nissan	1,179
5.	Mitsui-Bussan	1,073
6.	Japan Oil Development	674
7.	Ito-Chu-Shoji	587
8.	Nissho-Iwai	505
9.	Godo Oil Development	439
10.	Sony	419
11.		
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20.		
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30.		
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40.		
--		
44.	Aoki Construction	91
--		
50.		
--		
55.	Kajima Construction	75
--		
60.	Kumagai-Gumi	69
--		
66.	Taisei Construction	59
--		
68.	Fujita Kogyo	57
--		
70.		

Source: 68

overseas, not just in the U.S.. Therefore, we may conclude that investment in the U.S. by Japanese contractors has been very small. Table 4.3 summarizes the establishment of subsidiaries and offices in the U.S. which do business related to construction and development. One of the remarkable characteristics is the high percentage of business located in Hawaii(27.8%). Japanese firms are relatively familiar with Hawaii traditionally, many Hawaiians are of Japanese background, a number of travelers to Hawaii come from Japan, and Hawaii is so close to Japan. The operation of housing and hotels, and tourist-oriented businesses are especially evident in Hawaii. They are included as "Others" in Table 4.3.

Real estate and development have been the most common businesses. Fully 54.2% of business by Japanese firms falls in this type of enterprise. Because this type of business is very integrated (development, construction, sales), profit could be created more easily for this than for any other single type of business, for example than for construction only. In addition, Japanese firms can eliminate problematic cooperation with U.S. firms through integration.

Only 36.1% of business falls into design/construction. Of this, 76.9% of business is done on the U.S. mainland.

Table 4.3-(2) through Table 4.3-(4) show details of business by Japanese firms. A large number of business is also operated in California (like Hawaii, congenial to

Table 4.3: Establishment of Subsidiaries and Offices Related Construction or Development in the U.S. by Japanese Firms -(1) Summary

(1983)

Content of Business	Development		Design/ Construction		Others	
Place	Hawaii	Main Land U.S.	Hawaii	Main Land U.S.	Hawaii	Main Land U.S.
Number	8 (20.5%)	31 (79.5%)	6 (23.1%)	20 (76.9%)	6 (85.7%)	1 (14.3%)
Sub-total	39 (54.2%)		26 (36.1%)		7 (9.7%)	
Total					72	

% of Number of Business in Hawaii 27.8%
% of Number of Business in Mainland U.S. 72.2%

Note: Total number of firms doing business in 1983 was 23. If a firm has several businesses, each business was counted as one. Therefore, the total number of business does not necessarily equal to the total number of firms.
Numbers in parentheses indicate percentages of the numbers.
Numbers above are as of 1983.

Source: 68

Table 4.3: Establishment of Subsidiaries and Offices Related Construction or Development in the U.S. by Japanese Firms -(2) Details of Establishments

(Format and symbols are explained in (5))

Aoki Construction (General Contractor)

1.	$ 2.5	5(1*1)	RED	n.a.	MD	efim2P'J'
2.	$ 5.2	5 (*1)	RED	U.S.1-0.2%	MD	efim1'PdJ'
3.	$ 2.6	3 (*1)	RED	U.S.1-0.4%	MD	Efi2P'J'
4.	$10.0	8(5*1)	RED	U.S.1- 11% Jpn.3- 40%	MD	EfimP'J'

Aoki Toshi-Kaihatsu (Realtor)

1.	$ 1.0	3(2*1)	RED,	n.a.	HW	n.a.
2.	$ 0.1	n.a.	RED	n.a.	CA	n.a.

Asahi Life Insurance (Life Insurance firm)

1.	$34.5	4(3*1)	Real estate investment		NY	FJ'

Ohbayashi-Gumi (General Contractor)

1.	$ 0.3	55(1*1)	Sightseeing- bus business	Jpn.several	HW	n.a.
2.	$ 4.0	24(12*2)	Construction, RED		CA	EilP'J'
3.	$ 5.0	8(4*2)	Construction, Design, RED		HW	Ei2P'J'
4.	$10.0	2(1*1)	Construction, Design		HW	EiJ'
5.	$ 3.0	220(3*1)	RE,Mgt of Hotel		HW	EiJ'
6.	$ 1.0	5 (*1)	Construction,	U.S.1-10.3%	CA	ei

Kajima Construction (General Contractor)

1.	$12.2	15(4*4)	Construction,D		CA	gim
2.	$ 2.0	n.a.	RE investment		HW	gP'
3.	$ 4.5	169(31*7)	Construction, Design, RE	Jpn1-8.1%	CA	fP'
4.	$23.5	5(3*0)	Mgt of Hotel, & Mall	Jpn8-53%	CA	n.a.

