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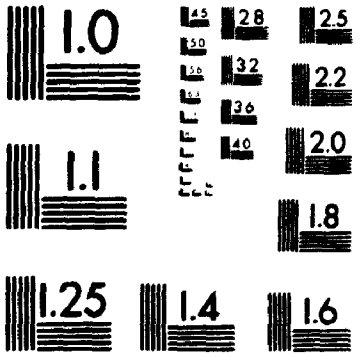

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Recent Trends in Japan's Political Economy: The Industrial Policy for the 1980s.

by

Mineko Sasaki-Smith, B.A., M.A.

A thesis submitted to the Faculty of Graduate Studies and Research
in partial fulfilment of the requirements for the degree of
Doctor of Philosophy

Department of Political Science
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Chair, Department of Political Science

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External Examiner

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ABSTRACT

Through the Industrial Policy for the 1980's, the Japanese state attempted to accelerate structural adjustments of the economy upward in a more knowledge-intensive direction and away from the previous emphasis on capacity expansion in order to improve Japan's quality of life, to insure economic security, and to enhance foreign relations.

By the late 1970's, structural adjustment became imperative to transcend the two main contradictions. Firstly, Japan's past economic development strategy of creating growth by ever-expanding production capacity and exports had caused supply-demand imbalances -- slowing the nation's growth and raising protectionism abroad.

Secondly, the same strategy had caused urban congestion, environmental degradation, and social overhead deficiencies -- leading to the relative rise of subordinate social forces.

In order to maintain its power and cohesion under such circumstances, the national elite hegemony was compelled to facilitate positive structural adjustment, correcting imbalances, minimizing new protectionism, and shifting from growth in output to higher value-added production.

As the three case studies -- the technopolis projects, the textile industry, and the robotics industry -- show, the current structural adjustments are inducing profound and lasting technological and industrial changes. They are sustaining the current second longest economic expansion of the Japanese economy since the war.

The process of change has not been without contradictions: the expansion and contraction of industries; the painful and painless adjustment processes; the improvement and deterioration in the quality of life; labor shortages and dislocations; and the widening of regional population disparities.

Japan's vulnerabilities to the supply of natural resources have been mitigated, but the impact of other vulnerabilities, such as foreign exchange fluctuations, have intensified.

While the economy accommodates surging manufactured imports and expanding ODA payments, Japan's obstinate trade surplus continues to plague its trade relations.

The Japanese elite hegemony thus continues to orient the nation's economic development in a way that would ensure its own cohesion, and that of the whole system, through continued growth without fundamentally altering the social and political structures on which the Japanese capitalist system has been built.

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INTRODUCTION

In March 1980, the Japanese government adopted its Industrial Policy for the 1980s, entitled Hachijunendai no Tsusho Seisaku Bijon (The Vision of the Industrial Structure of Japan for the 1980s). [1] This document announced a policy of structural adjustment that placed particular emphasis on the process of knowledge intensification across industrial sectors.

In order to grasp the dynamics which induced this policy, this thesis adopts a political economic approach that places a national level analysis of the Japanese political economy in the context of the changing international political economy. A sector-specific approach is then used to explore the extent of these changes as well as their consequences with respect to resolving contradictions in the three key areas identified in this policy document, that is, improving Japan's quality of life, its economic security, and its foreign relations.

In this context, this study plays a part in the contemporary policy debate by contending that the current Japanese industrial policy has been designed to facilitate structural adjustments to respond to global supply-demand imbalances rather than to preserve the status quo through protectionism. However, it also seeks to dispell some

of the widely held perceptions of Japanese industrial policy, particularly that of its "total" or "complete" success in doing so.

I. INDUSTRIAL POLICY FOR THE 1980s.

1. Industrial Policy Debate.

In the post-World War II period, when studies of politics and economics were artificially separated, the topic of industrial policy was placed in a less prominent position. Since the early 1980s, however, industrial policy has emerged as an important focus of attention in advanced industrialized countries. This is because many of these economies experienced, in the late 1970s and early 1980s, crises of slower growth, increased unemployment, high inflation, and intensified international trade competition, coupled with ensuing excess capacity and a fall in profits. Moreover, large budget deficits, common to these economies, appeared to make Keynesian-type counter-cyclical demand management and full employment objectives solely by means of increased public expenditures more difficult. Under these circumstances, industrial policies began to be reexamined in an attempt to revive the economy.

Against this background, many studies have praised Japan's industrial policies by implying that the Japanese economy is performing well and successfully carrying out structural adjustments as a result of its industrial policy. These studies have not questioned the role and efficacy of Japan's industrial policy, mainly because they

generally equated the past rapid rate of economic growth with the success of Japan's industrial policy or assumed that "technically competent bureaucrats" (in the case of Chalmers Johnson, Ezra Vogel, Ira C. Magaziner and Thomas M. Hout and the U.S. Congressional Joint Economic Committee) or "the whole society so devoted to the national goals" (the OECD report) are somehow always capable of finding optimal solutions to the prescriptions outlined in the industrial policy and carrying them out. [1]

In order to dispel some of the widely held assumptions about Japanese industrial policy, this study investigates why present the industrial policy came to be adopted in 1980 and the degree to which this policy has or has not realized its objectives. Before examining the dynamics which shaped this policy, we must clarify the nature of the policy by distinguishing between techniques and goals of policy because both have changed over time. The goal of Japanese industrial policies in the past was to expand output growth through a high rate of capital investment to catch up with the West by nurturing industries through a variety of techniques especially the use of protection and unequal allocation of resources to industries. But since the 1970s, when the Japanese economy had basically caught up with other advanced industrial economies, the goal has changed to that of matching social and economic objectives

through a planning process by means of knowledge-intensification techniques across all sectors.

In the resurgent interest in the subject, Japan's industrial policy has been perceived as:

a) a policy exercised by the Ministry of International Trade and Industry (MITI) [2];

b) the allocation of capital to favored industrial sectors [3];

c) the protection of the domestic market from foreign competition in order to preserve ailing industries or to stimulate new ones [4];

d) the acceleration of structural adjustment by national planning [5]; and

e) the state's efforts to match economic outcomes of market forces to social objectives [6];

Although Robert Leone and Stephen Bradley have observed in the general industrial policy debate that nothing in the term industrial policy itself requires a specific policy choice, the basic choices implied by industrial policy are between preserving the status quo and facilitating structural adjustments. [7] Indeed, in the case of Japan, the basic policy choice made in the Industrial Policy for the 1980s is to facilitate positive structural adjustments rather than to preserve the status quo. In other

words, through industrial policy, structural adjustments are encountered to respond to global supply-demand imbalances in order to minimize the need for new protectionism. While current attempts to undertake structural adjustments may include protectionist measures, such as special laws permitting "depression cartels" and tax benefits, in contrast with the new protectionism, these measures are short-term and not intended to return necessary industrial changes. In fact, they are accompanied by other policy instruments designed to induce such changes. This study finds, therefore, the above first three approaches to be inadequate because industrial policy involves more than just MITI and because the ultimate objective of Japan's industrial policy is neither simply allocating capital to favored industrial sectors nor erecting trade barriers to preserve ailing industries or to stimulate new ones. Instead, this study endorses the last two approaches. As John Zysman, et.al., and Ezra Vogel have suggested, the current Japanese industrial policy aims to accelerate structural adjustment by national planning and, as Niino Kojiro, Shinohara Miyohei and Jack N. Behrman have contended, it represents the state's effort to match economic outcomes of market forces to social objectives. [8]

Such social objectives must be acceptable to Antonio Gramsci's notion of elite hegemony, which, in the case of Japan, consists of the ruling Liberal Democratic Party (LDP), the national bureaucracy, and the peak federations of big business and financial

institutions. [9] An inter-penetrative close alliance of these key sectors of the society has remained hegemonic by dominating power to define the national agenda and to set economic priorities. However, as discussed in the following chapters, subordinate forces are not always and inevitably excluded. When the contradictions of past economic development threatened the cohesion of this coalition, it tried to perpetuate its rule preempting the demand of subordinate forces by matching economic outcomes of market forces to social objectives.

Having rejected the first three definitions of industrial policy as inadequate, all these different approaches are not necessarily mutually exclusive. The various characterizations which have been proposed all describe different aspects of Japan's previous industrial policies. The differences are due more to the emphasis, the scope and the time of each of these studies. Some of these studies have been more concerned with means and techniques of sector-specific industrial strategies and have overlooked the more fundamental governing policy behind why these strategies have been applied in order to realize national goals set in Japan's industrial policy.

In the period of U.S. economic dominance, and that of Britain's economy before it, the Japanese economy was in a catch-up modernization phase. It adopted industrial policies which contained an extensive degree of import-substitution industrialization together with strategies which protected infant industries from foreign

competition. These policies also concentrated scarce capital in leading industrial sectors in order to create advantages until those industries were able to begin to develop economies of scale and to achieve sufficient levels of international competitiveness. Until the 1970s, such industrial strategies continued to be an integral part of Japan's industrial policies. [10] These strategies were part of the overall goal of industrial development, but they were not goals in themselves but rather techniques to achieve the broader goal and hence would be progressively abandoned or changed as conditions changed. As stated at the outset of this chapter, the industrial policy goal of catching up, which used techniques of protection, unequal allocation of resources, etc., associated with the kinds of activities identified by those in the first three groups above, has since evolved into a policy of matching social and economic objectives through a planning process using knowledge-intensification techniques across all sectors.

This change in the industrial policy came about not only as a result of the internal dynamics of Japanese growth, such as its negative consequences, and new political forces and struggles, but also because of the changes in the international system feeding back into the political processes. As Japanese industries gained international competitiveness and consequently began to experience constant trade surpluses, they were under pressure to refrain from over-exporting and to liberalize the

domestic market by stepping up imports. With the growth of the economy, moreover, Japan's dependence on the U.S. defense system, on which the cohesion of Japan's elite hegemony had relied upon, came under scrutiny and necessitated Japan to define its burden sharing in economic terms -- i.e., increased official development assistance, expanding manufactured imports, and expansion of domestic demand. To liberalize the domestic market without hurting domestic industries and to share the international burden without drastically increasing defense spending, Japan was compelled to undertake structural adjustment by enhancing knowledge intensity of the economy rather than by increasing protectionism.

Most definitions which view Japan's industrial policy from a national planning perspective, however, do not preclude that past industrial policies allocated capital to favored industrial sectors or resulted in protection from foreign competition. In other words, the choice is not between centralized economic planning versus a freely competitive market and free trade. As Shinohara has suggested, the objective of industrial policy is to augment and conform to rather than contradict market forces. [11] Thus, instead of impeding market competition and isolating the Japanese economy from the global economy through protection and the preservation of the status quo, thereby contradicting market forces, Japan's industrial policies have attempted to utilize market competition and create a comparative advantage and, more recently, to

adjust to changes in the global pattern of competition which would enhance market forces -- that is, market-conforming methods of intervention, to borrow Chalmers Johnson's term. [12]

National planning in Japan's current industrial policy aims, at least in theory, not to contradict competitive market and unrestricted international trade. The objective is to upgrade the whole economic structure to a more knowledge-intensive one. Since this implies both process and product innovation, it is argued that restructuring the economy upward across all sectors is possible (not just nascent or senescent sectors) and that such a process should not, in theory, allocate capital to favored industries at the cost of other industries. Moreover, one of the major aims of the current industrial policy is to restructure the economy by upgrading products to higher value-added so as to open the domestic market to more imports. [13] Thus, in theory again, industrial policy should not contradict unrestricted international trade. [14] The implementation of this policy, however, is by no means fixed, and therefore has become the subject of investigation in this study.

2. Dynamics Inducing the Current Industrial Policy.

Why is it necessary to undertake structural adjustment of the Japanese economy? The Industrial Policy for the 1980s, a national planning document, claims that it envisages the restructuring of the whole economy in order to realize the following three long-term national goals:

1. To attain a dynamic society while improving the quality and comfort of life.
2. To ensure economic security by working toward a "knowledge-based" society, thereby reducing Japan's vulnerability to raw material supplies, particularly oil.
3. To make contributions to the world community as an economic power to earn the trust of other nations. [15]

Just like the calls for fukoku-kyohei (a rich nation with a strong army) of the Meiji era, shokusan kogyo (nurture industries and expand production) of the 1950s, shotoku baizo (income -doubling plans) of the 1960s, and chishiki shuyakuka (knowledge intensification) of the 1970s, the current industrial policy attempts to project a future vision of Japan -- this time, as a "technological nation" in order to achieve the above three national goals. The establishment of these goals stems from the Japanese state's effort to match economic objectives of growth with social goals of improving the quality of life, lessening vulnerabilities, and gaining the trust of other

nations, which domestic social forces and international forces had come to demand by 1980 as discussed in the following chapters.

Beyond the above rhetoric and platitudes evident in the national goals, the industrial policy contains the following underlying assumptions:

- Japanese capitalism is at a turning point whereby the "catch-up industrialization" phase since 1868 basically has been accomplished.
- This industrialization has, however, led some people to believe that the quality of life has deteriorated.
- It has created an industrial structure heavily dependent upon the import of raw materials and the export of manufactured goods. This structure has not only made Japan more vulnerable to global uncertainties but has also strained its trade relations with other countries.
- In order to maintain its standard of living, to improve the quality of life, to reduce Japan's vulnerability and to gain the respect and trust of other nations, Japan must step up its efforts to create a knowledge-intensive economy and strive to become a "Technological Nation".

In other words, this policy seemed to suggest that the upward structural adjustment of the Japanese economy through a massive injection of technology across-the-board would help alleviate the problems emanating from past economic development, thereby bringing about a comfortable and dynamic society, assured of economic security and trusted by other nations.

Why this policy was adopted and these particular national goals were chosen lies in the internal contradictions of Japan's past economic development. As will be examined in Chapters II and III, during the postwar period, the Japanese state pursued a high-growth-oriented economic development strategy. Reflecting the interests of the Japanese elite hegemony -- composed of the leadership of zaikai (the offspring of prewar zaibatsu conglomerates, consisting of peak associations of big business and financial institutions), the ruling conservative Liberal Democratic Party leadership, and senior members of the national bureaucracy, it was inherently anti-labor and anti-consumer. [16]

In fact, throughout most of modern Japanese history, there has existed a close coalition of conservative political parties, the state bureaucrats, and urban big industrialists and financialists, determined to push Japan along the capitalist development path. Notwithstanding postwar reform by the Occupation forces, the Cold War mood of the 1950s permitted the reemergence of this coalition. United by the ideology of pro-capitalist, anti-labor, and anti-consumer, their interests were inextricably entwined. Retaining majorities since 1955, the LDP has controlled all cabinet posts and appointments and promotions of senior bureaucrats. In exchange, senior bureaucrats implemented public policies in accordance with the interests of LDP. Urban industrialists of big business and financiers linked through peak trade and

business associations have pushed membership opinions to senior bureaucrats in exchange to ensure industrial compliance with public policies. They financially support the machinery of LDP. All these segments of the elite hegemony are constantly conversing their views at social functions. A qualification for entry into this elite hegemony is based more on a merit system, such as graduation from University of Tokyo or other noted universities, rather than a rigid class structure, and social mobility is relatively open. [17]

It excluded organized labor, the opposition political parties on the left which labor supported, small businesses, and consumers, as we shall see in Chapter III, by exploiting not only the ideological polarization that existed within the progressive-radical camp but also the "industry-first" strategy derived from the national desire to recover from the war and achieve high growth.

As will be seen in Chapter II, like other industrial economies, the Japanese state adopted an economic development strategy which aimed at creating growth by expanding production capacity through investment in plant and equipment based on mass production technologies. Owing to this strategy, the Japanese economy basically caught up with other advanced industrial economies and lost most of its "late-comer effects" by the early 1970s. But this strategy, though it induced the high growth of the 1950s and 1960s, reached its limit in the late 1960s when it began to saturate the

consumer goods markets of the advanced industrialized countries, causing structural excess capacity, a fall in profits, and a slowdown in the rate of growth. [18] These two trends combined to produce a shift in the Japanese economy in 1973 from high growth to a slower growth era.

Because Japanese industries pushed exports to correct domestic supply-demand imbalances and to maximize economies of scale not only during economic downturns but also toward the end of each product cycle, this strategy intensified international competition and resulted in the rise of trade tensions and "new protectionism" against Japanese exports to North America and Western Europe. [19] The proliferation of Japanese products into LDC markets, particularly in Asia, also provoked boycotts of these products and anti-Japanese sentiment in the early 1970s when international competition was intensified further as this strategy was also applied by the newly industrializing economies which shifted from import substitution to export-led industrialization. [20]

Moreover, the contradictions of the postwar development strategy was made worse by the economic uncertainties of the 1970s. It made the Japanese economy more sensitive to exchange-rate fluctuations as the economy became more integrated into the world economy. It also made the economy more vulnerable to a disruption in the supply of raw materials as the economy became highly dependent on imported natural

resources. Consequently, when OPEC quadrupled oil prices and the Nixon Administration imposed a soybean embargo in 1973, the Japanese economy was shaken and consumers panicked, not only awakening the nation with a deep sense of economic insecurity but also causing the worst inflation followed by the worst recession in the postwar era. [21]

Faced with intensifying international competition and the economic uncertainties of the 1970, the Japanese state chose structural adjustment policy over protectionism because Japanese industrial capital combined with the powerful sogo shosha (general trading houses) had come to rely on the global market rather than strictly on the domestic market, and thus their well-being had come to depend on the enhancement of international trade rather than protectionism.

On the domestic socio-political scenes, as we will see in Chapter III, the postwar development strategy led to other contradictions and consequences. It tightened the domestic labor market. Although the Japanese labor force was fragmented and remained relatively weak, it was able to take advantage of the tightening labor market to demand higher wages, more benefits, better working conditions and job security through the Shunto (Spring Offensive) -- a joint bargaining process. [22]

It also caused environmental degradation, urban congestion and rural alienation due to the unrestricted nature of expansion carried out by the Japanese state. Local residents affected by pollution and congestion organized protest movements and helped to induce the growth of progressive local administrations in the urban areas. Discontent over the quality of life in general and the depopulation of rural areas, on which the LDP is dependent for its power base, led to a general decline in the electoral support for the LDP during the 1970s. [23]

Faced with structural excess capacity, a fall in profits, and the slower growth of the economy on the one hand, as well as with intensifying international competition and protectionism on the other, the Japanese state had to search for new ways to create growth that would go beyond mass production technology for a mass market based on the economies-of-scale principle. Beset by a sense of economic vulnerability, the intensifying demand from labor, the rise of protest movements over poor quality of life, the growth of progressive local administrations, and the general decline in the support for the LDP in the 1970s, the Japanese state attempted to create growth in a way that also met the following conditions:

- less material-intensive, particularly less energy intensive.
- less labor-intensive.
- less polluting.

- less geographically concentrated.
- accommodating more imports and helping expand the global economy.

In search of new ways to create growth and pacify demands from subordinate social forces, Keizai Doyukai (The Japan Committee for Economic Development), one of the major associations of big business and financial institutions, helped the government to establish a think-tank named Sogo Kenkyu Kaihatsu Kiko (The National Institute for Research and Advancement:NIRA) in 1974. Through joint funding, Keizai Doyukai and the government sought NIRA to act as the pivot of various think tanks in Japan. Staffed sparsely mainly to coordinate research undertaken in the nation's private think tanks, NIRA's first task was to launch the Twenty-First Century Project in order to explore a long-term national agenda for Japan. [24] After three years of preparation, a national agenda was formulated by this project. It stressed the need to transform Japan into a technology-based society by means of expanding technological frontiers through intensified R&D and by restructuring the economy upward into a more knowledge-intensive one. [25]

In line with the Shumpeterian notion of technology as the engine of capitalism, the Twenty-First Century Project report suggested that the intensification of knowledge in the economy would create new growth through higher value-added and increased

competitiveness and would overcome the constraints of past economic development. [26] The report implied that:

- the development of new technology would enable the Japanese economy to grow through diversification and specialization into areas away from where structural excess capacity exists.
- the development of conservation technology and new materials would make the economy less material-intensive and hence less vulnerable to imported resources, thereby improving the economic security of the nation.
- the development of less material intensive industries would, in turn, make the economy less pollution prone.
- the development of automation technologies would make the economy less labor intensive.
- the development of transportation and communication technology would enable new industries to spread to rural areas, thus ameliorating urban congestion and rural alienation, and thereby improving the quality of life.
- the move into knowledge-intensive industries would result in greater imports as the economy abandoned basic commodities and standardized production, thereby facilitating a new international division of labor. [27]

The general outline of this national agenda was adopted by the LDP as its party policy platform in January 1978 and was officially introduced by then Prime Minister Ohira Masayoshi in his annual Administrative Policy Speech in the Diet on January 25, 1979. It designated the economic aspect of the agenda as Keizai anzen hosho (economic security). [28]

It is against this background that the Industrial Structural Council, a policy advisory body attached to MITI -- in existence since 1964 --defined three long-term national goals. It is hardly surprising that the general outline of national agenda presented by the Twenty-First Century Project was replicated by the Industrial Structural Council since the two share an overlapping membership from four peak associations of big business and financial institutions, three major labor federations, consumer groups, women's organizations, and small-medium business organizations, along with representatives from academia, media, regional governments and other specialists. [29]

It should be noted, however, that the presence of such subordinate social forces as labor and consumer groups does not imply that all these groups share equal influence in the deliberations or in the outcome. After all, it was one of the four main peak big business associations which sponsored the Twenty-First Project and the MITI minister in the LDP administration who appointed members to the Industrial Structural Council. The deliberations on the future vision of the Japanese society were organized and "consensus" was forged among those present in the two bodies, but only within the bounds of maintaining the Japanese capitalist structure. Even more importantly, however, the national agenda outline reflected only those concerns and needs of the

nation which had to be acknowledged and addressed by the elite hegemony in order for it to survive.

In other words, the first national goal of improving the quality and comfort of life was defined to appease domestic social forces, notably labor, urban and rural citizens and the opposition political parties. The second goal of ensuring economic security was to satisfy industries and consumers. And the third goal of making contributions to the world community was responding to other advanced industrial economies as well as those of the LDCs. All these three national goals were tailored to be acceptable to the elite hegemony. Only by combining the three national goals, was the elite hegemony able to address all forces pushing for changes.

In essence, therefore, the Industrial Policy for the 1980s is a prescription for the kind of Japanese industrial structural adjustment that is necessary for the elite hegemony to maintain its cohesion and the cohesion of the whole system and to legitimize its rule by means of creating continued growth and responding to some, but not all, demands made by the domestic subordinate social forces as well as by the elite regimes of other countries, without fundamentally altering the social and political structures on which the Japanese capitalist system has been built.

3. The Functions of the Japanese State.

The literature on economic growth tends to oppose the state and the market as organizing forces. In the Japanese case, however, assigning the impetus to Japan's economic growth to either the state, as the "Impossible Without Policy" school does, or to capital as the "More Market, Less Policy" school does, is misplaced. [30] Rather, John Zysman and et. al. have argued,it is not that policy is paramount and market forces are of no relevance in shaping economic outcomes but that state policy has a major influence in shaping Japan's industrial structure -- because in the formulation of an industrial strategy it assumes that the market pressures of competition can serve as an instrument of policy. [31] As they have suggested, moreover, the state not only makes use of competitive forces that arise naturally in the market but also often induces the very competition it directs and creates comparative advantage. [32]

Market is also a source of pressures on the state to act. As will be analysed in Chapter II, negative economic effects of high growth and changes under way in Japan's economic structure forced the state to formulate and implement industrial policy.

The Japanese state, as we shall see in Chapter III, however, is not simply reducible to MITI as Chalmers Johnson would have us believe, though MITI is clearly important. [33] Nor can we view Japan simplistically as "Japan, Inc." along the lines of

of the 1972 study by the U.S. Department of Commerce. Although the author of this report, Eugene Kaplan, illuminated the significant collaborative relations between government and business, the over-emphasis on Confucian influence of "Japan, Inc." prevents the explanation of similar interpenetrative relations that exist between the state and capital elsewhere. [34]

Nor is the Japanese state an autonomous entity called government and a "neutral arbiter" as pluralists have implied, including more recent models of the state such as Murakami Yasusuke's "para-political nexus hypothesis", Muramatsu Michio and Ellis Krause's "patterned pluralism", and Inoguchi Takashi's "bureaucracy-led mass inclusionary pluralism". [35] Although the above pluralists have successfully steered the debate over the state away from the preoccupation with the ethnocentric identification of "uniqueness", "backwardness" and "anomaly" and identified interpenetrative relations among the bureaucracy, the LDP and various "interest groups", they all appear to have assumed that the interests of various social groups are somehow always equally included and reflected in policies. [36]

As the contents of the Industrial Policy and the Twenty-First Century Project indicate, there never was a serious debate over fundamental social changes which subordinate social forces desire: such as a shift to a socialist mode of production that radical labor organizations, the Japan Socialist Party and the Japan Communist Party

have called for; a de-concentration of oligopolistic conglomerates that many small-medium industries desire; or a decentralization of national administrative authorities and fiscal autonomy that regional governments hope for. Yet, the Japanese state is not strictly the elite coalition that T.J. Pempel and Tsunekawa Keiichi have described as "corporatism without labor" in their power-elite analysis in the tradition of C. Wright Mills. [37] They have correctly identified the composition of the Japanese ruling elite coalition as "the organs of the national bureaucracy, the major federations and trade associations of big business and the major financial institutions, and the ruling LDP". However, they have failed to recognize adequately how some subordinate social forces can, over time, pressure the elite hegemony to bring about some, but not all, changes in order for this elite hegemony to remain in place. [38]

Granted that power is not equally distributed, such subordinate social forces as labor, environmentalists and other citizens groups, as well as opposition parties, and even regional governments are, nonetheless, neither totally shut out of power nor, as we shall see in Chapter III, as insignificant as Pempel and Tsunekawa have portrayed. The functions of the Japanese state, therefore, are broadly determined by the structures and the dynamics of the society rather than by the people who occupy positions of state power.

The term elite hegemony used in this study differs from pluralist theories of the state which assume that subordinate social forces enjoy an equal share of power. While there is clearly an asymmetry of power in the Japanese social structure, subordinate forces are not consistently and totally excluded from power. The notion of the state used in this thesis, therefore, combines seemingly contradictory elements of elite theory and Gramscian notions of hegemony in order to overcome the shortcomings of both approaches.

It is not that the Japanese state is unique in intervening in the economy by means of industrial policy. Indeed, it is a universal trend. What stand out as the salient features of the Japanese case, however, are as follows. The first feature is that, while industrial policies of many economies tend to be formulated more on an ad-hoc basis and with a shorter time horizon, Japanese industrial policy is explicit and prominent with goals from a long-term and comprehensive perspective. [39]

The second feature is that the Japanese state has attempted to restructure the economy as a whole rather than a few particular sectors. Reorganizing and rationalizing ailing industries to make them competitive is as essential a part of the strategy as that of promoting nascent industries. As Kudo Akira has stressed, therefore, a salient feature for Japanese industrial policy is to place priority on certain

industries in order to reorganize the whole economic structure into a set direction in a comprehensive and systematic manner. [40]

The third feature which is unique to Japan, as Hayashi Shintaro has argued, is to watch a specific industry in order to identify inherent troubles, analyse, diagnose, then create a concrete prescription and push for these changes. [41]

The fourth feature is to actively promote inter-firm R&D collaboration, often jointly with public R&D institutions. In this context, a number of studies have appeared recently to explain why companies in high-technology industries are increasingly collaborating in R&D with outside research laboratories.

Jonah D. Levy and Richard J. Samuels, for example, observed that the existing theories of Japan's inter-firm research collaboration can be categorized into three groups: 1. neoclassical theorists' skepticism of the benefits of cooperation and their tendency to emphasize the role of side-payments as the key inducements; 2. cultural theorists attributing the Japanese propensity to work together in groups, a willingness to subsume individual interests to the greater good, and an emphasis on consensual decision making; and 3. political development theorists focusing on the imperatives of late development. [42] They disagreed with the above three streams and contended that a firm's need to participate in research consortia emanates from the fact that competitiveness has become a function of the ability of producers to innovate quickly

and efficiently against a backdrop of intense global competition, dramatic reductions in product cycles, coupled with equally dramatic increases in front-end costs. [43]

In contrast, Imai Ken'ichi attributes R&D collaborations between firms to technological factors, particularly the fact that the efficiency of technological innovation depends on how well know-how and information are transmitted between basic research and final manufacturing because the current process of technological innovation requires numerous and diverse smaller innovations in the stage between the birth of the basic idea or designing and practical application -- not in the ordinary straight line but in many feedback stages. [44]

In addition, Kodama Fumio believes that coordination and synergy of R&D among different disciplines are required to achieve "creative fusion" of existing technologies such as the hybrid technologies of "mechatronics" (electronics and mechanics) or electronics and food processing, and pharmaceuticals and industrial chemicals -- which has become an integral element of industrial change today. [45]

As against the traditional paradigm that inter-firm collaborative R&D -- often equated with cartels and collusion -- would stifle competition, thereby retarding technological development, research collaboration among firms, either within the same industry or across sectors, has become an essential element in the current phase of

technological change. This is because of intense competition and the prohibitive costs involved in creating new technology, as Levy and Samuels have pointed out. [46]

The functions of the Japanese state are also determined by foreign pressures. Intensified international competition and intensified politicization of trade issues -- often linked to Japan's reliance on the U.S. military security regime upon which the postwar Japanese economic growth was dependent -- forced Japan to redefine its role in maintenance of the international economic system in the Industrial Policy for the 1980s. Asked by the United States to increase its burden sharing on defense, but bound by the constitutional constraint on military spending (under 1% of GNP), the Japanese state defined its role in economic terms, namely, assisting in the expansion of the global economy, particularly through increased manufactured imports and official development assistance. [47] It is in this context that the Industrial Policy for the 1980s called for making contributions to the world community to earn the trust of other nations.

In an effort to gain further insights into the nature and actual process of industrial changes underway and to probe the consequences of these changes, this study undertakes three case studies: technopolises in Chapter IV, the textile industry in Chapter V and robotics in Chapter VI. These case studies enable us to assess the extent to which changes in each of these domains conform to the national goals of creating a

comfortable and dynamic society, assured of economic security and trusted by other nations. Common to policies covering all these cases (or for this matter, all micro-industrial policies) is the aim of raising the value-added aspect by increasing the knowledge/information component. Each case study will allow us to analyse a different aspect of this overall policy.

Chapter IV looks at emerging technopolis projects around Japan and Tsukuba Science City -- the proto-type technopolis. The establishment of technopolises is a regional development plan under current industrial policy in order to spread high-technology industries, R&D centers, and academic institutions into outlying areas of the country by encouraging R&D collaboration among firms, regional public laboratories, and academic institutions. Its objective is to reduce regional disparities through the redistribution of population and industries, thereby improving the quality of life by easing urban ills and rural alienation while enhancing the knowledge intensity of the economy as a whole. Thus, the technopolis case study permits us to address those elements of the policy dealing with decentralization and quality of life.

Chapter V provides a case study of the textile industry which allows us to examine the application of the knowledge-intensity principal to "senescent" (or "traditional") industry. This is not only because Japan's static comparative advantage has been lost and excess capacity exists but also because the state, recognizing this as a

fact, has decided not to abandon the textile industry. The state has instead chosen to intensify the knowledge component in textile production in order to, once again, shift its comparative advantage while at the same time, by opening Japan's domestic market to more textile imports and dealing with some of the international conflicts created by its trade surplus. This is why some segments of the textile industry are designated as "structurally depressed" industries while at the same time current textile policy aims optimistically to transform the industry into a knowledge/information intensive "advanced industrial society type" industry. It is in this context that textile policy calls for a contraction of domestic production in less competitive segments and product differentiation as well as diversification into non-textile fields.

Chapter VI discusses robotics, a nascent industry. It permits us to look at the way in which industrial policy deals with the need to increase the knowledge intensity of production even in small and medium sized enterprises -- that is, throughout the economy and not just in the big conglomerates. This is why, although robotics is a nascent industry, the policy on robotics is just as adamant in its attempt to revive "senescent" industries through robotization as to the expansion of the robot-production industry and the robot-leasing industry.

These three case studies, therefore, enable us to see how Japanese industrial policy seeks to restructure the entire economy rather than a few selected sectors.

confirming that the definition of Japan's industrial policy simply as "protection from foreign competition" or "targeting favored industrial sectors" (often applied to a few nascent industries) is inadequate and that it is a national planning process through which an attempt has been made to restructure the entire economy upward into a more knowledge-intensive one.

More importantly, the three case studies will show that current efforts to restructure the Japanese economy are inducing profound and lasting changes. The consequences of these industrial changes, moreover, are complex, uneven and fluid. This results from the fact that a continuous interaction between technology, capital, states and other forces, and responses to these changes differ by sector, industry, firm or individual.

Although new technologies have created new industries, new growth and new jobs, and many have exploited opportunities presented by technological changes to improve their lives, others who have been unable to catch up with these changes have borne the costs of such changes. Contraction of inefficient industries and technological job displacement have pushed the unemployment level higher than that of the past, albeit lower than a few years ago. They have weakened the bargaining position of labor in general and eroded some traditional Japanese employment practices. Although high-technology industries have helped to rejuvenate some of the provincial areas, the

rise of service industries -- information and financial industries in particular -- has created even more concentration in the Tokyo area, thereby worsening many of the urban problems, especially raising already prohibitively high land prices even higher.

Meanwhile, local governments continue to remain subordinate to the central government because of their budgetary dependence on the latter. Although Japan's dependence on imported oil and other raw materials has been mitigated to a certain degree by energy conservation measures and a general global over-supply, Japan's vulnerabilities to new protectionism abroad continues to threaten the economy as the competition for high technology products has intensified. Moreover, although Japan's imports of manufactured goods is on the rise, its external trade surplus continues to strain its relations with other countries.

In the above manner, therefore, these case studies enable us to demonstrate that the Industrial Policy for the 1980s has achieved only partial and limited success because there are social and other rigidities which are making the realization of these policy goals very difficult. They thereby allow us to dispel some of the widely held assumptions regarding the "success" of Japan's industrial policy. By preempting and taking up some of the demands from subordinate forces as its own issues, the Japanese elite hegemony is perpetuating its reign of power. Meanwhile, although structural adjustments in the Japanese economy have given a tremendous impetus to renewed

growth, the Japanese society may be more appropriately described as in a state of turmoil as opposed to the comfortable and dynamic society, assured of economic security, contributing to the world community and trusted by other nations as desired by the current industrial policy.

II. ECONOMIC INDUCEMENTS TO RESTRUCTURING: MARKET.

1. Emphasis Toward "Knowledge-Based Society".

This chapter will examine the domestic and international market forces and economic dynamics which shaped the Industrial Policy for the 1980s in order to grasp why this policy attempted to restructure the entire Japanese economic structure into a more knowledge-intensive direction to achieve the three national goals as discussed in Chapter I.