Kitano Construction (General Contractor)

1.	$ 0.1	6 (*1)	Construction, RE	U.S.1-45%	HW	eF3P'J'
2.	$ 0.01	1 (*1)	Construction, Design		NY	eF3P'J'

Kumagai-Gumi (General Contractor)

1.	$ 1.0	9(7*3)	Construction, RED		HW	eim1"P'J'
2.	$ 3.3	12(6*6)	Construction, RED		CA	gimP'J'

Table 4.3: Establishment of Subsidiaries and Offices Related Construction or Development in the U.S. by Japanese Firms -(3) Details of Establishments

Shimizu Construction (General Contractor)						
1.	$ 2.0	18(9*)	Construction, Design,Consult		NJ	defimtP'J'
Sumitomo Fudosan (Realtor)						
1.	$ 0.5	22(1*1)	Mgt of golf course	Jpn.Several -49%	HW	eil
2.	$ 1.0	9(4*2)	RED		CA	efil
Daikyo Kanko (Realtor)						
1.	$ 0.4	n.a.	RED		TX	EfP'J'
Taisei Kensetsu (General Contractor)						
1.	$ 0.1	9(4*1)	Construction, D(Housing)		NY	DefP'J'
Daiwa House (House Builder)						
1.	$ 2.0	5(2*)	Construction & D of Housing, RE	Jpn.Several 20%	CA	n.a.
2.	$ 2.0	n.a.	ditto	ditto	TX	n.a.
3.	$ 2.0	3(1*)	ditto	ditto	CA	n.a.
4.	$ 4.0	5(4*)	ditto	ditto	TX	n.a.
Daaiichi Seimei Hoken (Life Insurance Firm)						
1.	$ 3.5	n.a.	RE investment		NY	efJ'
Takenaka Komuten (General Contractor)						
1.	$ 0.3	17(6*2)	Construction, Design,RED,Agent of const.material		CA	efil
2.	$ 0.2	2(*1)	Consultant	U.S.Several- 50%	CA	Efgij
3.	$ 1.6	(2*1)	RE	Jpn.3-51%	CA	eiJ'
Tomen (General Trading Firm)						
1.	$100.0	n.a.	RE		CA	n.a.
Toda Kensetsu (General Contractor)						
1.	$200.0	8(5*3)	Construction		NY	i3P'J'
2.	$ 0.01	n.a.	Construction, D		FL	n.a.
3.	$ 0.2	n.a.	Construction, RED of Housing	Jpn.1-20%	CA	n.a.
4.	$ 0.1	n.a.	RED	,Jpn.1-50%	TX	n.a.
Tokyu Kensetus (General Contractor, Subsidiary of Conglomerate)						
1.	$ 3.2	69(2*3)	Construction		HW	ei

Table 4.3: Establishment of Subsidiaries and Offices Related Construction or Development in the U.S. by Japanese Firms -(4) Details of Establishments

Tokyo-Kyuko Dentetsu (Private Railway Firm)					
1.	$ 2.4	70(2*1)	RED ,Jpn.1-35.4%	WA	n.a.
2.	$ 5.5	876(2*1)	Mgt of Hotel,Jpn.1-54%	HW	n.a.
3.	$44.0	90(7*1)	D ,Jpn.8-56%	HW	n.a.
Tokyu Fudosan (Realtor)					
1.	$ 9.0	5(1*2)	RE	CA	1'P'J'
2.	$ 0.3	100(1*1)	Sightseeing bus	HW	1'P""J'
Nichimen (General Trading Firm)					
1.	$ 5	4(3*2)	RE	FL	J'
Nihon Seimei Hoken (Life Insurance Firm)					
1.	$23.2	2 (*2)	RE investment	NY	n.a.
Hasegawa Komuten (General Contractor-Housing)					
1.	$ 0.1	4 (*1)	D & Construction of Condominiums	CA	Eim1"P'J'
2.	$10.0	20(9*1)	D & Construction of Condominiums, Mgt of Hotel	HW	Gim1'P'
3.	$ 3.0	5(5*1)	D of Condominiums, RE	NY	gimP'J'
Mitsui Fudosan (Realtor)					
1.	$ 5.0	681(1*1)	Mgt of hotel	HW	J'
2.	$25.0	14 (*5)	RE	CA	e
3.	$ 4.0	3(1*1)	RE	NY	EJ'