Industrial policies since the early 1970s have stressed the need to strengthen knowledge-intensive industries through industrial adjustment. [1] The Industrial Policy for the 1980s went one step further by urging the building of a "knowledge-based society". [2] Compared with the past emphasis on economies of scale and the strengthening of international competitiveness throughout all industries, recent industrial policies have paid more attention to knowledge intensification, structural adjustment and international industrial transfer. As Michele Schmiegelow contended, structural adjustment in the Japanese case is concerned with "anticipatory adjustment",

rather than "preventive", "defensive", or "interventionist" policies among OECD's four types of "positive adjustment policies". [3]

In addition to the income-elasticity criterion (comparatively high elasticity of export demand with respect to world real income as a whole) and the comparative technical criterion (comparatively greater degree of technical progress) applied in the previous industrial policies to nurture industries, the enhancement of value-added and the improvement in living conditions have been confirmed as new criteria in industrial policy since the early 1970s. [4]

Needless to say, although there was a moderation in the excessively growth-oriented rhetoric towards an emphasis on "balanced growth", the desire for growth has never really been abandoned through to Industrial Policy for the 1980s. [5] Growth maintenance and growth creation have remained the cardinal objectives of industrial policy to the present. Although the Industrial Policy for the 1980s foresaw slower growth for the Japanese economy than during the high growth era until the early 1970s it did not subscribe to the notion of a predetermined and inevitable stagnant growth for the future. Rather, it suggested that intensive technological innovation and industrial adjustments of the economy would transcend conditions constraining growth, improve the quality of life, and ensure economic security. [6]

The prescription offered in the Industrial Policy for the 1980s has been to reiterate the need for continued restructuring of the Japanese economy by means of knowledge intensification and the transfer of standardized production of intermediate goods to the LDCs, thereby to enhance the development of a new international division of labor. For this purpose, this policy called for strengthened R&D investments, particularly in the areas of basic research, in order to promote a highly knowledge -intensive and diversified industrial structure and to expand technological frontiers. [7] In effect, this aimed at accelerating the shift in Japan's technological development from its previous "technological harvester pattern" in which Japan adopted technologies developed in laboratories elsewhere, to a new "technological planter pattern" by exploiting the full advantage of domestic R&D capabilities. [8]

This chapter first examines how Japan's postwar economic development strategy that was based on mass production technologies led to the crisis of structural supply and demand imbalances, and how it coincided with the end of Japan's catch-up modernization phase to result in the slowing down of growth since the early 1970s. At the same time, it looks at how this strategy had intensified international competition and created trade tensions. It then discusses how the internal contradictions inherent in this strategy were exacerbated by the economic uncertainties of the 1970s: the yen revaluation and wild fluctuations in the exchange rate under the floating rate

arrangement, the rampant rise in price of oil and other commodities, and the ensuing inflation and the recession.

Under these circumstances, the existing strategy no longer provided for assured growth or economic security. It was imperative, therefore, to alter the past industrial strategy and adjust the economy away from industries that are based on mass-production technology. Moreover, this chapter also attempts to clarify why the Industrial Policy for the 1980s tried to move the Japanese economy towards greater knowledge intensification and structural adjustment rather than taking other policy options.

2. The Postwar Economic Development Strategy.

In order to strengthen competitiveness, raise income, and catch up with the West, successive Japanese regimes of the postwar era adopted industrial policies that fostered large-scale production and export promotion while shielding the domestic market from foreign competition. The state organized the economy by channeling low-cost capital and technology to large firms in heavy and chemical industries in order to ensure a needed supply of investment and to maximize the potential of imported technology. The rationale behind this state intervention was to allow large

firms in the principal industries to take advantage of economies of scale so as to bring about cost and price reduction through mass-production systems, and hence to enhance competitiveness. [9] The favorable treatment to large firms in major industries was justified on the basis of the "trickle-down theory", whereby benefits achieved initially by these key sectors were believed to seep through eventually to all other sectors. [10]

It must be remembered in this context, however, that ample examples testify to the uneven distribution of benefits and unequal representation in policy making, and trickle down was never automatic. Postwar industrial policies were naturally accompanied by macro- and micro-economic policies that were inherently pro-big business at great cost to labor, consumers, and small businesses in the following manner: the government budgets which built industrial infrastructure left social spending low; the tax structure which allowed many write-offs to industry gave few breaks to average wage earners; import protection and land policy raised domestic prices; and a low- interest-rate policy which provided cheap loans to industry earned less interest income for individual savers. [11]

Imported technology mainly under licensing agreements with firms in the United States and Western Europe was highly beneficial to Japan because the expensive and risky R&D costs associated with the development of generic technology were borne by others. Japanese firms were able to acquire them relatively

inexpensively and foreign firms were willing to sell them since the marginal cost -- at least in a short run -- was minimal. Japanese firms could concentrate their R&D activities on the adoption and modification (i.e., applied research and product development) of imported technology. This arrangement allowed them to invest heavily in plant and equipment and improve productivity. [12] The system-integration type technology for application and assembly (i.e., mass production technology) that flourished worldwide in the postwar era was conducive to Japanese needs as it enabled Japan to rebuild its war-torn industrial base and to achieve rapid growth by expanding industrial capacity and exports as if there were no limit to the economies of scale.

Meanwhile, as Yamamura has described as follows, this strategy was accompanied by pro-cartel policies:

> -- If the largest firms were to grow rapidly by adopting new technology that was usually larger in scale than what it replaced, the firms had to produce more -- to make optimum use of the new technology. The problem was that such an increase in production capacity often tended to exceed the domestic demand and increases in exports often did not occur swiftly enough. -- To overcome such a temporary gap in supply and demand, the firms, if they were to be motivated to grow, needed "freedom" to fix prices and/or limit output until domestic and international demand could increase. If the rapidly growing firms were allowed to engage in temporary "cooperative actions" to fix prices or limit output, no potentially ruinous price-cutting competition would occur, threatening bankruptcies, and no loss in profits would result, reducing the internal reserve needed for the next round of expansion enabling the firms to adopt even more advanced technology. --
>
> Anxious to encourage rapid growth and increases in productivity, the LDP and MITI needed no prompting to accommodate the wishes of industry, and the latter was always willing even to take the initiative in creating price-fixing (and/or output-limiting) cartels and a more oligopolistic market structure -. [13]

In addition, as Niino noted, small and medium firms (many of them being subcontractors) were also allowed to form cartels in order to acquire some competitive ability so that the productivity and the quality of final assembly at parent firms would be improved. [14] As will be examined in the textile case study in Chapter VI, cartels among small and medium firms tended to fail, however, because of their weak presence in industry federations vis-a-vis large firms and their lack of cohesiveness.

Supported by an extraordinarily high rate of investment (private domestic investment averaging near 20% of GNP over the years between 1955 and 1970) (Table II-1), production output expanded greatly during this period. (Appendix II-1) With continuous new investment and technology, productivity rose steadily (Table II-2) and the price of products continued to decline even with the succession of cartels since large firms were competing not only among themselves but also with producers abroad. [15] Japan's exports grew at 16% during this period -- nearly twice the about 8% average growth of international trade -- enabling the country to enjoy balance of payment surpluses. (Table II-3) This was made possible by such favorable factors as the ready availability of oil and other commodities at stable prices, the fixed exchange rate of 360 yen to the U.S. dollar, the relative absence of strong competition from LDCs, and expanding global trade owing to the growth policies of the industrialized

countries, the development policies of the LDCs, the greater purchasing power through short-term credit facilities of the IMF as well as the enhanced trade flows through the GATT-sponsored tariff cuts and gradual reduction of trade barriers. [16] MITI asserted that Japan's remarkable export growth rate (18.2% annually) during the 1963-1970 period owed a great deal to the economies-of-scale factor, contributing 5.8% to this total export growth, followed by the non-price factor (3.1%) and the price factor (0.9%). [17] Against this background, the Japanese economy achieved a rapid growth rate of about 10% during the 1960s. (Table II-4).

Table II-1: Private Investment in Plant and Equipment as a Share of GNP

	(%)		(%).
1953	12.3	1972	17.6
1954	12.1	1973	18.8
1955	11.4	1974	17.3
1956	15.8	1975	14.2
1957	18.1	1976	13.2
1958	18.7	1977	15.1
1959	20.1	1978	15.8
1960	24.5	1979	16.5
1961	27.1	1980	16.8
1962	25.2	1981	15.4
1963	19.7	1982	15.0
1964	20.4	1983	14.9
1965	18.4	1984	15.5
1966	18.6	1985	16.2
1967	21.6	1986	16.1
1968	18.8	1987	16.2
1969	20.1	1988	17.5
1970	20.1	1989	24.0
1971	19.5		

Source: Computed from the Economic Planning Agency, Annual Report on National Income Statistics, various issues.

Table II-2: Changes in Labour Productivity.

(1980 = 100)

	Manufacturing	Textiles	Chemicals	Iron & Steel	Machinery
1952	9.5	19.3	6.9	7.7	6.0
1960	17.6	38.6	14.5	15.1	10.2
1970	47.8	64.8	48.1	50.5	37.3
1971	49.9	71.4	50.9	49.5	38.9
1972	55.5	75.0	57.1	56.8	44.2
1973	66.6	87.4	66.7	73.6	54.9
1974	67.1	80.9	68.2	73.1	57.2
1975	63.7	82.4	63.4	68.5	53.1
1976	71.6	91.1	71.8	76.3	61.6
1977	81.2	95.1	76.4	78.2	64.4
1978	91.1	89.9	86.8	83.2	70.0
1979	94.1	98.3	97.5	96.3	87.5
1980	100.0	100.0	100.0	100.0	100.0
1981	102.4	101.8	101.8	96.8	107.0
1982	103.4	104.5	106.8	96.5	107.6
1983	108.1	107.4	115.3	97.5	114.7
1984	118.9	113.2	125.7	109.3	133.8
1985	123.9	115.3	129.7	114.1	144.2
1986	126.6	116.3	130.9	111.4	147.3
1987	133.4	118.2	146.8	122.2	156.3
1988	148.8	124.3	158.5	138.6	180.1
1989	158.1	126.6	171.6	145.4	194.4

Source: Japan Productivity Center, Productivity Statistics Quarterly, various issues

Table II-3: Balance of Payments.

(Million $US)

Year	Exports	Imports	Trade Balance	Current Account	Overall Balance
1950	820	974	-154	-	-
1951	2,011	2,471	-461	-	-
1960	4,055	4,491	-437	-	-
1961	4,236	5,810	-1,575	-	-
1962	4,916	5,637	-720	-	-
1963	5,452	6,736	-1,284	-780	-161
1964	6,673	7,938	-1,264	-480	-129
1965	8,452	8,169	283	932	-405
1966	9,776	9,522	254	1,254	337
1967	10,442	11,663	-1,221	-190	-571
1968	12,751	10,222	2,529	1,048	1,102
1969	15,679	11,980	3,699	2,119	2,283
1970	18,969	15,006	3,963	1,970	1,374
1971	23,566	15,779	7,787	5,797	7,677
1972	28,032	19,061	8,971	6,624	4,741
1973	36,264	32,576	3,688	-136	-10,074
1974	54,480	53,044	1,436	-4,693	-6,839
1975	54,734	49,706	5,028	-682	-2,676
1976	66,026	56,139	9,887	3,680	2,924
1977	79,331	62,000	17,331	10,918	7,743
1978	95,634	71,038	24,596	16,534	5,950
1979	101,232	99,387	1,845	-8,754	-16,662
1980	126,736	124,611	2,125	-10,746	-8,396
1981	149,522	129,555	19,967	4,770	-2,144
1982	137,663	119,584	18,079	6,850	-4,971

1983	145.468	114.014	31.454	20.799	5.177
1984	168.290	124.033	44.257	35.003	-15.200
1985	174.015	118.029	55.986	49.169	-12.318
1986	205.591	112.764	92.827	85.845	-44.767
1987	224.605	128.219	96.386	87.015	-29.545
1988	259.765	164.753	95.012	79.631	-28.982
1989	269.570	192.653	76.917	57.157	-33.286

Source: Bank of Japan (I.M.F. Formula), in Statistics Bureau, The Prime Minister's Office, Japan Statistical Yearbook.

Table II-4: Annual Rate of Growth in GNP

	(%).
1950-1960	7.7 (average)
1960-1970	10.8 (average)
1980-1989	4.2 (average)
1969	12.1
1970	10.6
1971	6.8
1972	8.7
1973	10.2
1974	-1.0
1975	2.3
1976	5.3
1977	5.3
1978	5.0
1979	5.1
1980	4.4
1981	3.7
1982	3.1
1983	3.2
1984	5.1
1985	4.9
1986	2.7
1987	4.4
1988	5.7
1989	4.9

Source: The Economic Planning Agency, Annual Report on National Income Statistics, various issues.

The consequence of this rapid industrial growth was the contraction of primary industry and the expansion of secondary and tertiary industry. As shown in the tables in the appendix, whereas the share of primary industry of GDP shrank from 23.5% in 1950 to 2.8% in 1986, that of secondary industry grew from 31.9% in 1950 to 39.3% in 1986 and tertiary industry from 45.5% on 1950 to 57.9% in 1986. Likewise, while the share of employment in primary industry shrank from 52.4% in 1950 to 8.5% in 1986, that of secondary industry grew from 22.9% in 1950 to 33.9% in 1986 and tertiary industry from 24.6% in 1950 to 57.6% in 1986. (Appendix II-2 & 3)

It must be remembered in this context that despite the phenomenal expansion of exports, Japan's high growth in the postwar era should not be characterized as export-led. Exports have indeed played a critical role in filling internal imbalances between supply and demand during periods of domestic cyclical downturns and also in financing the growing imports of raw materials and capital goods. But as Lawrence Krause and Sekiguchi Sueo have emphasized, the share of exports in total GDP was not really that high (exports of goods and services stayed fairly stable at 10-11% during the 1955-1973 period), and private fixed investment, public investment, housing investment, and even imports also led growth. [18]

3. The Internal Structural Problem.

Since the early 1970s, however, the crucial configurations of domestic and international economic conditions that had sustained this rapid industrial expansion underwent profound changes. These changes no longer permitted the Japanese economy to grow at its previous rate. After a decline in the growth in 1971 and 1972, the year 1973 marked a clear end to Japan's high-growth period. (Table II-4) Why did this shift occur? The major trend relating to the nature of mass-production technology was taking place since around that time. The system-integration type technology so enthusiastically adopted on the basis of economies of scale that brought postwar growth proved to contain an inherent limit because the demand for a particular durable product could not be expanded endlessly within a given time. In other words, as Michael J. Piore and Charles F. Sabel contended, the strategy that had facilitated relentless expansion in production capacity had by the late 1960s saturated the consumer goods markets of the advanced industrial countries in one industry after another. This situation, therefore, created supply-demand imbalances in some of those industries that had experienced rapid expansion in the postwar era and constrained the growth of the economy as a whole. [19]

In the case of Japan, this trend was roughly converged upon the end of the catch-up industrialization process and resulting erosion in "late-comer effects" of its economy. In this context, Yamamura observed:

> -- By the mid-1960s, it was becoming evident -- that MITI policies were about to bequeath them a major problem. As the technological level of Japanese industries caught up with that of the West one after another, it was becoming obvious that the investment race no longer promised increased efficiency but held a distinct danger of excess capacity. Thus it was no accident that journalists began to speak of a "structural problem" --mainly excess capacity -. Japan was beginning to realize that no economy can continue to grow by increasing its industrial capacity 15% per year.
>
> - The appearance of structural problems was an unmistakable warning that the investment race could not be continued indefinitely. [20]

By 1970, the mass production system was no longer capable of reducing production costs. According to Ueno's assessment, the average prime cost, producer price, and export price in iron and steel, automobiles, nonferrous metals and metal products, machinery, and chemicals, which decreased steadily by 1963 and continued to decline albeit at slower rate until 1967, had started to rise in 1967. They did so, he contended, because of the end of cost reduction through the system of large-scale production, the rising trend in wages, and the emergence of downward price rigidity associated with the formation of an oligopolistic system. [21] He calculated that Japan's unit value of industrial exports fell by 11% between 1953-1962 and 3% between 1963-1966 but rose 11% between 1967-1970 in step with those of the United

States, West Germany and Italy. [22] However, because its competitors' prices rose also at about the same time, Japan's exports of heavy and chemical products grew markedly during the late 1960s and maintained their international competitiveness until after 1970 despite all-round price increases after 1967. [23]

As Ohkawa Kazushi and Henry Rosovsky observed, by the late 1960s a "historical flexible labor response process", in which the leading industrial sectors of the economy were able to draw needed manpower among redundant and underemployed workers in the primary sector and low productivity small-enterprises in the manufacturing sector, had slowed down and was becoming minimal. [24] This slowdown of inter- and intra-sectoral labor force reallocation combined with the declining birth rate following the height of the baby-boom of 1947-1949 began to tighten the Japanese labor market in the late 1960s, resulting in steadily rising wages. [25] (Table II-5)

Table II-5: Annual Changes in Wages

	(%)	
	Nominal Wages	Real Wages
1950-1959	10.4	7.3
1960-1964	9.8	4.4
1965-1969	12.3	6.8
1970	17.1	9.2
1971	14.7	8.5
1972	15.9	11.3
1973	21.7	10.0
1974	27.2	2.2
1975	14.8	2.7
1976	12.5	2.9
1977	8.5	0.5
1978	6.4	2.5
1979	6.0	2.3
1980	6.3	-1.6
1981	5.3	1.1
1982	4.5	1.7
1983	3.5	1.6
1984	4.3	2.1
1985	2.7	0.7
1986	2.7	2.3
1987	2.0	2.2
1988	3.8	3.3
1989	4.7	2.4

Source: Ministry of Labor, Report on Survey of Monthly Wage Statistics

As Japanese industries grew and narrowed the technological gap, cost-saving accruing from imported technology began to lessen because, in Yamamura's words, " -- readily available borrowable technology had been exhausted and many Japanese industries could no longer hope to increase their productive efficiency by adopting new foreign technology". [26] This, for example, was the case with pollution control technology. [27] According to the Science and Technology Agency, Japan's technological catch-up came to an end around 1972 when its technology trade balance in new programs (but not overall balance) began to register a surplus. [28]

In short, Japan's catch-up industrialization strategy of ever expanding production capacity through investment in plant and equipment that was based on mass production technologies caused the internal contradiction of a structural problem of supply and demand imbalances and led to a slowdown in the growth of the Japanese economy since the early 1970s.