Table 4.3: Establishment of Subsidiaries and Offices Related Construction or Development in the U.S. by Japanese Firms -(5) Details of Establishments

Format and Symbols:

```
1. $____   xx(xx*xx) ___________ _____________ ___ _______
    (a)   (b)(c) (d)      (e)          (f)      (g)   (h)
```

(a) Amount of capital ($ million)
(b) Number of employees
(c) Number of Japanese employees
(d) Number of Japanese directors
(e) Contents of business
RE ---Realtor
RED ---Realtor and engaged in development
D ---Development
(f) Investors other than a parent firm in Japan
U.S.x -xx% --x number of U.S. firms invested by xx%
(g) Name of a state where an establishment is located
(h) Symbols;

Purpose of business and investment:

- a Procurement of raw materials or natural resources
- b Easier manufacturing because of plenty of natural resources
- c Use of spot labor, cost reduction
- d Protectionism by the U.S.
- e Increase of market in the target country
- f Collection of information
- t Difficulty of export because of trade friction with the U.S.
- g Others
- r Royalty

Where to sell

- h Japan
- i To the U.S.
- j To the third country

Where to buy parts and raw material

- k From Japan
- m In the U.S.
- n From the third country

Performance

- 1 Making profit
- 1' Delivering dividend
- 1" Retaining
- 2 Balancing
- 3 Making loss

Receipt of profit by parents firm

- P Yes
- Pa By dividend
- Pb By interest
- Pc By royalty
- Pd By others
- P' No

Joining of overseas investment insurance

- J Yes
- J' No

Japanese investment). For real estate investment (not real estate development), Japanese firms tend to stay in New York probably because information is easily available there and much of the real estate with high value is in Manhattan. The development project in East Manhattan by Kumagai-Gumi should be noted. In this project, Kumagai-Gumi purchased real estate in East Manhattan. Kumagai-Gumi is planning to demolish the existing building and construct a building complex (Option 2.c. + I.b. + II.c.).

Investment through joint venture with U.S. firms has been rare so far. Focus on one geographic area has been demonstrated by Kitano Construction. Its business is fundamentally housing development in Maryland (Option 2.c.- geographical focus). Although not included in these tables, two construction contracts for manufacturing facilities from Toyota should be noted. They were received by Ohbayashi-Gumi and Simizu Construction respectively. These two firms followed one of the strategies illustrated in the previous section (Option 2.c. + II.c.).

4.5 Possible Strategies and Entry Modes for Japanese Construction Firms

Based on the information presented in the previous two sections, entry strategies and modes that could be adopted by Japanese general contractors will be addressed systematically in this section. Each combination of entry strategy and entry mode as a different option will be considered in detail.

There are three major options for Japanese contractors. Each reflects a different type of market segment and services. They are;

Option A: Enter U.S. construction market through construction services and related business operations, and provide the same services as those offered by U.S. counterparts

Option B: Enter U.S. construction market through construction services and related business operations, but offer services differentiated from those provided by U.S. counterparts

Option C: Enter U.S. construction market through investment. Investment may be made in real estate (buildings and land or both) and public facilities (privatization). One modified option may be investment in the U.S. stock market as part of the portfolios for Japanese contractors doing business in the U.S.

Japanese general contractors that adopt Option A will enter the U.S. construction industry by providing U.S. customers with exactly the same features as U.S. companies already offer. As shown below, this option is the combination of Option 1 and Option II.c. under Option A. By doing so, Japanese general contractors would need to steal market shares from their U.S. counterparts. Detailed descriptions are provided in the chart in the next page.

In order to work around their unfamiliarity with systems and mechanisms in the U.S. construction industry, Japanese contractors can utilize Option A in joint venture with or by acquisition of a U.S. firm (Option A1). Through this option, Japanese contractors may also gain the capacity to engineer and build plant and industrial facilities, which they traditionally have not done.

In order to stabilize profits, Option A and A1 can be developed further through combining focusing strategies. For example, they might enter projects on a CM contract basis (focus on type of service), or focus on projects of a certain type, size, or complexity of, or focus on geographically (Option A2).

Option B is for Japanese contractors trying to enter the U.S. construction market through differentiated services. Differentiation can be done fundamentally in two ways. First, it will be achieved through vertically integrated services which Japanese general contractors have traditionally provided their customers. These services include study of the needs of client, search for project and suitable sites, feasibility study, planning and design, finance, negotiation with community, construction,

Option A

```
                                  Option I --Product entry
                                               mode
Option 1 --Provide the                    a. Export entry mode
           same features  ***                i. through agent/
           as U.S.          *                   distributor
           counterparts     *               ii. through branch/
                            *                   subsidiary
                            *              iii. Franchise
Option 2 --Provide the      *
           features         *             b. Investment entry
           differentiated   *                mode
           from U.S.        *                i. Joint venture
           counterparts     *               ii. Sole venture
       a. Overall cost      *              iii. Acquisition
          leadership        *
                            *     Option II Contractual entry
       b. Differentiation   *               mode
                            *             a. Licensing
       c. Focus             *             b. Franchise
                            ********* c. Contract
                                         construction
```

[Combination of Strategies and Modes]
Option 1 + Option II.c.
[Features]
Providing U.S. customers with the same features of services as those by U.S. counterparts. However, it may be difficult for Japanese contractors to succeed by this option because of their unfamiliarity with systems and mechanism in the U.S. construction industry.

maintenance, and operation. This type of differentiation can be easily combined with a focusing strategy, such as by type, size or complexity of project, by forms of contract (design/ construct), or by geographic area (Option B1).

One extreme case of focusing is to concentrate on serving Japanese customers. The services of Japanese contractors are already differentiated toward Japanese customers because of the convenience. Of course, Japanese

Option A1

```
                                 Option I --Product entry
                                            mode
Option 1 --Provide the                 a. Export entry mode
           same features  ***             i. through agent/
           as U.S.          *                distributor
           counterparts     *            ii. through branch/
                            *                subsidiary
                            *           iii. Franchise
Option 2 --Provide the      *
           features         *          b. Investment entry
           differentiated   *             mode
           from U.S.        *********     i. Joint venture
           counterparts     *            ii. Sole venture
       a. Overall cost      *********   iii. Acquisition
          leadership        *
                            *    Option II Contractual entry
       b. Differentiation   *              mode
                            *          a. Licensing
       c. Focus             *          b. Franchise
                            ********* c. Contract
                                          construction
```

[Combination of Strategies and Modes]
Option 1 + Option II.c. + Option I.b.i or iii
[Features]
Providing U.S. customers with the same features of services as those by U.S. counterparts. In addition, Japanese contractors eliminate their unfamiliarity with systems and mechanisms in the U.S. construction industry through joint venture or acquisition of a U.S. firm. Furthermore, through acquisition of a U.S. plant contractor or a plant design/constructor, Japanese general contractors can obtain the capability in such a segment of the market.
customers expect vertically integrated services and close

relationships. This vertical relationship will continue to provide is one of the most effective way for Japanese contractors to get projects in the U.S. (Option B1').

Option B1 can be combined with franchising (Option B2). However, segments to which Option B2 is applicable are limited. They are the highly fragmented segments of the market. Probably the most suitable segment is residential

Option A2

```
                                     Option I --Product entry
                                                mode
Option 1 --Provide the                    a. Export entry mode
           same features  ***                i. through agent/
           as U.S.          *                   distributor
           counterparts     *               ii. through branch/
                            *                   subsidiary
                            *              iii. Franchise
Option 2 --Provide the      *
           features         *             b. Investment entry
           differentiated   *                mode
           from U.S.        *********        i. Joint venture
           counterparts     *               ii. Sole venture
       a. Overall cost      *********      iii. Acquisition
          leadership        *
                            *    Option II Contractual entry
       b. Differentiation   *              mode
                            *             a. Licensing
       c. Focus *************             b. Franchise
                            ********* c. Contract
                                          construction
```

[Combination of Strategies and Modes]
Option 1 + Option II.c. + Option 2.c. or
Option 1 + Option II.c. + Option 2.c. + Option I.b.ii or iii
[Features]
Providing U.S. customers with the same features of services as those by U.S. counterparts, but focusing market in someway, such as focusing on type of service (CM), type, size, and complexity of projects, or design/construct contracts. In addition, Japanese contractors can combine this with joint venture or acquisition of a U.S. firm.

construction.