Recognizing the above circumstances, Japan's powerful industrialists, bankers, economists, scientists, and others influenced the Twenty-First Century Project in acknowledging that Japan's industrialization had inescapably been headed for a slowdown. [29] The report suggested that domestic and global stagnation derived from the present transitional stage between two cycles of technological change owing to a decline in technological breakthroughs since about 1950. It cited studies by Ohkawa

and Rosovsky and by the Japan Economic Research Center which sought to explain the end of catch-up industrialization as the reason for the deceleration of the Japanese economy, as well as pointing to the Nomura Institute's and Kondratiev's "long-wave cycle" theories. [30] The report stressed that the extensive technological leap which had been achieved since 1950 had largely been in the field of system-integration type technology for the assembly and application by incorporating existing scientific knowledge, such as large-scale integrated plants, tankers, bullet trains, all the way to the American Apollo programs. What had been inert and less pronounced, the report contended, was the break-through type technology accompanying new scientific discoveries and inventions --such as the core technologies for T.V.s, radar, rockets, jets, transistors, computers, antibiotics, penicillin, nylon and the nuclear bomb -- all of them discovered or invented before 1950, primarily for military needs. [31]

Influenced by the above view of the Twenty-First Century Project, the industrial policy urged the enhanced research to create breakthrough-type technologies and to keep knowledge intensification of the economy in order to overcome structural problems.

4. Trade Tensions.

Also by the early 1970s, the postwar Japanese industrial development strategy discussed above proved to contain another contradiction, this time externally manifested. It became increasingly apparent that Japan could no longer continue to expand exports to correct domestic supply-demand imbalances and to maximize economies of scale deriving from mass production technology while at the same time protecting the domestic market from foreign competition. This strategy was permitted as long as Japan's economy was small and its trade insignificant on a global scale. During the postwar era, as part of its Pacific regional strategy, the United States assisted Japan's economic reconstruction and reintegration into the world economy by means of liberal access to the vast U.S. domestic market (in addition to direct and indirect financial aid) and strongly backing Japan's entry into the IMF and the World Bank in 1952, the GATT in 1955, and the OECD in 1964. [32]

As the Japanese economy grew in size and competitiveness and the absolute strength of the U.S. economy began to erode while the industrialization of some of the developing economies proceeded, Japan began to experience trade tensions. It faced two contrasting pressures which increasingly undermined the continuation of an industrial policy that simultaneously promoted exports and restricted imports. The first

was to liberalize the domestic market and the second was to curtail export penetration abroad.

How did these pressures mount? As Piore and Sabel have argued, because it became harder to increase economies of mass production through the expansion of the domestic market alone, the saturation of the domestic market resulted in direct competition for each other's market among the advanced industrial countries as well as for those of the LDCs. As they have then contended, since there is no mechanism to ensure a sufficient rate of global economic growth to justify new investment in increased productive capacity, a shortfall in demand creates trade tensions arising from intense competition for a bigger share of limited markets. [33]

Japan has been particularly prone to these pressures for two reasons. First, Japanese industrial policies allowed industries to raise production capacity beyond a "prudent" level, to borrow Yamamura's expression -- that is a level beyond what the market is capable of absorbing. This occurred, he argued, because Japanese industries could expect to rely on "recession cartels" as noted above. [34] Second, since new technology tends to be adopted at about the same time by most firms in an industry, often guided by MITI, the need to raise exports to correct the domestic supply-demand imbalance also matures about the same time, thereby inducing what has come to be called shuchugou teki yushutsu (concentrated downpouring of exports). [35]

With respect to the first type of pressure, although Japan began to liberalize its import quota system in 1961, it was not until the Kennedy Round of multilateral trade negotiations (MTN) (1964-1969) that more visible changes began to take place. [36] When it became evident that the across-the-board tariff cuts of the Kennedy Round had produced relatively little impact on Japanese imports due to continuing high tariffs on agricultural products, non-tariff barriers (NTBs), and the structure of a sharp tariff escalation from material to manufactured goods through higher processing stages, a considerable degree of international pressure was placed on Japan to expand imports. [37] As Japan's current account surplus and the U.S. current account deficit grew and Japanese exports grew by an annual rate of 25.5% in 1971 from the previous year, foreign pressures forced the Japanese authorities to take highly publicized unilateral actions. In October 1972, Japan instituted a 10% across-the-board tariff reduction, a 30% decrease in import quotas, and restraints on exports of products that had shown rapid export expansion. [38]

Japanese authorities initially hoped that the above unilateral measures and the "harmonization scheme" of the subsequent Tokyo Round (1976-1979) of negotiations (in which Japan agreed to reduce its tariffs on industrial products much more than the United States or the EEC) would place Japan's average tariff level at about par with other OECD countries, and hence calm foreign criticisms. Notwithstanding such

optimism, the authorities found themselves confronted with intensifying charges of restricted nature of the Japanese domestic market throughout the 1970s. [39] Criticisms of perceived or real restrictions focused increasingly on less formal NTBs, ranging from Japan's trade policy, procurement policy, interlinkages of its industrial organization, the archaic distribution system (layers of middlemen), consumer tastes and the nature of culture, language, and the society itself. [40]

With respect to the second type of pressure, contrary to the general global trend toward trade liberalization through the Kennedy and the Tokyo rounds, Japanese industries have been experiencing a rising tide of "new" protectionism (i.e., protectionism applied on a product-by-product and country-by-country basis) since the 1970s. In order to shelter domestic industries from intensified foreign competition, "new" protectionism measures such as orderly marketing agreements (OMA), voluntary export restraints (VER), the trigger price system (TPS), quotas, minimum reference prices, etc. have been imposed by the United States and the European Community, often invoking Article 19, the principle escape clause under GATT rules. [41]

While "new" protectionism was not invented to exclude or reduce increases in Japanese imports alone, and as observed by Rianne Mahon and Lynn Mytelka, it is exercised by the industrialized countries against manufactured goods not only from the

LDCs but also from each other, the VER imposed in 1957 on Japanese textiles to the United States was the first observed case of "new" protectionism. [42] Beginning with this VER and one on steel in 1968, a number of Japan's major exports from ball-bearings, shipbuilding, color television sets, to automobiles and semiconductors have been subjected to "new" protectionist restrictions. [43]

The perceived and real barriers to the Japanese market, the concentrated nature of Japanese exports, Japan's mounting trade surplus, and its persistently low share of manufactured imports (24.5% in 1979 cf. 55.0 in the U.S., 65.7% in the U.K., 57.9% in West Germany, 60.2% in France and 48.1% in Italy), all reinforced the image of Japan's "unfair" trade practices, giving rise to legitimacy for more new protectionism toward Japanese products. [44]

Moreover, resistance to Japanese export penetration was also rising in the Asian LDCs as manifested by the outbreak of protests against Japanese products, particularly strong during Prime Minister Tanaka' Southeast Asian trip in 1972. It was induced mainly by a fear of Japanese economic domination invoked by wartime memories of the Greater East Asian Co-prosperity Sphere, and a resentment toward the aggressive and closed nature of Japanese business, combined with disappointment in the lack of development from Japanese economic assistance as against their aspiration which was inspired by the call for a new international economic order. [45]

While there were reported to be other contributing factors to the anti-Japan riots in 1972, (for example, the ruling regime in Indonesia exploited the situation to deflect internal conflict), these incidents clearly demonstrated the depth of mounting anti-Japanese sentiment in neighboring countries. [46] In the 1970s, Japanese authorities were made aware of the potential volatility in their relations with these countries that could trigger a momentum towards shutting out Japanese products from their markets unless Japan opened up its domestic market to the products of these countries particularly as many of these economies shifted a development strategy from import substitution industrialization to export-led industrialization. [47] Since some LDCs proceeded with industrialization and gained competitiveness -- also relying on mass production technologies -- , these NICs began to challenge in the advanced industrial markets. The impact of increased imports and, to a lesser extent, a loss of exports to Japan is illustrated in the textile case study below.

In sum, by the early 1970s the Japanese postwar development strategy of expanding exports to realize economies of mass production and to ameliorate the supply-demand gap had intensified trade competition and created trade tensions. These trade tensions not only threatened Japanese exports but created pressures to expand imports.

5. Economic Uncertainties of the 1970s.

Yen Revaluation.

The structural problem and ensuing trade tensions deriving from the postwar industrial strategy were further exacerbated by economic uncertainties of the 1970s, primarily caused externally. Firstly, the appreciation of the yen and the shift to the floating exchange-rate system in the early 1970s had negative ramifications for the internal contradiction of the Japanese high growth model. Japan's postwar high-growth strategy was sustained by the fixed exchange rate of 360 yen to the U.S. dollar. The yen's relatively undervalued position since the mid-1960s was becoming evident in the country's rising trade and current account surpluses. (Table II-3) By the late 1960s, the Japanese economy had moved into a position of structural surplus on trade account as a consequence of the growth and the gains in international competitiveness achieved over two decades since 1949.

The Bretton Wood system of fixed exchange rates came to an end in August 1971 when President Nixon announced the New Economic Policy suspending the conversion of the dollar into gold to deal with worsening balance-of-payment problem. [48] The exchange rate of 360 yen to the U.S. dollar formally ended in December 1971 and the yen was revalued by 17% against the dollar when the Smithsonian Agreement

on multilateral currency realignment -- the flexible ad hoc exchange rate adjustment under controlled floats -- came into force in December 1971. [49] The yen was again revalued by about 16% in February 1973 when the Smithsonian Agreement was superceded by the floating exchange rate system following the second U.S. currency crisis. [50]

The appreciation of the yen had some favorable impacts on the domestic economy, including export industries since imports became relatively cheaper. However, it eliminated an artificial price advantage bestowed upon Japanese export goods by the undervalued yen, and thereby eroded price competitiveness of its export industries, at least until they were able to make adjustments. [51] While the overall economy had generally absorbed the "yen revaluation recession" relatively well owing to strong and massive industrial capital, a lower prime rate and brisk public investment designed to offset its negative impact, the revaluation hit many export oriented industries, particularly such labor intensive industries as textiles, ceramics, metal products, and paper products, hence forcing many firms to carry out rationalization programs. [52] As the 1970s progressed, the rapidly rising yen (nearly 40% within a two-year span -- from 290 yen in early 1977 to 170 yen in late 1978) put further stress on export oriented industries, necessitating even more intensive rationalizations, technological innovations, organizational and managerial innovations, etc., to maintain

competitiveness. [53] In essence, the yen's rise undermined Japan's static comparative advantage, such as labour, and forced industries to create dynamic comparative advantage, such as technology.

In addition, Komiya Ryutaro and Suzuki Yoshio observed that the revaluation of the yen and the shift to the floating exchange rate system gave rise to a pervasive feeling of uncertainty in Japan because exchange rate fluctuations require constant adjustments in exchange rate differentials and made macroeconomic policy-making as well as business decision-making less predictable. [54]

The Oil Crisis

Secondly, the oil crisis and perceived shortages of other commodities in the 1970s had also exposed the internal contradiction of the postwar development strategy. Due to its extremely limited natural resource endowment, Japan's postwar rapid growth strategy of seeking economies of scale centered around heavy and chemical industries was supported by rising imported raw materials. Because of this "processing" nature of Japan's trade structure, the postwar industrial expansion translated into a further increase in import dependency on natural resources: from 1955 to 1973, the import dependency of coking coal climbed from 51.7% to 83.9%; iron ore from 57.6% to 91.1%; lead from 51.7% to 77.1%; zinc from 38.1% to 69.2%; oil

from 99.5% to 99.7%; aluminum and nickel remained at 100%, and the overall category of major mineral resources rose from 55% to 90%. [55] As more farm land was converted into industrial sites, the self-sufficiency rate for agricultural products declined as well: grains from 83% in 1960 to 41% in 1973; soybeans from 28% to 3%, vegetables from 100% to 88%; fruits from 100% to 83%; meats from 91% to 78%, and feed grains from 67% to 31%. [56]

Although the dependence on imported raw materials had in the past restrained Japan's growth at cyclical peaks because export expansion was sometimes insufficient to pay for growing imports (but not supply shortages or jumps in price), ample supplies of primary products worldwide nevertheless sustained Japan's growth, as elsewhere. [57] Thanks to the relative stability of commodity prices, the cost of required raw material imports remained stable at about 10% of GNP during the 1960s. [58]

The Japanese economy was severely shaken, however, when the Organization of Petroleum Exporting Countries (OPEC) took steps to restrict oil supplies, resulting in a quadrupling of the oil price in 1973-1974. Although there was increasing concern that Japan might face a real possibility in which the world might be unwilling to supply needed raw materials, the oil crisis was of a magnitude never imagined by the nation in its postwar era. [59] By 1974, the value of crude-oil imports had jumped from $4

billion in 1972 to $20 billion. [60] The shock was particularly deep because Japan relied on imports for over 80% of its total energy supply in 1972. Of this total 74.9% in its total energy supply was oil, with 85% of its total oil imports from the Middle East. Japanese energy imports in 1972 totalled $5.7 billion in value, accounting for 24% of total imports. [61]

The aura of shock was quick to spread as Japan had just experienced a food crisis, prompted by Nixon Administration's soybean embargo in July 1973. Since soybeans constitute a significant source of protein for the Japanese diet and import dependency reached in excess of 95%, the embargo sparked a crisis. It caused a chain reaction, leading to higher prices on assorted animal feed that, in turn, raised prices of meat, milk, and dairy products. [62]

While the oil crisis emerged as a direct result of OPEC oil strategy and the soybean embargo was declared because of concerns for a U.S. shortage after the Soviet Union's massive grain purchase in 1972, they arose, as Nakamura argued, in the context of the Malthusian trend in which supplies can no longer keep pace with the expansion in demand for energy resources and food supplies by record-breaking population increases and high economic growth throughout the world. [63]

With the advent of the oil crisis and the soybean embargo, a period of perceived "shortages" and panic buying set in. Any advantage accruing from the yen revaluation

was offset by increases in the prices of imported commodities. Because of apprehension over supply and rising prices, Japanese trading companies and wholesalers increased inventories and even withheld some goods for speculation. A fearful hoarding stimulated a spiral in which increases in real demand further stimulated speculative demand, which drove prices even higher, which, in turn, induced still more panic buying. Such a phenomenon proliferated from petroleum and soybean products to daily necessities like toilet paper, detergent, sugar, salt, hides, wool, textiles, to construction materials like lumber, steel, and cement. [64]

The wholesale price index (WPI) of crude oil rose 54.2% in the second half of 1973 and 153.5% in the first half of 1974; soybeans 56.9% in the first half of 1973; beef 71.1% in the first half of 1973; coking coal 39.5% in the first half of 1974; and steel scrap 64.5% in one year in 1973 and 55.8% in the first half of 1974. [65] Heavy industries such as steel, cement, metal products, non-ferrous metals, petro-chemicals, and pulp and papers received the full brunt of massive increases in energy prices. [66] The drastic price increases in imported primary commodities, combined with the effect of yen revaluation, trade liberalization measures and capital outflows for long-term overseas investment cut Japan's trade surplus in half in 1973 and resulted in a balance-of-payments deficit of $10 billion in 1973 and $6.8 billion in 1974. [67]

The quadrupling of the world oil price and the soaring costs of food and other commodities in 1973-1974 exacerbated already inflationary pressures stemming from rising wages, the balance-of-payments surplus, currency and commodity speculations, and expansive fiscal and monetary policies designed to overcome "yen revaluation recession". [68] All these inflationary pressures erupted with full force to produce the worst inflation Japan had experienced in more than 20 years. WPI rose 15.9% in 1973 and 31.3% in 1974 while CPI rose 11.7% in 1973 and 24.5% in 1974. [69]

It became vividly clear from the experience of the oil crisis and the ensuing inflation:

1. that Japan's postwar growth had been dependent upon the availability of inexpensive imported raw materials.
2. that Japan had become very vulnerable to a supply disruption and a major price change in commodities.
3. that a supply disruption can occur not only as a result of purely economic considerations during peacetime, as in the soybean embargo, but also can be a means to achieve political goals in a time of war, as the oil embargo.

The nation's awakening to its vulnerabilities to resource dependency led to the popularization and adopting of public policies for <u>enerugii ampo</u> (energy security),

shokuryo ampo (food security), and shigen ampo (resource security), advocating Japanese industries and the society as a whole to become more efficient in energy and other material inputs. [70]

In essence, the oil crisis made clear the inappropriateness for Japan to keep pursuing development through the expansion of energy/material intensive heavy industries. It also helped to induce the worst inflation in the postwar era, awakening a new sense of national vulnerability.

The Recession

Moreover, the structural problem of supply-demand imbalances deriving from the postwar industrial strategy was worsened by the worst recession Japan had experienced in the postwar era which, in turn, was prompted by the oil crisis and the inflation of 1973-1974. This recession was caused in the following manner. First, a massive net transfer of purchasing power from oil importing to oil producing countries exerted a deflationary impact on the former. The Japanese economy reacted immediately by registering the first postwar negative growth of -0.5% in 1974 followed by only 1.4% in 1975. [71] Second, the oil crisis and worldwide inflation induced a downward spiral of international trade. [72] Third, faced with double-digit

inflation, tight fiscal and monetary policies were introduced to curtail inflation. [73] Fourth, the accelerating inflation led to a sharp reduction in the propensity of households to consume. [74] Fifth, as the inflation and tight fiscal and monetary policies produced a decline in real demand, the production index in the mining and manufacturing sector dropped to its lowest level in 1975 -- output in 1975 was 85.5% of 1973. [75] According to Nakamura, about one third of production capacity on average was standing idle in 1975. [76] Sixth, corporate profits were depressed by a decline in demand, higher inventory ratios, excess capacity, and rising costs due to soaring prices and increased wages. Profits in the manufacturing industries declined to 84% of the 1973 level in 1975. [77] Over 25% of Japanese firms ran into profit deficit in 1974-1975. [78] 11,681 cases of corporate bankruptcy were registered, amounting to a total of 1,649 billion yen in debt in 1974 -- the highest figure since 1955. [79] Seventh, depressed profits, in turn, dampened corporate enthusiasm for investment. The rate of growth in plant and equipment investment registered -6.1% in 1974 and -6.9% in 1975. [80]

Compared with previous recessions, this recession was much deeper and longer. [81] As discussed in the earlier section of this chapter, this was because it was not an ordinary cyclical downturn but was induced by structural supply-demand imbalances, combined with what Uchino called the "end of high-speed economic

growth recession" -- i.e., it occurred in the process of the economy's shift from long-term growth rate of about 10% until early the 1970s to a much slower growth of about 5% from the mid-1970s. [82]

Despite a rebound from a cyclical downturn in 1976, the recession exerted a profound adverse impact on Japan's economic condition. Firstly, the recession caused structural problems to worsen and spread to more industries such as chemicals, aluminum, and shipbuilding. Many of the industries that had lost international price competitiveness in the light of mounting challenges posed by the LDC's and/or due to higher commodity prices were severely weakened by the recession. They were left with increasing excess capacities and were unable to rebound on a long term basis. As the yen's exchange rate rose further and the economy relapsed into a slump in 1977, the problems of these so-called structural recession industries or structurally depressed industries intensified.

Collaborating with the industries involved, the following measures were introduced to dispose of excess capacity, indicating the severity of Japan's structurally ailing industries. The Tokutei Fukyo Sangyo Antei Rinji Sochi Ho (Provisional Measures Act for the Stabilization of Designated Recession Industries) of May 1978 designated 14 industries as structurally depressed industries. The rates of total capacity to be scrapped were as follows: steel by open hearth and electric furnace by 14%;

aluminum refining by 32%; nylon filaments by 20%; polyacrylnitrile staples by 17%; polyester filaments by 11%; polyester staples by 17%; ammonium 26%; urea by 45%; phosphoric acid by wet processing by 20%, cotton by 6%; wool by 11%; ferrosilicon by 21%; linear and corrugating mediums for container boards by 15%; and shipping by 35%. [83] Other industries such as vinyl chloride resins, soda, cardboard, industrial machinery, sugar refining and marine transportation were added in 1983 when the above law was superceded by Tokutei Sangyo Kaizen Rinji Sochi Ho (Provisional Measures Act for Structural Improvement of Designated Industries) -- which scrapped 98% of designated capacity of all 26 sectors including 13 completing well before the termination of the law in June 1988. [84]

As growth slowed and the structural recession spread to more industries, the absorption of workers released from production contraction by other industries became harder. Since depressed industries tended to be concentrated in certain regions (some, but not all, of these regions were later designated as technopolis centers discussed in Chapter V.), the Tokutei Fukyo Chiiki Rishokusha Rinji Ho (Provisional Act for Relief of Workers in Designated Recession Areas) was adopted to provide for an extension of unemployment benefits and retraining allowances for both retained and dismissed workers. [85] Moreover, as some large firms attempted to reduce excess capacities, their subcontractors, which were mainly small and medium-sized firms

concentrated in the designated depressed regions, were left with shrinking contracts. To provide a variety of financial relief measures to small and medium-sized firms to adjust their business and other large firms had vested interests in keeping their subcontractors in business, but with improved productivity and the quality of products, the Tokutei Fukyo Chiiki Chusho Kigyo Taisaku Rinji Shochi Ho (Provisional Act for Small and Medium-Sized Businesses in Designated Recession Areas) was introduced. [86]

In Uchino's estimate, in the manufacturing sector alone these structurally depressed industries comprised as much as 15 to 20% of the overall industrial structure. [87] The only exception to significant production reduction was a small number of strongly export-competitive products such as consumer electronics and automobiles. [88]

Secondly, the recession raised unemployment. The recession forced most firms to adopt genryo keiei (Management Scale-Down) or genryoka (Operation Scale-Down) centered around production reduction and three retrenchment strategies: reducing labor costs by trimming down employees and extracting wage concessions; curtailing financial costs by paring the interest burden; and cutting down not only energy-related costs but all costs. [89] On the one hand, these rationalization efforts naturally resulted in higher productivity by intensifying technological innovations, and such

organizational and managerial innovations as Toyota's now famous "just-in-time" inventories, quality control circles, and the project-team concept (to create a new group for a new product), etc. [90] (Table II-2) According to Nakamura, unlike the rapid increase in productivity prior to the oil crisis, which was achieved mainly through technological innovations concomitant of the vigorous investment in plant and equipment, the substantive part of productivity gains since 1975 has come from piecemeal improvements and expedients designed to economize labor and material without changing the scale of production. [91] On the other hand, these rationalization moves raised unemployment. The situation in which there was almost full employment until the oil crisis was dramatically reversed. The unemployment rate rose from 1.3% in 1973 to 2.0% in 1976 and remained at around 2% during the remaining years in the 1970s -- very high for the Japanese standard. (Table II-6)

Table II-6: Population by Employment Status

(ten thousands).

Year	Population 15 years old	Labor Force	Employed	Unemployed	Unemployment Rate (%)
1970	7,885	5,153	5,094	59	1.1
1971	5,979	5,186	5,121	64	1.2
1972	8,072	5,199	5,126	73	1.4
1973	8,241	5,326	5,259	68	1.3
1974	8,344	5,310	5,237	73	1.4
1975	8,443	5,322	5,223	100	1.9
1976	8,540	5,378	5,271	108	2.0
1977	8,631	5,452	5,342	110	2.0
1978	8,726	5,532	5,408	124	2.2
1979	8,824	5,596	5,479	117	2.1
1980	8,932	5,650	5,536	114	2.0
1981	9,017	5,707	5,581	126	2.2
1982	9,116	5,774	5,638	136	2.4
1983	9,232	5,889	5,733	156	2.6
1984	9,347	5,927	5,766	161	2.7
1985	9,465	5,963	5,807	156	2.6
1986	9,587	6,020	5,853	167	2.8
1987	9,720	6,084	5,911	173	2.8
1988	9,849	6,166	6,011	155	2.5
1989	9,974	6,270	6,128	142	2.3

Source: Statistics Bureau, Management & Coordination Agency.

Monthly Statistics of Japan, various issues.

Thirdly, the recession caused national revenue shortfalls and a sharp increase in cumulative domestic debts which, in turn, led to intensified trade frictions. As the public sector expanded with industrial expansion and the increase in public services, the ratio of public expenditure to GNP rose from 21.5% (1967-1973) to 29.1% (1974-1980). [92] Previously, the continuous expansion of public expenditure had easily been absorbed since the economy as a whole was growing rapidly. The prolonged recession left a 10% decline in tax revenues in 1975 from the previous year -- 3.5 trillion yen less than official projections. [93] Tax revenues shrank because corporate tax receipts decreased due to the sharp drop in corporate profits; indirect taxes stagnated with depressed levels of consumption; and income taxes remained flat with high inflation. [94]

Facing strong resistance from the business community as well as from the labor federations to a tax increase and drastic spending cuts, the authorities resorted to the issuance of "deficit bonds" and construction bonds to cover the revenue-expenditure gap, beginning with 2.29 trillion yen in 1975. [95] With swelling debt servicing costs, the cumulative domestic debt climbed from 15 trillion yen in 1975 to 32 trillion in 1977 and to 70.5 trillion yen by 1980. As a result, the rate of fiscal dependence on bond issues rose from 9.4% in 1974, 24.6% in 1975, 32.5% in 1977 and to 33.5% in 1980. [96] In the wake of rapidly growing public debt, growth inducement through

Keynesian demand management via expanded fiscal spending was viewed by the authorities not only as undesirable because it would increase public debts further, but also as ineffective because it would rekindle inflation without ameliorating unemployment. [97] Consequently, macroeconomic policy that was primarily oriented to maintain price stability and contain a fiscal explosion did not work to stimulate stagnating domestic demand.

With a soaring budget deficit, the Japanese government took little action to create new domestic markets, expand existing markets, or reduce supply to correct domestic demand-supply imbalances but facilitated the continued expansion of exports by the nation's export-oriented manufacturing conglomerates -- one of the components of the elite hegemony and the powerful influence on the state policies as discussed in the last chapter. The sluggish domestic demand thus led manufacturers to rely more heavily on export demand, thereby aggravating trade frictions. In the absence of an effective anti-recessionary policy (due to the preoccupation with price stabilization), firms that were struggling to eke out small profits in a stagnant domestic market launched export drives in early 1976. Japanese exports began to climb steeply, aided by quicker recoveries from the oil crisis in the United States and elsewhere, improved Japanese competitiveness stemming from rationalization, and the depreciation of the yen. [98] A surge in exports, particularly destined for other industrial countries, and

the resultant dramatic improvement in Japan's current account in 1977 and 1978 (Table II-3) provoked stern criticisms and induced another tide of "new" protectionism abroad against Japanese products. For example, the export of color television sets to the United States was placed under OMAs in 1977 and less formal restraints in Western Europe. [99] The ball-bearing industry and the steel industry were placed under VERs and TPMs in the United States and Western Europe. [100]

It should also be noted that, just as the economy appeared to be finally on a path to healthier growth, albeit at much slower rate than the pre-1973 period, it was rocked again in 1979 by the second oil crisis sparked by the Iranian revolution. Though much less severe than the first oil crisis, the second oil crisis underscored the urgency for the ongoing effort engaged since the first oil crisis -- that is, to ensure energy security by rationalization, conservation and diversification, and hence to transform the nation's industrial structure away from its energy-intensive, oil-oriented base. The second oil crisis led to an increase in Japan's exports again, particularly automobiles, because the overseas demand for less energy consuming price-competitive Japanese automobiles rose and Japan's export drive intensified to pay for the swollen oil-import bill. In 1979, the number of Japanese passenger cars sold in the United States rose more than 30% over 1978, further heightening trade tensions that had been gaining momentum since 1976. As the Japanese automakers' share in the U.S. market jumped from 16.6% in

1979 to 21.8% in the first of 1980. VERs were imposed in the United States and Canada, as well as in Western Europe. [101]

In short, the oil crisis and the ensuing inflation had prompted the worst recession since World War II. The recession and the absence of effective macro policy, in turn, caused structural problems to worsen and spread to more industries, raising unemployment and leading to a sharp increase in domestic debts. The stagnant domestic demand induced Japanese industries to seek more exports, heightening trade tensions.

6. The Structural Adjustment Strategy

Faced with structural supply-demand imbalances, export restraints, import competition, the appreciation of the yen, wild fluctuations in exchange rates, higher energy and other commodity prices, rising unemployment and mounting budget deficits, it was no longer possible for the Japanese state to maintain an industrial strategy which sought to develop a modern economy by strengthening its international competitive position through ever-expanding industrial capacity and exports. To restore viability of industries affected by the above internally and externally generated factors and to create renewed growth so as to realize three national goals, the Japanese

state adopted a new industrial strategy in the Industrial Policy for the 1980s. As discussed in Chapter 1, the new industrial strategy sought to restructure the Japanese economy by expanding technological frontiers and adjusting to a higher degree of knowledge intensity through greater value-added, higher processing, better quality, process and product innovations, and organizational and managerial innovations, and through diversification and transferring of standardized production abroad. In other words, the structural adjustment strategy was meant to augment the new strategy of the economies of scope (the ability to produce a wider variety of products at lower cost) and the enhancement of non-price competitiveness to the past strategy of the economies of scale and the enhancement of price competitiveness.

The Japanese state chose the industrial strategy of structural adjustment over contraction of supply, expansion of domestic demand and creation of differentiated market, or protectionism as a way to deal with intensifying international competition. It is because the interests of Japan's export-oriented big industrial capital are fundamentally aligned with keeping production levels by increasing exports and maintaining lowerbarriers to trade than reduction of supply, stimulation of domestic demand (perceived unwise in macroeconomic terms), or protectionism. Only after a crisis of supply and demand imbalance worsened and other countries became unwilling to accommodate Japan's export pressures, the Japanese state became obliged to

reexamine its past responses to this crisis of excess capacity. By facilitating structural adjustment and lowering barriers rather than raising barriers, Japan's industrial conglomerates -- even their subcontractors, for this matter -- and awesome sogo shosha (trading houses) can expect to maintain access to foreign markets because of a lesser chance of trade war and to ensure importation of their own goods produced abroad back to Japan as they began to relocate production facilities overseas in the early 1970s to avoid higher labor and material costs at home. [102] A sudden rise in the balance of payment deficits in 1973-1975 in spite of continued balance of trade surplus indicated a surge in Japan's direct overseas investment resulting mainly from production relocation. [Table II-3]

The attempt to move the economy and the society towards greater knowledge intensity is nothing unique to Japan but it is a universal trend, as mentioned in the last chapter. However, to redirect, in a concerted manner, the entire industrial structure as a whole into a more knowledge-intensive system of production, particularly to deal with "senescent" industries in the anticipatory adjustment manner -- i.e., making adjustment in anticipation of where industries ought to be viable -- is distinctive to Japanese industrial policy, as Michele Schmiegelow pointed out. [103]

In sum, Japan's industrial strategy of strengthening its competitive position through ever-expanding industrial capacity and exports had created supply-demand

imbalances and slowed down the nation's economic growth by the early 1970s. Domestic and international economic uncertainties of the 1970s, such as exchange rate swings, oil crisis, and absence of effective macroeconomic policy had further aggravated these structural imbalances. Because the Japanese state facilitated export-oriented manufacturers to export more to correct this imbalance rather than scrapping the entire excess capacity or expanding domestic market sufficiently to absorb all excess capacity, its export pressures led to rising protectionism abroad. The intensifying protectionism, in turn, forced the Japanese state to reconsider its response to the domestic supply-demand imbalance and to make structural adjustment. Then, why has the Japanese state resorted to structural adjustment policy politically rather than contracting domestic supply, expanding domestic market, or even protectionism? What were the political circumstances in which the Japanese state chose structural adjustment policy over these other options?

III. DOMESTIC POLITICAL INDUCEMENT TO RESTRUCTURING: THE STATE.

1. Emphasis On the Quality of Life Issues.

This chapter will examine the domestic political dynamics which shaped the Industrial Policy for the 1980s in order to grasp why the Japanese state had chosen structural adjustment policy politically over other options, such as contracting domestic supply, expanding domestic market, or even protectionism. Such examination will enable us to comprehend why the Industrial Policy for the 1980s paid lip service to the betterment of national welfare in redirecting the Japanese economy towards a more knowledge-intensive structure.

Industrial policies since the early 1970s have, at least rhetorically, acknowledged the need to improve national welfare. The Industrial Structure Council's Interim Report of 1971 claimed to alter economic management from seicho tsuikyu gata (growth pursuit) to seicho katsuyo gata (growth utilization) in setting the basic direction toward a knowledge-intensive industrial structure. [1] The Industrial Policy for the 1980s claimed to improve the quality and comfort of life as among its three

national goals. [2] Of this new gesture on national welfare since the early 1970s, Johnson observed:

> - the old concept of industrial structure -- how did Japan's structure compare with that of international competitors -- was no longer meeting the Ministry's need. The Industrial Structure section -- was searching for a new concept that would incorporate the goals of environmental conservation, continued prosperity, and a "higher quality of life" that the public had come to demand -. [3]

Namiki Nobuyoshi, the head of MITI's industrial structure section, asserted that a knowledge-intensive industrial structure is synonymous with economic growth which does not produce pollution and enables people to enjoy life. [4]

Japan's postwar rapid economic development strategy discussed in the previous chapter was carried out under the uninterrupted reign of the conservative Liberal Democratic Party (LDP) in close collaboration with big industrial and financial capital and the upper echelon of the national bureaucracy. The labor and the opposition parties which labor supported were generally fragmented and weak. The LDP was able to sustain power and the elite hegemony could remain intact because the LDP was able to translate a strong national desire to recover from the war and to improve life into electoral support for their highly pro-growth policy as we shall see below. [5] By the late 1960s, however, the elite hegemony began to face numerous challenges emanating from the unrestricted industrial expansion of the rapid growth policy which was based

on the strategy of the economies of scale. Accumulated social consequences of this strategy surfaced in the form of urban congestion, environmental degradation and a lag in public social investment. Liberal critics talked of a fukushi gyappu (welfare gap) the disparity between economic growth and social welfare -- as ever widening segments of the public became disenchanted with the LDP's high-growth policies of the 1960s, and a sense of malaise pervaded Japan of the early 1970s. [6] As these contradictions intensified in the late 1960s, pushing public discontent beyond the threshold of tolerance and shifting society's attitude toward growth, they gave rise to struggles among various social forces over the costs and benefits of this rapid growth.

This chapter will first review the social consequences of Japan's postwar economic strategy to see how Japan's postwar unrestricted industrial expansion caused environmental degradation, urban congestion and social deprivation. It will then examine how these repercussions led to the growth of citizens' protest movements, the rise of regional progressive regimes, the relative rise of labor and the relative rise of the opposition parties as a whole at the national level. At the same time, it will also investigate how these strengthened social forces translated the general discontent into political influence to grasp why the Japanese state has been forced to acknowledge the need to improve the quality of life since the early 1970s and why the current industrial policy accepted it as part of its national goals.