The second type of differentiation may be achieved through advanced technology developed through Japanese R&D. However, the areas in which they are very advanced are highly speciafic, such as goetechnical seismic engineering and the underground construction utilizing such engineering. Projects which use shields, up-down construction, slurry walls etc. could involve this technology. Because of the

Option B

```
                                     Option I --Product entry
                                                mode
Option 1 --Provide the                    a. Export entry mode
           same features                     i. through agent/
           as U.S.                              distributor
           counterparts                     ii. through branch/
                                                subsidiary
                                           iii. Franchise

Option 2 --Provide the
           features                       b. Investment entry
           differentiated                    mode
           from U.S.                         i. Joint venture
           counterparts                     ii. Sole venture
       a. Overall cost                     iii. Acquisition
          leadership
                                     Option II Contractual entry
       b. Differentiation ***                  mode
          (Vertically      *              a. Licensing
           integrated      *              b. Franchise
           service)        ********* c. Contract
       c. Focus                              construction
```

[Combination of Strategies and Modes]
Option 2.b. + Option II.c.
[Features]
Providing U.S. customers with features differentiated from those provided by U.S. counterparts. Differentiation can be fundamentally achieved by vertically integrating services.

limited areas of advanced technology in which Japanese contractors specialize, the market segments for such advanced technology must be targeted precisely (Option B3). Finally, joint venture with and acquisition of U.S. firms can be combined with any of Option B, B1, B2, and B3 in order to become involved in ongoing activities of the U.S. construction industry. (These variations are not indicated in the charts.)

The last option is to enter the U.S. construction industry through investment. Perhaps the most familiar

Option B1 (B1')

```
                                       Option I --Product entry
                                                mode
Option 1 --Provide the                      a. Export entry mode
           same features                       i. through agent/
           as U.S.                                distributor
           counterparts                       ii. through branch/
                                                  subsidiary
                                             iii. Franchise
Option 2 --Provide the
           features                         b. Investment entry
           differentiated                      mode
           from U.S.                           i. Joint venture
           counterparts                       ii. Sole venture
       a. Overall cost                       iii. Acquisition
          leadership
                                       Option II Contractual entry
       b. Differentiation ***                   mode
          (Vertically      *                a. Licensing
           integrated      *                b. Franchise
           service)        ********* c. Contract
       c. Focus *************                  construction
```

[Combination of Strategies and Modes]
Option 2.b. + Option II.c. + Option 2.c.
[Features]
Providing U.S. customers with the features differentiated from those offered by U.S. counterparts. Differentiation can be fundamentally achieved by vertically integrated services. In addition, such as by type, size and complexity of project, forms of contract (design/construct), by geographic area. The extreme of this option is to focus on Japanese customers in the U.S.

approach for Japanese contractors is investment in land or building in the U.S. One way to utilize such assets is to operate purchased offices, apartments, hotels, and so on (Option C). This option can be combined with real estate business. Another way is to demolish facilities and develop them into operatable assets, as listed above. There is a possibility that such development

```
Option B2
---------
                                         Option I --Product entry
                                                    mode
Option 1 --Provide the                        a. Export entry mode
           same features                         i. through agent/
           as U.S.                                  distributor
           counterparts                         ii. through branch/
                                                    subsidiary
                                               iii. Franchise
Option 2 --Provide the
           features                           b. Investment entry
           differentiated                        mode
           from U.S.                             i. Joint venture
           counterparts                         ii. Sole venture
       a. Overall cost                         iii. Acquisition
          leadership
                                         Option II Contractual entry
       b. Differentiation ***                       mode
          (Vertically      *                  a. Licensing
           integrated      ********* b. Franchise
           service)        ********* c. Contract
       c. Focus *************                    construction
          (Fragmented segments)
```

[Combination of Strategies and Modes]
Option 2.b. + Option II.c. + Option 2.c. + Option II.b.
[Features]
Providing U.S. customers with the features differentiated from those offered by U.S. counterparts. Differentiation can be fundamentally achieved by vertically integrated services. In addition, focus should be on highly fragmented segments of the market.

can be combined with construction of such facilities (Option C1).