Faced with the growing power of the subordinate social forces, the elite hegemony was compelled in 1972 to officially acknowledge the existence of a fukushi gyappu as "the consequence of largely unrestricted growth that relied mainly on the market system." [7] As a result of the consequences of rapid growth and ensuing criticisms, the LDP steadily lost popular support leading up to the loss of its parliamentary majority in 1980. This trend created a growing belief that an opposition coalition government was imminent. As leadership of opposition parties and labor federations intensified criticism of the government's handling of economic difficulties in the context of the slower growth of the 1970s, it became imperative for the elite hegemony to intensify its willingness to work toward improving Japan's quality of life. The economic difficulties of the 1970s necessitating a shift away from the heavy/chemical industries based on mass-production technology toward more knowledge-intensive industries, as discussed in the previous chapter, opened up the opportunity for the elite hegemony to promise to "improve the quality and comfort of life through a knowledge-based society" in the Industrial Policy for the 1980s, without jeopardizing its cohesion and ability to continue ruling.

2. Consequences of Rapid Industrial Expansion

Urban Congestion

The highly growth-oriented postwar industrial policies based on the strategy of economies of scale with an emphasis on heavy/chemical industries brought Japan in the 1960s not only rapid growth but also serious urban congestion, environmental degradation, and a lag in public investment in national welfare.

The brisk economic expansion led to a steady migration from rural peripheries to urban centers. The population of the greater Tokyo area jumped from 5,060,000 in 1950 to 11,060,000 in 1970. [8] The intensity of the urbanization was also illustrated by the 45% decline in the rural population during this period. [9] For a small mountainous island nation where only 28 % of the land is relatively flat, arable and habitable, the impact of urbanization and industrialization has been extremely severe. [10]

Without adequate central urban planning, factories, buildings, and houses of all sizes and shapes sprouted up with scant regard for welfare and esthetic considerations, comprising a vast strip of ugly industrial sprawl along the Pacific coast. [11] The result of urbanization was sharp increases in land values. During the 21-year-period from 1955 to 1974, land prices rose at an average compound rate of 19.2% per year in a sample of 140 cities, and at a sligltly higher rate in the six largest cities. Urban land values rose more than twice as fast as rural land values during the same period. [12] According to Sato Kazuo's estimate, while total real household income rose only about

six times and the implicit consumption deflator rose only a little over four times, urban land prices rose by 30 times during 1955-1980. [13]

Exorbitant urban land prices were magnified by stringent building height controls due to the danger of earthquake, poor subsoil foundations in many cities, and the absence of earthquake- proof building technologies until the 1960s. For these reasons, unlike Manhattan, an intense substitution of capital for land in the form of skyscrapers took root only in the last two decades in Japan. [14] Consequently, the urban population suffers severe shortages of interior space and of open land around structures, such as gardens, parks, roads, etc. [15] It is a mistake, however, to assume that the high price of land and resultant high cost of housing are strictly a natural outgrowth of physical and technological limitations. They are instead the direct result of the Japanese state's decision during the 1960s to rely on the private sector to expand supply for land. [16] In the absence of land price control, a shortage of supply encouraged land developers and land owners to engage in rampant speculation. [17]

Edwin Mills and Ohta Katsutoshi asserted that a widespread owner occupancy of housing and the predominance of small family-owned farms may mean that land ownership in Japan is less concentrated among high-income groups than are other forms of wealth and that an increase in land values somewhat reduced the concentration of wealth, thereby decreasing the inequality of incomes. [18] However,

while rising land values may have pluralized the high-income class, average wage earners who did not own or whose parents did not own land already were squeezed out of the market, left to live in housing provided by employers or to hope for a slim chance of obtaining below-market-priced public housing, or to pay high rents and suffer severe shortages of floor space. [19]

Urbanization also caused troubles relating to transportation congestion. Although public transit systems are relatively inexpensive, fast, frequent and reliable and cover a large network of origins and destinations, crowding, particularly during rush-hours, is notorious, and the long commuting time for those who can afford to live only in the suburbs creates serious problems of fatigue and discomfort. According to Miyamoto Ken'ichi, the energy loss per hour in a crowded train is equivalent to 4 hours of office work. [20] Because of scarce and expensive parking facilities and high gasoline prices, automobile commuting tends to be costly and generally slower due to traffic congestion. Whether it is by public transit or automobile, commuting for most Japanese has become such a hardship that it has acquired names like tsukin jigoku (commuting hell) and kotsu senso (traffic war). [21]

It is not that an attempt to keep the population flow in check was not made. At least policy objectives to rectify regional disparity and promote regionally balanced growth were set ever since the first National Comprehensive Development Plan of

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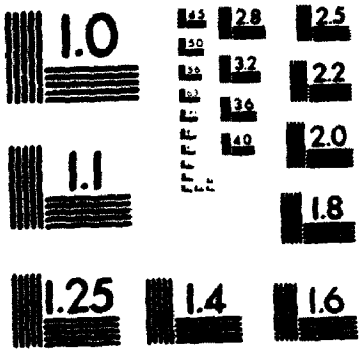

MICROCOPY RESOLUTION TEST CHART
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1962 was established. According to Hanayama, however, such objectives were never realized for the following reasons. First, the attraction of existing large cities was so great that the authorities possessed neither the will nor the means to prevent further concentration. Second, although attempts were made to ease inter-regional population mobility, an adequate policy to address inter-industry population movement -- the main cause of regional dislocation -- was never formulated. Third, the first National Comprehensive Development Plan and others which flowed from the "Income Doubling Plan" (the rapid growth policy of the 1960s) all assumed that rapid growth through industrial expansion would automatically provide solutions to any problems (a point to be examined below). [22] Based on this assumption, the authorities failed to confront each problem squarely.

Environmental Degradation

Another consequence of the postwar rapid growth strategy based on the economies of scale strategy was the problem of pollution -- both industrial and urban. By the late 1960s, Japan was becoming one of the most polluted countries in the world. [23] The industrial culture of mass production/mass consumption of the 20th century itself is conducive to environmental degradation because of the massive scale of resources extraction required to fuel mass production; large size factories; competitive

packaging practices creating extra garbage (this is particularly pronounced in Japanese tradition); and the propensity of consumers in a mass consumption society to discard goods when new products appear on the market. The Japanese experience, however, was more conspicuous by its intensity due to the extremity of its physical limitations and the sheer speed of its industrial expansion. [24]

An inexhaustible list of environmental contamination from emissions and effluents experienced in Japan can be found. [25] Among the more tragic cases were what came to be known as yondai kogaibyo (the Big Four pollution inflicted diseases). The first two were the outbreaks of Minamata Disease -- a particularly painful and incurable illness caused by ingestion of fish contaminated by mercury -- one in Minamata city in Kyushu and another in the Agano river basin in Niigata prefecture. [26] The third was Itai-Itai (Ouch-Ouch) Disease -- cadminium poisoning --which affected residents of Jintsu River in Toyama prefecture at the end of 1950s. [27] The fourth was the debilitating forms of asthma, bronchitis and emphysema suffered by many residents, particularly the young and the aged, near Yokkaichi Kombinato (clusters of interrelated heavy/chemical industrial complexes built in close proximity to each on a planned site. Since construction of kombinatos was fostered as the spearhead of rapid industrial expansion and thereby encouraged by the growth policies of the

1950s and 1960s, the case of respiratory ailments in Yokkaichi served as a testament to the nation's unrestricted industrial expansion. [28]

By 1970, the impact of the less dramatic but pervasive nature of environmental degradation was also widely felt and documented in such fields as: the contamination of water resources; atmospheric pollution; soil erosion; land subsidence; siltation of waterways and coastal areas; deforestation; noise; and the worsened quality of life and amenities which are often harder to quantify, like privacy, sunshine, social relations, loss of natural beauty, etc. [29]

Social Overhead Deficiencies

Environmental degradation and urban problems were exacerbated by serious social overhead deficiencies. Japan's public investment in social welfare remained low compared with other industrialized nations, particularly until the early 1970s. For example, in 1970 Japan's expenditure on health and medical as a percentage of GNP was 2.86% and that on unemployment was 2.59% while that on social security and retirement was 5.45%. The equivalent figures were 1.30%, 6.58% and 5.45% for the United States, 3.9%, 16.02% and 19.92% for West Germany, 4.54%, 14.68% and 19.22% for France, and 3.25%, 11.78% and 15.03% for Italy. [30]

Although the solidarity of the extended family as a source of security was rapidly eroded by the individualized wage-work system of industrialization, a generalized and universal system of social welfare had not yet been fully implemented in the late 1960s. [31] This lag in establishing a social welfare system was a result of a decision by the Japanese labor movement to bargain for and establish as a norm the permanent employment system and with it a wide range of fringe benefits from employers rather than from the state. The focus on employers rather than on the state was, in turn, due to the evolution of Japanese labor unions along enterprise lines, resulting in fragmentation and weakness in their ability to influence public policy as will be examined below. Thus, the privatization (by employers) of unemployment and health benefits as well as security upon retirement were established in many, but not all, firms -- 30.8% of all workers in Japan were unionized in 1980 and approximately half of the workers were believed to have been covered under various privatized schemes. [32] Having less pressures for social welfare put on the state directly, demands for a generalized system of social welfare were retarded.

Given the above, why was the general public relatively tolerant of social deprivation and the lag in public social expenditure? Firstly, in the euphoria created by the general rise in GNP and the general ability to purchase more consumer durables, external diseconomies from rapid industrial expansion were somewhat obscured, and a

full realization of the extent to which these dysfunctions were under way was slow to be articulated. [33] More concerned with issues of Japan's subordinate status to the United States, the Kakushin jin'ei (progressive reformist camp of opposition parties and labor federations) was slow to exploit the consequences of rapid growth, as will be discussed below.

Secondly, a large number of people considered social deprivation a short-term sacrifice necessary for growth. Under seisan daiichi shugi (production-first policy) that was inherent in Japan's postwar industrial policies, it was believed that all limited available capital had to be plowed into production to achieve a high rate of growth, while the market mechanism would eventually redistribute the benefits of rapid growth by readjusting social deficiencies. [34] In this context, Iida Tsuneo reminded us that Japanese economists were slow in proposing an alternative growth plan because, except for Shinomura Osamu, no economist recognized that Japan's high rate of growth was real and that it is a simple outcome of the high investment rate to GNP, particularly when investment was put into productive capacity with new technology. Hence, before the mid-1960s, Iida noted, the central controversy was whether the growth was real or not, rather than how to obtain balanced growth. [35] Like the leaders of labor unions and the progressive opposition parties, radical economists were

busy denouncing Japanese capitalism as a whole and an alternative option for high growth was not articulated in a concrete form until the late 1960s. [36]

3. Strengthened Subordinate Forces.

By the late 1960s, however, the pressures emanating from public discontent over the consequences of postwar rapid growth policy that was based on the economies of scale strategy gave rise to subordinate social forces struggling over net costs and benefits.

Growth of Citizens' Protest Movement

Those who were affected by pollution, congestion, and a host of other urban ills became increasingly articulate and inclined to engage in protests. These were often organized spontaneously by members of the hithertofore docile neighborhood liaison network (chonaikai), most of whom possessed no link to any political party, at least at the outset, and some, but not all, were subsequently endorsed by the opposition parties. Prompted by revelations made during the Big Four pollution court cases and by the intensifying trend in pollution, public grievances with respect to environmental

degradation induced a blossoming of shimin undo (citizens movements) and jumin undo (local residents' movements) which had been growing for some time. [37]

The growth of citizens movements can be explained partly in the nature of social deprivation or external diseconomies which acquired the name gendai teki hinko (new poverty). According to Miyamoto, although urban problems are also found in contemporary socialist states and the new poverty cannot be attributed to a particular system but rather is determined by technology, business management, politics, and culture, etc., the fundamental source of new poverty in Japan's case derived from the structure of capitalist accumulation process -- that is, under the industry-first policy, firms and the society as a whole curtailed the expenses required to maintain the environment and to ensure safety for the sake of profit maximization, thereby transferring the costs incurred in this process from firms to the third parties, i.e. local residents, consumers, fishermen. [38]

Residents and consumers took direct action by forming protest groups, because they were frustrated by a lack of responsiveness in the established party politics in which the progressive camp was relatively slow to exploit these issues. They did so also because many aspects of the new poverty issues were often left out of labor-management struggles. By means of protest ranging from lobbying to demonstration, boycott to lawsuit, by the late 1960s citizens' movements had become

formidable social forces to be reckoned with, opposing industrial plants, commercial projects, subways, trains, highways, airports, or protecting nisshoken (the right to sunshine). According to one estimate, there were over 3000 citizens' movements based upon the mobilization of residents in local areas in 1973, a tenfold increase in the number of such groups in three years since 1970; as many as 10,000 local disputes were carried out in 1973; in 1971, local governments had received over 75,000 pollution-related complaints, double the number from 1969 and quadruple the number from 1966. [39]

Particularly alarmed by the circumstances of Yokkaido Kombinato, the citizens of Mishima and its neighboring communities of Numazu and Shimizu organized a protest movement in 1963, defeating a plan by the national government, the Shizuoka prefectural government and three major firms to construct a large-scale petrochemical kombinato in the area. This protest movement involved massive rallies and anti-pollution education, embracing diverse organizations, such as women's clubs, youth clubs, informal neighborhood clubs, agricultural and fisheries cooperatives, doctors' and pharmacists' associations, and various local labour unions. [40] In the Big Four pollution cases as well, local victims' groups challenged the corporate polluter in the courts and won compensation in all four cases between 1971 and 1973, thereby

establishing the polluter-pays-principle (PPP). [41] These experiences helped proliferate environmental protection and compensation movements elsewhere. [42]

Protest movements stemming from difficulties created by unrestricted industrial expansion thus became a new channel of expression for citizens' dissatisfaction and demands. This is not to suggest, however, that all civil protest movements were unanimously supported by local residents nor to imply the absence of conflict within movements. On the contrary, in most cases conflicts and disagreements were ubiquitous. A participant in a struggle to prevent the construction of a chemical factory in Oiso, for example, found herself threatened with mura hachibu (ostracism) by her neighborhood association, which saw gains from the multiplier effects of the factory. [43] Not all movements were successful either. While the Mishima-Numazu Shimizu pattern of anti-Kombinato protest was successfully repeated in Fuji, Miyazu and Hamaoka, similar protests in Himeji, Sakai and Takarshi were unsuccessful for each turn of events. [44]

In the 1970s, the nature of demands in public protest movements became more complex and perception of success diversified. For example, in the case of court appeal against Osaka Airport for noise pollution in 1974, although the protesters supported by the local regime were successful in obtaining monetary compensation, they failed to achieve their demand to cease flights after 9 p.m. or to demolish the

airport. The court acknowledged the extent of "public damage", but stopped short of suspending flights in the name of "public nature" and "public interests" of the operation of the airport (subsequently, an agreement was reached on no flights after 9 p.m.). [45] Similarly, although financial compensations were granted to fishermen for the oil spill caused by Mitsubishi Refinery Plant in 1974, the aim of the movement to restore a natural environment in the Seto Inland Sea is far from being achieved. [46] Nevertheless, by mobilizing public discontent and taking direct action, these protest movements extracted many concessions and brought about significant changes in the strategies of firms and policies of regional and national authorities as discussed below.

Rise of Progressive Regional Regimes.

The second type of force to emerge was progressive regional regimes. Until the late 1970s, local politics in Japan failed to receive much attention. Being a unitary state, the picture often portrayed of the Japanese political system tended to be that local governments were totally subordinated to the national government. Indeed, except for a few localities, local politics mattered so little in Japan during the postwar era because of the conservative domination of local regimes. By the early 1970s, however, local

politics moved onto center stage "in a tone of intense politicization and public arousal" in Richard Samuels' words. [47] He observed:

> - In the face of a lag in the social infrastructure, demands upon the state escalated. The progressive opposition parties saw political potential in these increasing demands and they sought to channel popular discontent into support for themselves, succeeding in gaining power at the local level, particularly in the urban centers where dislocation of life was felt most intensely. In essence, local governments were developing new functions to fulfill needs generated by rapid growth. [48]

More radical opposition parties had a specific reason to concentrate in local politics as Muramatsu contended:

> - The Socialist Party and the Communist Party became active in community affairs after the confrontation over the renewal of the Security Treaty with the U.S. in 1960. They attributed their inability to block the renewal of the treaty to the fact that their political ideas did not reach the average people in the local communities. They hoped that politicization and/or democratization of the electorate -- that is, the fostering of active concerns with problems of national importance -- would rebound locally to the benefit of the opposition. [49]

In April 1975, over 20% of the country's 642 mayoral positions and 10 of the 47 governorships were held by the kakushin jin'ei (the radical-progressive camp) Since the Tokyo election in 1967 until 1979 (when kakushin jin'ei's challenge in local government weakened), all the major cities along the Pacific belt elected kakushin mayors: for example, Tokyo, Saitama, Kawasaki, Yokohama, Nagoya, Kyoto, Osaka, Kobe, Okayama, and Kita Kyushu. [50]

The emergence of progressive local regimes had the following significance. Firstly, by exploiting popular criticisms of the national elite regime's economic policies and of the conservative ties between the national and local politics, the progressive opposition parties, heretofore unable to become a cohesive force at the national level, due to the ideological differences of the leaders (scientific revolution vs. social democratic reforms) as well as long years of personal rivalries, were finally able to forge a broad political coalition at the local level and implement social reform policies. Citizens' protest movements not only provided progressive parties' candidates in local elections with concrete issues to fight against, such as pollution, health care and welfare, but they sometimes put forward independent candidates who then received the joint endorsement of the opposition parties. These coalitions were often successful in embracing moderate conservative voters as well as their natural constituents in the center and moderate left of center. For example, Minobe Ryokichi, an independent backed by the Socialist and the Communist parties, won the majority of votes in Tokyo governorship race in 1967, 1971 and 1975 largely as a result of his criticism of the national government's economic policy and of his stand on quality of life issues and humanitarian appeal. [51]

In 1967, the Minobe administration adopted the concept of "civil minimum" or "civic minimum" -- a policy to provide satisfactory amenities and social services based

on expressed needs of the citizens. The basic consideration advanced in civil minimum was that the national implementation of Article 25 of the Constitution (the right of people to maintain a minimum standard of living) through subsidies and grants fell short of the actual minimum requirements of urban life. The Tokyo Metropolitan Government, therefore, had to set its own minimum standard --the civic minimum as differentiated from the national minimum. [52] Under this concept, Minobe introduced a host of reformist social programs, such as upgrading welfare provisions for the aged, the handicapped and other disadvantaged groups, stricter measures against pollution and traffic, and the creation of such amenities as more parks and elevated pedestrian crosswalks. [53]

Secondly, the emergence of more independent and progressive local regimes horizontally influenced other localities, resulting in a proliferation of reformist social policies. The victory of Minobe in 1967 and that of Asukata Ichiro as the Socialist mayor of Yokohama in 1963, in particular, as well as the long reign of the Communist backed Ninagawa Torazo in Kyoto from 1950 served as pace setters for progressive regimes elsewhere, as the reformist social programs introduced by these administrations were emulated.

In this context, the importance of the rise of progressives was more because of where they were elected and what they did in office rather than because of their

absolute number. For example, in 1960, Kyoto's Ninagawa administration created an additional local source of revenue by instituting an automobile acquisition tax, thereby increasing its fiscal autonomy from the national regimes. This example was followed by many other prefectures. [54] Similarly, Asukata of Yokohama pioneered the voluntary pollution control agreement with industries in 1964. This so called Yokohama formula -- in which the management of a plant enters into an agreement with a local community directly or through local government to consent to periodic inspections, and to cease operation and provide compensation in the event of an environmental disruption -- spread to other localities, including some under conservative control. [55] As of October 1974, 7,096 operations had such a pact in 40 prefectures and 1929 municipalities.[56] The totally free medical care for those over 60 years old and for the disabled which were first instituted under the civil minimum concept of the Minobe administration of Tokyo in 1969 proved so popular that the system quickly spread to other prefectures, with all but two initiating similar programs by April 1972. [57] A similar pattern was repeated in other social programs such as free public transportation for the aged, a pension coverage for all citizens, etc.

Thirdly, the growth of progressive local regimes and the proliferation of reformist social programs at the local level also influenced national policies, thereby changing the local-national dynamics in the Japanese politics. Pressured by local

governments eager to be relieved of their new financial burdens, the opposition parties pushed for similar national programs. The concept of free medical care for senior citizens popularized by Minobe in Tokyo and spread to other localities, for example, was adopted in the revision of the Welfare Law for the Aged in 1972. [58] The same path resulted in the establishment of a national childhood allowance program. [59]

Local pollution-preventive ordinances also forced national actions. Shaken by the success of the anti-Kombinato movement in Mishima-Numazu-Shimizu and wary of a proliferation of extremely stringent local anti-pollution acts, the national government was compelled to set a policy to control environmental pollution to secure a way for a continued industrial expansion. The first major national action was the enactment of the Basic Law for Environmental Pollution Control in 1967. [60] When Metropolitan Tokyo established the principle of the right of citizens to live in a pollution-free environment in its Pollution Prevention Act of 1969, the national conservative regime overhauled the weak Basic Law then in effect. In 1970, the LDP-led Diet enacted and amended 14 pollution related laws (later 15) and eliminated from the Basic Law the controversial notion to balance pollution control against economic development needs. [61] The regime created the Environmental Agency in 1971 to implement these laws. [62] Notwithstanding difficulties associated with their implementation, these pollution policies were progressive even at the international

standard. [63] It reflected not only the growing influence of citizens protest movements and progressive local regimes but also the LDP's tactics in preempting to meet some, but not all, demands of the subordinate forces in order to sustain its rule and maintain the cohesion of the elite hegemony.

Relative Rise of Labor.

The third force to emerge is the relative rise of labor. In general, Japan's labor union movement has remained weak. The inherent weakness can be attributed to a combination of the fragmentation deriving from a historically obstinate ideological conflict within the labor movement and the vertical structure in which most unions are organized along enterprise lines rather than horizontally by trade or craft lines. The labor movement in Japan has been divided along two ideological lines: one committed to revolutionary radicalism and the other favoring trade unionism in the social democratic orientation. This division -- dating back to the 1920s when the impact of the Russian Revolution and Marxist influence reached Japan and splitting the hitherto moderate Sodomei (Japan General Federation Labor) into two factions -- set the basic pattern of conflict for the subsequent history of the labor movement. [64]

In the former stream, during the immediate postwar era when unionism was encouraged by the Occupation forces as part of the nation's democratization, Japan Communist Party (JCP) members established Sanbetsu Kaigi (All-Japan Federation of Industrial Organizations) and the anti-mainstream forces opposed to JCP's control and the left-wing faction of Sodomei formed Sohyo (General Council of Trade Unions of Japan) with the support of the Socialist parties (unified in 1955 as the Japan Socialist Party -- JSP). In the course of the "U-turn" in the Occupation forces' policies (from pro-labor -- encouraging and legalizing Japanese labor movement -- to anti-labor -- suppressing and illegalizing strikes by public sector unions) as a result of the intensifying U.S. anti-Communism deriving from their rivalry with the Soviet Union and China, more radical Sanbetsu Kaigi was dissolved by the authorities and Sohyo evolved from a moderate anti-Communist federation into a militant anti-American one which placed its main emphasis on the politico-military issues of Japan's relations with the United States rather than bread-and-butter issues. [65] Like that of the JSP it supports, Sohyo's rationale for this strategy has been that its ultimate goal is to bring about fundamental change in Japan's socio-economic system -- i.e. a proletarian revolution against Japan's elite hegemony. They believed that this would succeed only after the interpenetration of Japanese and U.S. elites is severed. Their first objective,

therefore, was to detach Japan from its subordinate position to the U.S. by obtaining neutrality and only then to proceed with a domestic class struggle. [66]

In the second stream, Japan's enterprise union tradition began in 1906 when the national railways union was created and soon spread to the private sector. During the 1910s and 1920s, industrial capitalists fostered the ideology of ie (family) and introduced the life-time employment system with its increments of job security, seasonal bonuses, lump-sum retirement payments as well as firms' health, educational and other fringe benefits to ensure enough skilled manpower. [67] During the war, any moderate unions which did not go underground were placed under Sampo (Industrial Patriotic Association) -- the state sponsored organization created to force the labor-management collaboration. Although Sampo was dissolved in 1945, it strengthened the enterprise union tradition by teaching management the value of bringing both sides together to thwart radicalism. [68] The same severe conditions which had fostered intra-plant collaboration during the war continued to prevail in the immediate postwar era, encouraging the wage determinant system based on the age, the length of service and the number of dependents rather than position, responsibility and efficiency. [69] Enterprise unionism, therefore, was consciously fostered by management which was challenged by a new surge of trade unionism in the early postwar years rather than derived from Japan's peculiar culture as often implied. [70]

Moreover, Nikkeiren (Japan Federation of Employers Association) was formed in 1948 to form a unified management voice on labor issues and to further encourage enterprise unionism. [71] Opposed to the increasing radicalization of Sohyo, four Sohyo affiliated groups of unions broke away in 1954 to form Zenko (All Japan Trade Union Congress) along with the right wing of Sodomei. Zenko became Domei (Japan Confederation of Labor). [72]

On the one hand, Sohyo, whose main base is in the public sector, has been oriented toward radical political causes at the national level with the leadership's objective aimed at class struggle and eventual revolution. However, even the most militant Sohyo members on the shop floor pursue essentially the economic objectives of a national minimum wage, guaranteed employment, minimum standards for health and safety in the workplace and so forth. [73] On the other hand, Domei whose 90% of the members are in the private sector, follows a strictly economic strategy by concentrating on bread and butter issues, thereby more willing to make a compromise for the sake of the ultimate economic success of firms. Domei is aligned with the moderate Democratic Socialist Party, although its members tend to vote more independently. [74]

In addition, there are also smaller labor federations all in the private sector, not affiliated with any political party, such as Churitsuren (National Federation of

Independent Unions), Shinsunbetsu (National Federation of Industrial Unions), and Kinzoku Rokyo (International Metal Workers Federation: Japan Chapter). [75] With the ideological polarization of Sohyo and Domei, the dominant feature of Japan's labor movement has been fragmentation and enterprise autonomy rather than unity and federational solidarity, thereby preventing them from becoming strong.

Notwithstanding Japanese organized labor's weakness and its limited power to influence public policies, however, politically weak and ideologically divided labor federations have nurtured a concerted formula of wage and benefit bargaining called Shunto (Spring Offensives). To circumvent difficulties in organizing one cohesive national labor federation, Sohyo leaders initiated Shunto in 1955 to orchestrate a joint offensive rather than a lasting federation in labor's attempt to ensure benefits from the growing economy. Although only eight industrial union federations were involved in its first year, Churitsuren joined a few years later. In 1960, Zenro -- which became Domei in 1964 -- adopted the same pattern of wage and benefit bargaining although it refrained from calling its activities Shunto, because of its rivalry to Sohyo. [76]

Shunto is a bargaining pattern in which the Shunto committee --comprised of representatives of Sohyo, Churitsuren and some Domei affiliates -- first issues a white paper on wages and benefits every winter. Domei unions not in the Shunto committee also time their negotiations to coincide with Shunto by issuing a similar document

around the same time. (More recently, Domei joined with the Shunto committee to form the Shunto Liaison Office). The committee then selects each year a lead-off union among those in a particularly strong bargaining position on the basis of its internal strength or for its pivotal position in the economy. Although a precise settlement is determined by bargaining between each enterprise union and its management, the settlement obtained by the lead-off union -- called Shunto Soba (Shunto standard rate) --tends to become the figure that serves as the starting point of wage calculations in determining what wage concessions are necessary to maintain employee morale and to protect enterprise union leadership. Thus, Shunto-plus-or-minus becomes the basis of each company's settlement against which union officials measure success or failure. [77]

Through this pattern of trans-enterprise solidarity, the Shunto has proven to be a powerful tool for Japanese labor in coordinating economic bargaining in an otherwise fragmented and divided labor movement. It has often worked not only as pressure on management to make wage and benefit concessions, but also to persuade other companies whose unions may not be part of the Shunto struggle to make prompt settlements along the lines achieved by the lead union since Japanese firms, particularly until a several years ago, are often poorly placed to survive a long strike because of the high ratio of debt financing and the crucial importance of maintaining a

given market share. In 1971, for example, 84% of organized enterprises and 50% of unorganized ones raised wages during Shunto season. [78] The number of workers directly involved in the Shunto committee itself has climbed from 800,000 in 1956, 6.5 million in 1964, 8.5 million in 1973 to 8.7 million in 1979. [79] Although only about 30% of the entire workforce is formally mobilized under the Shunto committee and/or the Shunto Liaison Office, the bunching of wage and benefit adjustments has much wider reinforcing and pressuring pattern effects, even to employers of unionized workers. [80]

With this pattern of coalition under the tightening in the labor market (even after the recession of the mid-1970s, there was a shortage of skilled workers in certain areas), Japanese labor has struggled hard to obtain not only wage increases but also the enhancement of job security, working conditions, and a host of other benefits including, health care, pension plans, retirement lump sum payment, housing, commuting costs, educational allowances, access to recreational facilities, and payments of other incidental expenses, such as births, marriages, and deaths of relatives. [81] In this manner, seemingly weak Japanese labor became a formidable force to the eyes of management and the elite hegemony.

Finally, not to be outdone by citizens' protest movements, the Sohyo leadership belatedly demanded the improvement in the quality of life by taking up the issues of

environment, health, welfare and social amenities and influenced the JSP's social policies by the latter also adopting the same policies since the two share the same leadership. When labor failed to achieve its bargaining potential during the mid-1970s recession, Sohyo began to take a much more visible and forceful assault on the elite hegemony. This focused on the issues of more immediate economic and social concerns to the masses (compared with the past strategy based on geo-political issues of neutrality, military, constitution, etc., -- to be discussed in the following chapter) under the banner of the Shakaito-Sohyo Burokku (the JSP-Sohyo Bloc). [82]

Gradual Decline of the Liberal Democratic Party's Electoral Support.

Finally, the fourth type of change in power dynamics to appear was in the relationship between the LDP and the opposition parties. The LDP has dominated Japan's national politics ever since its formation in 1955, establishing itself as the "party of government" following the merger of two conservative parties, the Liberal Party and the Democratic Party. The LDP's monopoly of power was made possible for the following reasons. First, the LDP exploited the rapid growth of the Japanese economy by taking credit as the party that brought unprecedented growth and recovery from the devastation of the war. The growth obfuscated the opposition's appeal of alternative visions of society based upon the ideologies of establishing a centrally planned socialist or communist economy. In this manner, the LDP attempted to minimize domestic political polarization. [83] J.A.A. Stockwin offered several reasons why the rapid-growth policy was the most natural policy for the LDP during the 1950s and 1960s: one, the high rate of growth enabled material wants to be satisfied in a way that took much of the wind out of the sails of the opposition; two, the rapid growth provided much the most attractive means of satisfying the LDP's own rather heterogeneous base of support because, although the growth benefited cities more immediately and directly than the countryside, it also provided revenues with which

the government could stabilize the prices of agricultural produce and thus prevent rural income from falling too far behind urban levels; three, by framing a political appeal in terms of the rapid accumulation of national and personal wealth, it was possible for government to play down more divisive political issues, such as those of the Constitution, defense, relations with China, the position of the emperor, education and the bargaining rights of workers in the public sector -- divisive issues not only between the government and the opposition, but also within the LDP itself where any contentious issue was capable of being exploited for the purpose of factional advantage. [84]

Second, like the labor movement, the opposition has been fragmented by the rivalry between the leadership of the JSP and the JCP dating back to the 1920s. This split derived from two different Marxist interpretations of the Meiji Restoration -- called the Rono-Koza controversy. The Rono school saw the Restoration as an incomplete bourgeois revolution but believed it to be possible for the working class to take over the reins of power without an intervening stage of revolution. On the other, the Koza school argued that it was not a genuine revolution and thus advocated a two-stage revolution (bourgeois-democratic followed by proletarian-socialist). While the Rono school influenced the left-wing of the JSP, the Koza had impact on the JCP.

Their strategic differences created a bitter rivalry and prevented the two parties from joining forces, despite their predominant Marxist orientation. [85]

Third, the JSP -- the largest opposition party -- has been fraught with a lack of internal cohesion due to ideological strife and personal rivalries among the leaders, thereby preventing the party from consolidating its power base and surpassing the LDP. In the postwar period, the JSP started as a coalition of several socialist factions. The two major factions were the right wing faction which followed the incrementalist-social democratic tradition and thus advocated a parliamentary process to gain power, while the left wing faction embraced a more radical, scientific revolutionary route. After splitting into two socialist parties in 1951 and rejoining in 1955, the party experienced two major defections. In 1959, the right-wing faction led by Nishio Suehiro broke away to form the Democratic Socialist Party. Then in 1977, a moderate group led by Eda Saburo left the party to establish the Socialist Citizens' League (later the Social Democratic League). In the period of increasing relative economic prosperity in general, the adhesion of the mainstream JSP leadership to radical Marxism prevented the party from broadening its support base beyond the Sohyo labor federation and from building a mass party rather than a class party. The lack of internal cohesion stemming from this adhesion induced two splinter parties, further fragmenting the opposition forces. [86]

Fourth, the malapportionment of electoral boundaries resulting from the population migration from rural peripheries to urban centers during the rapid growth era has favored the LDP. According to Stockwin, the value of one vote in the most populous constituency at the time of the 1979 lower house election was 3.9 times less than that in the least populous constituency. [87] No major redrawing of electoral boundaries has been undertaken because the LDP has the most to lose as there has been heavier support for the LDP in the rural areas and the opposition could not agree to any proposal for a fear that each would be the biggest loser. [88]

The LDP's lengthy dominance of parliamentary power notwithstanding, a close scrutiny of electoral trends indicates, however, that the opposition parties as a whole have not been as insignificant or powerless as many have suggested. [89] In conjunction with the social and economic repercussions of the nation's rapid industrial expansion, there had been a slow but steady decline in the LDP support from the 1950s to 1980. Although the JSP's share within the opposition forces shrank since 1955 because of defections and the subsequent creation of splinter parties and the relative gain of the JCP during the 1960s, the relative electoral strength of all opposition parties combined increased. Although it retained power, the LDP lost its majority in the House of Representatives between 1976 and 1980, and in the House of Councillors between 1974 and 1980, and since 1989. [90] (Table III-1) (Table III-2)

Table III-1: Trends of the House of Representatives, Elections, 1958-1990.