Option C and C1 can be combined with the concept of privatization, that is, to focus on investment in government facilities. Because only a limited number of government facilities can be privatized, such as highways, water resources and so on, Japanese contractors have to focus

```
Option B3
---------
                                   Option I --Product entry
                                                mode
Option 1 --Provide the                 a. Export entry mode
           same features                  i. through agent/
           as U.S.                          distributor
           counterparts                  ii. through branch/
                                              subsidiary
                                        iii. Franchise
Option 2 --Provide the
           features                    b. Investment entry
           differentiated                 mode
           from U.S.                      i. Joint venture
           counterparts                  ii. Sole venture
       a. Overall cost                  iii. Acquisition
          leadership
                                   Option II Contractual entry
       b. Differentiation ***                   mode
          (Advanced         *          a. Licensing
           technology)      *          b. Franchise
                            ********* c. Contract
       c. Focus *************             construction
          (Segment where
           advanced technology
           is possessed
```

[Combination of Strategies and Modes]
Option 2.b. + Option II.c. + Option 2.c.
[Features]
Providing U.S. customers with the features differentiated from those offered by U.S. counterparts. Differentiation can be achieved by advanced technology which Japanese contractors possess. However, the focused must be on the segments of market to which such advanced technology is adaptable.

further (Option C2). As with Option C, Option C2 can be combined with construction by Japanese contractors themselves (Option C3). Furthermore, in order to alleviate risks and to facilitate financing, all C, C1, C2, C3 can be combined with joint ventures. (Each option in which joint venture may be adopted is designated by

Option C (C1)

```
                                      Option I --Product entry
                                                  mode
Option 1 --Provide the                    a. Export entry mode
           same features                     i. through agent/
           as U.S.                              distributor
           counterparts                     ii. through branch/
                                                subsidiary
                                           iii. Franchise
Option 2 --Provide the
           features                       b. Investment entry
           differentiated   (C',C1')         mode
           from U.S.        *********        i. Joint venture
           counterparts     *               ii. Sole venture
        a. Overall cost     *********      iii. Acquisition
           leadership       *
                            *    Option II Contractual entry
        b. Differentiation  *                mode
        c. Focus            *             a. Licensing
                            *             b. Franchise
                            **(C1)*** c. Contract
                                         construction
```

Note: Purchasing assets can be interpreted as acquision in terms of purchasing assets.
[Combination of Strategies and Modes]
Option I.c. + (Option II.c.)
[Features]
Investing in assets in the U.S., then operating them. Also, Japanese contractors can be realtors. Furthermore, this option can be vertically integrated by constructing by themselves.

superscript symbols " ' ". One extreme in the investment option is investment in U.S. stock market (Option C4). Although this option is very attractive from the standpoint of profit-making, it does not involve any relationship to construction or construction-related business. Therefore, this option cannot be considered a major strategies or modes for the purpose of this study, but belongs among discussions of general business portfolios. This option may be used to

```
Option C2 (C3)
---------
                                 Option I --Product entry
                                              mode
Option 1 --Provide the                a. Export entry mode
           same features                 i. through agent/
           as U.S.                            distributor
           counterparts                 ii. through branch/
                                              subsidiary
                                       iii. Franchise
Option 2 --Provide the
           features                   b. Investment entry
           differentiated   (C2',C3')    mode
           from U.S.        *********     i. Joint venture
           counterparts     *            ii. Sole venture
       a. Overall cost      *********   iii. Acquisition
          leadership        *
                            *    Option II Contractual entry
       b. Differentiation   *             mode
       c. Focus *************         a. Licensing
                            *         b. Franchise
                            **(C3)*** c. Contract
                                         construction
Note: Purchasing assets can be interpreted as acquisition in
      terms of purchasing assets.
[Combination of Strategies and Modes]
Option I.c. + (Option II.c.) + Option 2.c.
[Features]
Purchasing government assets in the U.S., then operating
them.  Furthermore, this option can be vertically
integrated by constructing them also.
```

protect against risks in the actual construction business in the U.S. by Japanese contractors. As addressed so far, all options considered systematically here are combinations of strategies and measures with strong potential for aiding Japanese general contractors successfully penetrating U.S. construction market. At the same time, the market segments discussed here are the areas with high potential as arenas in the U.S. for Japanese general contractors. Because the the discussion here has been made in a very

Option C4

Option 1 --Provide the same features as U.S. counterparts

Option 2 --Provide the features differentiated from U.S. counterparts
- a. Overall cost leadership
- b. Differentiation
- c. Focus

Option I --Product entry mode
- a. Export entry mode
  - i. through agent/ distributor
  - ii. through branch/ subsidiary
  - iii. Franchise
- ******** b. Investment entry mode
  - i. Joint venture
  - ii. Sole venture
  - iii. Acquisition

Option II Contractual entry mode
- a. Licensing
- b. Franchise
- c. Contract construction

[Combination of Strategies and Modes]
Option I
[Features]
Investing in the U.S. stock market. To be used as a business portforlio.

general way, more variations or more detailed analysis may be necessary in further studies.

Chapter 5

Conclusion, Summary, and Future Studies

5.1 Summary and Conclusion

Since the destructive end of World War II, Japan has had tremendous economic growth. The cooperative effort among Japanese government, industries, and the Japanese people enabled a tiny island country become to the second economic power in the Western would. Japanese products are flooding all national markets.

However, compared to the successful penetration of foreign markets by Japanese products, the Japanese construction industry has made no significant inroad into the foreign construction market. Why have Japanese construction firms not penetrated foreign markets?

There are several good explanations: 1) the government policies of fostering manufacturing industries in order to reconstruct and industrialize the Japanese economy; 2) the absorbing task given to the construction industry to support such manufacturing industries and to reconstruct the nation's facilities and residences; 3) the specialization of Japanese general contractors only in building and heavy construction (no engineering or construction capability for plant and industrial facilities); and 4) several problems created by the delay in entering foreign markets. Taken together, these factors left Japanese general contractors far behind the international contractors of other countries in entering foreign markets.

The driving force behind industries in Japan's post-war economic expansion was debt-financing. This strategy succeeded until the oil crisis of 1973. However, the combination of slow growth and energy conservation since then allowed the burgeoning of industries for which equity financing was most suitable.

The financial structure of construction firms has not been improved in recent years. Its debt financing structure is now closer to that of the declining capital-intensive industries, than to that of the fast rising high-tech companies.

Until the oil crisis, projects from various industries, government, and households were sufficiently numerous to keep the construction industry growing faster than Japan's GNP. However, the slow-growth economy after the oil crisis stopped the construction industry's expansion. Since then, the construction industry has been faced with the need to find new markets outside Japan. Among opportunities, the U.S. construction market is the largest and one of the healthiest.

The construction industry is one of the most important industries in both the U.S. and Japan. However, the role of the construction industry in Japan is much more important to the national economy. The real value of U.S. new construction has been widely fluctuating between $150 and

$200 billion in 1977 constant dollars. This fluctuation has been exactly parallel to the fluctuation in new residential construction. Other types of construction in the U.S. have been stable. Japanese construction investment continued to increase until 1973. It has not grown since then, and in fact has been shrinking since 1979. Japanese new residential construction is proportional to the fluctuation in total construction investment.

The share of public construction has been shrinking in the U.S. but increasing in Japan. However, the proportional increase in Japan is due to a decrease in private construction rather than to growth in public construction.

The construction industry is fragmented both in the U.S. and Japan. However, U.S. construction industry is much more fragmented. Such fragmentation is reflected in the large number of tiny firms and special trade contractors.

Construction cost in the U.S. had been kept high mainly by labor cost. However, since 1973, material cost and financing cost as well as labor cost sending total construction cost up. Increases in construction cost in Japan has followed the rate of increase in material cost. Looking beneath the surface it is evident that a considerably high rate of increase in labor cost has been offset by a low rate of increase in financing cost. The increase in construction cost has only coincidentally parallelled the increase in construction material cost.

U.S. and Japanese contractors have fundamentally the same cost structure. However, because of the difference in considering what entity employs each worker and in the role of subcontractors in the two countries, Japanese contractors appear to have high subcontract rates and low labor cost. Japanese small contractors' subcontract rates are still high because of the multi-layered subcontract system.

Profits are generally higher for U.S. contractors but they fluctuate considerably year by year as well as firm by firm. Japanese firms' profits are very low but stable.

Top U.S. contractors specialize in plant and industrial facilities construction on a design/construct basis. Because such projects are mainly offered by developing countries or oil-producing countries, the percentage of foreign contracts is very high for the top U.S. contractors. Because of the complexity of such projects, their contracts include a large share of CM contracts. The annual contract volumes of U.S. top contractors fluctuate considerably. Many top U.S. contractors are held by conglomerates or are highly diversified to alleviate risks coming from fluctuation in the business.

Japanese top contractors specialize in building and heavy construction. Their main arena lies in the Japanese domestic construction market. They do not perform CM. Japanese top contractors have very stable volumes of annual contracts partly because their contracts are determined by an accumulation of small to medium-sized building and heavy projects and partly because the unique bidding system in Japan establishes order among fundamentally similar Japanese contractors.

Construction activity by Japanese contractors is much more vertically integrated than by U.S. contractors. Such vertically integrated services by Japanese contractors are facilitated by the integration in their own resources and organizations and by quasi-vertical integrations made possible by the unique social system in Japan, which includes such features as a multi-layer subcontract system, close relationships between a general contractor and subcontractors, the bidding system, extremely weak labor unions, and special relationships between general contractors and financial institutions.

R&D in the U.S. has been significant since 1975 and have grown at a higher rate there than in other advanced countries. However, the difference in R&D expenditure between the U.S. and other advanced countries is not as significant as the differences in nominal R&D expenditure might indicate because of the considerable proportion of defense-related R&D and the high inflation rate in the U.S..

The U.S. has the largest percentage of development expenditure for R&D among the advanced countries. The percentage of development R&D in Japan is slightly below that in the U.S. In advanced countries, R&D is performed mainly by industries. In the U.S., the largest segment of R&D, 46%, is financed by government, mainly in relation to the defense and space programs. However, nothing significant R&D has been done in the U.S. construction industry. The rate of finance of R&D by industry themselves is the largest in Japan (98.1%).

R&D in the Japanese construction industry is not significant compared to high-tech industries. However, Japanese general contractors are financing R&D at 0.53% of total sales on an average for 1,300 firms. Large firms are spending more. Their R&D covers all fields that relate to building and heavy construction. Recently they have become interested in high-tech fields.

The Japanese construction industry is organized by general contractors using vertical and quasi-vertical integration; the relationships between general contractors and other parties are very close and intimate. The U.S. construction industry is an aggregation of professionals. Each specializes in a very narrow area. They are gathered together on a ad hoc basis. Japanese contractors entering the U.S. market would lose much of the operating efficiency they owe to the unique social/industrial system in Japan.

In this context, potentially successful options for Japanese contractors to enter U.S. construction market may be classified in three groups;

Option A: Enter U.S. construction market by provide U.S. customers with the same construction services as those offered by U.S.

counterparts

Option B: Enter U.S. construction market by providing U.S. customers with the differentiated construction services from those by offered by U.S. counterparts

Option C: Enter U.S. construction market through investment

Each option has several sub-options and variations. Each option has an optinally suitable market segment. The present study suggests areas for more finely tuned research.

Finally, we must consider whether Japanese contractors' entry into U.S. construction market is beneficial either to U.S. construction industry or to the Japanese construction industry. The U.S. construction industry probably will benefit. Though it remains to be seen whether Japanese contractors can repeat in the U.S. their excellent performance achieved in Japanese domestic market, it is probable that their U.S. activities will stimulate U.S. contractors to develop more vigorously their advantages as outlined here.

By comparison, the Japanese auto industry significantly affected the U.S. auto industry. By providing availability of low cost, high quality, and fuel efficient Japanese automobiles, consumers in the U.S. has been benefited. The success of these imports stimulated the U.S. auto industry which had been avoiding innovation for a long time.

Furthermore, even if Japanese contractors enter U.S.

construction market, they mostly would use U.S. subcontractors, U.S. workers, suppliers, and materials. The negative effects for the U.S. industry could be less than is usualy thought.

The Japanese construction industry would also benefit. Of course, the new market would provide the struggling Japanese contractors with a short break. Also, by concentrating on the U.S. market, they would gain experience in international trade that might be applicable in other markets.

More importantly, entering U.S. construction market will give Japanese top management fresh insights into the effectiveness of the corporate strategies they are pursuing currently. Japanese top managements traditionally have been content to maintain their companies' rankings in the industry and construction contracts received (the usual deteminant of the rankings). Of course, profit-making that is aggresively pursued by U.S. firms is not the only purpose for management, either. There should be more alternative corporate policies to be taken for the benefit of the construction industry as a whole.

Moreover, the conservative nature of the Japanese construction industy makes it very difficult for them to go beyond traditional business the and to seek new fields. Because the Japanese construction industry is now at its first major turning point since World War II, entry into the U.S. market may be the opportunity for the Japanese construction industry to reconsider the future of the industry.

5.2 Future Studies

All the issues discussed in this study were reviewed and compared very generally. All of them require further investigation.

This study was carried out from the Japanese general contractors' point of view. Also the areas compared were mainly the arena of general contractors. A comparative analysis of U.S. and Japanese construction next should be made from viewpoint of other contributors to the industry, e.g. government, clients, subcontractors, house-builders, material suppliers, realtors, developers, and so on.

Other fields for future study may include paticular segments of both countries' construction markets, for example, building materials, interiors or parts of housings.

List of Tables and Figures

List of Tables

List of Figures

List of References

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