(%)

	LDP	NLC	JSP	DSP	SDL	KP	JCP	Other	Ind	Total
May		A 61.5		35.5				0.2	0.2	2.6
100										
1958	B 57.8		32.9				2.6	0.7	6.0	100
Nov		A 63.4		31.0	3.7			0.6	0.2	1.9
100										
1960	B 57.6		27.6	8.8			2.9	0.3	5.5	100
Nov		A 60.7		30.8	4.9			1.1	0.0	2.6
100										
1963	B 54.7		29.0	7.4			4.0	0.1	4.8	100
Jan	A 57.0		28.8	6.2		5.1	1.0	0.0	1.9	100
1967	B 48.8		27.9	7.4		5.4	4.8	0.2	5.5	100
Dec		A 59.2		18.5	6.4		9.7	2.0	0.0	2.3
100										
1969	B 47.6		21.4	7.7		10.9	6.8	0.2	5.3	100
Dec		A 55.2		24.0	3.9		5.9	7.7	0.4	2.9
100										
1972	B 46.8		21.9	7.0		8.5	10.5	0.3	5.0	100
Dec		A 48.7	3.3	24.1	5.7		10.8	3.3	0.0	4.1
100										
1976	B 41.8	4.2	20.7	6.3		10.9	10.4	0.1	5.7	100
Oct	A 48.6	0.7	20.9	6.3	0.4	11.2	7.6	0.0	3.7	100
1979	B 44.6	3.0	19.7	6.8	0.7	9.8	10.4	0.1	4.9	100

1983	B 45.8	2.4	19.5	7.3	0.7	10.1	9.3	0.1	4.9	100
Jul	A 58.6	1.2	16.6	5.1	0.8	10.9	5.1	0	1.8	100
1986	B 49.4	1.8	17.2	6.4	0.8	9.4	8.8	0.4	5.8	100
Feb	A 53.7		26.6	2.7	0.8	8.8	3.1	0.2	4.1	100
1990	B 46.2		24.4	4.8	0.9	8.0	7.9	0.5	7.3	100

Note: A % of total seats; B % of total votes. LDP-Liberal Democratic Party; NLP-New Liberal Club; JSP-Japan Socialist Party; DSP-Democratic Socialist Party; SDL-Social Democratic League; KP-Komei Party; JCP-Japan Communist Party.

Source: Compiled from data in various issues of Asahi Nenkan.

Table III-2: Trends of the House of Councillors, Elections, 1962-1990.

(%)

	LDP	NLC	JSP	DSP	KP	JCP	Other	Ind	Total
Jul	N 46.4		24.3	5.3	11.5	3.1	0.8	3.9	100
1962	L 47.1		32.8	7.3	2.6	4.8	0.2	4.8	100
Jul	N 47.2		23.4	5.9	13.7	4.4	0.8	4.6	100
1965	L 44.5		32.8	6.1	5.1	6.9	0.5	4.4	100
Jul	N 46.7		19.8	6.0	15.4	5.0	0.4	6.7	100
1968	L 44.9		29.2	6.9	6.1	8.3	0.2	4.4	100
Jun	N 44.4		21.3	6.1	14.1	8.1	0.1	5.9	100
1971	L 43.9		31.2	4.8	3.5	12.1	0.2	4.3	100
Jul	N 44.3		15.2	5.9	12.1	9.4	0.1	13.0	100
1974	L 39.5		26.0	4.4	12.6	12.0	0.6	4.9	100
Jul	N 35.8	3.9	17.4	6.7	14.2	8.4	6.2	7.4	100
1977	L 39.5	5.7	25.9	4.5	6.2	9.9	3.5	4.8	100
Jun	N 42.5	1.7	13.1	6.0	11.9	7.3	3.0	14.5	100
1980	L 43.3	0.6	22.4	5.2	5.0	11.7	1.1	10.7	100
Jun	N 35.3	2.7	16.3	8.4	15.7	8.9	12.7	-	100
1983	L 43.2	1.2	24.3	5.7	7.8	10.5	3.5	3.8	100
Jul	N 38.6	2.4	17.2	6.9	13.0	9.5	12.4	-	100
1986	L 45.1	-	21.5	4.6	4.4	11.4	2.6	10.4	100
Jul	N 27.3	2.2	35.1	4.9	10.9	7.0	12.6	-	100

1990	L 30.7	-	26.4	3.6	5.1	8.8	12.5	12.9	100

Note: N-national constituency, % of total votes. L-local constituency, % of total votes

Source: Compiled from data in various issues of Asahi Nenkan.

The LDP's power to initiate and carry out policies remained essentially intact, and notwithstanding the ideological and personal rivalries among the opposition parties, the opposition parties of the JSP, the JCP, the Democratic Socialist Party, the Social Democratic League, Komei Party, or even at times the New Liberal Club, forged a joint counter front to exert some influences on the LDP, however limited that might have been. The alignment among the opposition forces varied depending upon the issue, but such an issue oriented alignment did at times prove successful, particularly in 14 out of 16 parliamentary standing committees in which the opposition parties held parity or a majority between 1976 and 1980. [91] On those domestic social policy issues which had been adopted by progressive local regimes such as environmental protection and free medical care for the aged, opposition parties at the national level were often quick to attempt to replicate in national politics. [92] By the early 1970s, in fact, radical opposition parties had moderated their ideological rhetoric for revolution somewhat, and placed the foremost emphasis in their economic-industrial policies on the need to reduce pollution, to control land

speculation, to improve health and welfare, to control oligopolistic capital through nationalization of industries and banking systems. Most of these policies were shared not only by the radical JSP and JCP but also by the Komei Party and the DSP. [93]

The opposition parties' near parity with the LDP in the 1970s was heralded as hokaku hakuchu jidai (the era of conservative-progressive parity). Many saw this parity as a natural trend for the future, with the current reversal since 1980 as a temporary deviation. Those who believed that this parity represents a long-term trend suggested the arrival of rengo seiken jidai (the era of coalition regime) or tatoka jidai (the era of the multi-party sytem). [94] The Twenty-First Century Project Report stated that "the 1955 regime" -- the lop-sided LDP domination of the two party system of the LDP & the JSP since 1955 -- was eroding and coming to an end in the 1980s, although the precise form which would emerge thereafter might vary from minority LDP rule to any of a number of different coalitions depending upon political circumstances of the time. Through public opinion polls, this report projected that a more middle-of-the-road regime would rule the nation by the year 2000. [95] Whatever the term used to describe this phenomenon or whether it is perceived as temporary phase or longer-lasting trend, this parity of strength between the LDP and the opposition parties in the late 1970s combined to create the idea of forming an opposition coalition or a central-coalition which would include centralist members of

the LDP as well. Ideas of coalition government injected a great enthusiasm among the critics of the LDP and fear into the LDP and its allies. [96]

However, this phenomenon should not be interpreted as the absolute strengthening of the opposition parties or a big stride by one particular party. Instead, Muramatsu suggested that it should be seen as a trend in search of a new concept in political power through a reorganization and alignment of the opposition forces in response to the stagnation of the JCP and the weakening of the JSP to fill the field left open by the decline of the LDP. [97]

In sum, the postwar Japanese rapid growth policy based on the economies of scale strategy resulted in the consequences of urban congestion, environmental degradation and social overhead deficiencies. These domestic contradictions arising out of the postwar industrial policies gave rise to struggles among various social forces over the costs and benefits of rapid growth, thereby evolving the socio-political dynamics of the Japanese society. By the late 1970s, with the rise of citizens' protest movements on environmentalism, the growth of progressive regional regimes with reformist social policies, the emergence of the more coherent bargaining strategy of the Shunto by labor and the gradual but steady decline in the LDP's popularity and a

resultant talk of an opposition coalition also at the national level, the national elite hegemony could no longer assume its unequivocal power nor its permanency.

Under these circumstances, it was imperative for the elite hegemony to provide major concessions in order to sustain power and maintain its cohesion. Sensing this need, the LDP preempted by explicitly embracing the betterment of national welfare in their policy platform in the 1970s, as mentioned in Chapter I. [98] At the same time, the Industrial Structural Council assigned a more human face to industrial policies since the early 1970s and reaffirmed it in the Industrial Policy for the 1980s by pledging to improve the quality and comfort of life among its national goals.

This shift in emphasis in industrial policies hence represented the subordinate forces' rebuke against the elite hegemony's adhesion to the production-first policy based on the economies of scale route that was centered around the heavy/chemical industries. [99] More importantly, however, this shift reflected the elite hegemony's shrewdness in preempting and adopting some, but not all, of the subordinate forces' demands in their own policies, thereby minimizing polarization and sustaining their power and cohesion. The elite hegemony had to find a way to make major concessions without compromising their own interests. To do so, besides the growth-creating effect as discussed in the last chapter, the elite hegemony saw a shift in an industrial structure from that of pollution-prone heavy/chemical industries based on the economies of scale

strategy to that of knowledge-intensive industries (higher-value- added ones) based on the economics of scope strategy as "a catalyst to houseclean the economy", to borrow Ozawa's words, and improve the quality of life in Japan. [100]

Although there was a shift in rhetoric beginning in the early 1970s, the national government hardly acted accordingly and worsened all of the negative impacts of the earlier policy. Only when the postwar industrial strategy itself was under stress from internal contradictions between supply and demand and external factors of recession and trade surpluses as discussed in Chapter II, the vulnerability of the elite hegemony intensified sufficiently. Even its claim of high growth was challenged as the growth rate itself slowed and initial efforts to restore growth through increasing exports led to a reluctance to meet social demands by widening the market, causing consumers, workers and others to bear the brunt of structural adjustment in the 1970s, leading to even more social unrest.

IV. CASE 1: THE TECHNOPOLIS CONCEPT

1. Factors Inducing The Technopolis Concept.

As a part of the overall strategy to deepen the knowledge intensity of the economy and to improve the quality of life, the Japanese state adopted, in the Industrial Policy for the 1980s, the technopolis concept -- defined as high-technology-oriented industrial, academic and residential communities to be constructed in the outlying regions. [1] This concept was conceived from the Japanese elite hegemony's need to improve the nation's quality of life -- one of the three goals of the Industrial Policy for the 1980s -- while creating economic growth. It consisted of the redistribution of industries (replacing heavy industries by supposedly clean high-tech industries) and of population, thus alleviating such difficulties as pollution, urban congestion and high living costs in an era when progressive local regimes were increasingly gaining power vis-a-vis the national authorities as examined in Chapter III. To implement this concept, MITI established the Committee for Construction of Technopolis '90 and the National Diet enacted the Law for Promoting Regional Development Based Upon the High-Technology Industrial Complex (the "Technopolis Law") in 1983. [2]

This chapter will first examine why the Japanese state adopted the technopolis concept in order to grasp how the concept fits into the current national effort to transform the economy in a more knowledge-intensive direction as stipulated under the Industrial Policy for the 1980s. It will then look at Tsukuba Science City, formally called Tsukuba Kenkyu Gakuen Toshi (Tsukuba Research and Academic City) because Tsukuba is often treated as the prototype of technopolis projects. Although not an industry-led community as stipulated by the technopolis plan, but a public R&D/university-led science community started in the mid-1960s with massive national funds, Tsukuba nevertheless gives us some insights into the quality of life issues in a newly created high-technology-centered rural community. This is because the technopolis projects themselves are still in their infancy, thereby making it difficult to determine the quality of life there. Finally, this chapter will look at technopolis projects around Japan in order to assess the degree of success they have had thus far in being realized, in luring high-technology industries, and in stimulating local R&D activities. The impact they have on local revenues, employment, and the quality of life will also be examined.

Then, we will argue that there is no uniform pattern in the development of technopolises. The effects of technopolises have been both positive and negative as in the case of Tsukuba Science City. While the projects have generally stimulated R&D

activities in the outlying regions and created new technologies, often by inter-firm R&D collaboration, there have been varying degrees of success -- in luring high-tech industries, improving local revenues, creating employment, and enhancing the quality of life. The effects of technopolises, however, are not static and longer-term consequences, therefore, may not be evident for another decade or two.

Technopolises and Regional Balance

In one sense, the technopolis scheme is yet another attempt at regional development to restore an equilibrium in the nation's land utilization and population distribution. Yet, unlike past plans, this concept does not propose any major national expenditure. Rather, it calls for local government initiatives and for private sector financing. In part, this reflects the national government's attempt to trim the budget deficit in a context in which the growth of local revenues and employment could not be expected from the existing stagnating heavy industries. The national government was thus urging local authorities to encourage private sector-led regional development centered around high-tech industries. [3] It also reflects the national government's attempt, at the time of growing influence of regional governments, to delegate some initiatives to local governments without harming the cohesion of the national elite

hegemony. It thus sought to preempt the seizing of later initiatives by local governments and to minimize central-local conflicts. In this manner, the national elite hegemony hoped to maintain its dominance over regional governments. [4]

In the implementation of this scheme, while MITI selected projects among those initiated by local regimes and provided some very limited tax incentives and low-interest loans, it was entirely up to local regimes to initiate their own detailed plans and to bring in industries, academic institutes and research organizations, as well as to consolidate infrastructure and amenities. [5]

At a deeper level, the technopolis concept stemmed from the contradictions in the regional development plans of the high-growth era and the continuation of the essence of those plans in the development plan of the 1970s. The focus was thus on the redistribution of industries and of population by building high-tech industries away from major urban centers. The contradictions in the first and the second comprehensive national land development plans (zenso and shin-zenso) of 1962 and 1969 were that the dispersion of industries away from the three main urban centers (Kanto, Kansai and Chubu areas) led to the spreading of heavy/chemical industrial complexes along coastal lines embracing more cities and thus proliferating urban problems to extended areas without remedying those in the three centers. [6] By acknowledging these contradictions and stressing the limit to the growth of

metropolises, the third plan of 1977 (san-senso) proposed the rather vague idea of teijuken koso (the domiciliation concept) -- to create residential communities centered around less pollution-prone industries in a pleasant living environment away from congested urban centers. [7] When the Ohira regime came to power, it adopted den'en toshi koso (the pastoral city concept) by integrating the notion of improving the quality of life evident in the third plan into his regime's comprehensive national agenda setting in order to give further impetus to regional development. Although the pastoral city concept remained mere rhetoric, it was under this rhetoric that the technopolis projects were launched. [8]

The Ohira regime chose the technopolis projects over other possible policy options, such as doing nothing and letting the private sector determine entirely where high-tech laboratories and plants should be built, or by extensive national funding to create public laboratories and high-tech public corporations.

The idea of constructing pleasant communities away from congested industrial centers was also prompted by the U-turn phenomenon witnessed since the late 1970s -- i.e., the reverse trend in which those, particularly between the age of 25 to 29 in large urban areas, have been returning to rural cities lured by newly emerging jobs and a leisurely life-style. [9] It is because of this idea that jobs should be created where pleasant living conditions can be assured that some observers have described the new

pattern of industrial development envisaged in this concept as "jobs follow people" in contrast to "people follow jobs" as in the past. [10]

In fact, the attempt to decentralize population and industries is made easier by changing conditions for industrial location. Partly thanks to declining micro-chip prices, many high-tech products such as in the microelectronics, fine ceramics, fiber optics, and biotechnology industries are lighter and transportable by air at little extra cost and with time advantages. [11] Easy access to an airport (or building an airport which is much cheaper than building a harbor) instead of proximity to the sea has become the primary condition for locating plants, leading to the notion of rinku kogyo chitai (airport-side industrial belt) as opposed to the past rinkai kogyo chitai (sea-side industrial belt). [12] Since clean air and water are basic requisites for the semiconductor and biotechnology industries, plants in these industries have also tended to be located in less polluted distant regions. Kyushu island, one of the four main islands forming Japan, for example, has come to be called "Silicon Island". [13] Moreover, given the prohibitive cost of securing land at a time of fiscal restraint, national highway and railroad systems are not likely to be extended as rapidly as in the past. The focus of infrastructure in this regard has shifted more toward consolidation of airports, expansion of communication and information networks, and maintenance and upgrading rather than extension of highways and railroad systems. [14]

Technopolis and the Need for R&D Synergies

With regard to the main strategy of promoting high-tech industries so as to make the economy more knowledge intensive, there has been a heightened call for interpenetration of purely scientific and industrial research, for example, through joint R&D among firms, universities, and public laboratories at technopolises. [15] In this sense, the technopolis is envisaged as a means to induce R&D collaboration.

From the perspective of many regional governments, there is a need to decentralize R&D activities in order to narrow the regional gap in growth mainly created by the differences in knowledge intensities among regions. Accompanying industrialization, there was a concentration of knowledge- intensive activities in a few major urban regions, namely the Kanto and Kansai areas as well as a few other cities sprinkled around the country with a concomitant "brain drain" occurring in the rest of the country. Thus, in 1980 when the current industrial policy was revealed, 65% of the scientists, 48% of the engineers, and 55% of the university professors were concentrated in the above two main areas, and 78% of the private independent research organizations were located in the three major metropolitan centers (the above two plus Chubu). [16]

During the high-growth era, the difference between the fastest and slowest growing regions narrowed to 2.4 times because of the proliferation of plants, the growth of local industries, the redistributive fiscal policy, and the consolidation of external economies. However, this difference widened after the first oil crisis to 3.2 times and worsened after the second oil crisis to 6.9 times to the same level as in the mid-1950s. [17] MITI believed that this widened gap was not due to temporary causes but was deeply rooted in the structural differences --i.e., the growth of advanced processing and assembly-type industries (specialized metal products, electronics, precision-machinery and other high-tech industries) concentrated in certain areas vis-a-vis the stagnation of "basic resource" type industries (chemicals, oil-refinery, iron and steel, non-ferrous metals, etc.) and "local resource base" type industries (food, textiles, lumber, pulp and paper, ceramics, stones, etc.) elsewhere. [18] To restore balance among regions thus requires diffusion of R&D and high-tech industries.

It should be noted in this context that the technopolis concept has as a goal that high-tech industries are not to displace existing local traditional industries and indigenous crafts, but instead to establish a linkage between these and high technologies whenever that is possible, thereby making them more knowledge intensive. Particularly, in the current stepped-up effort in basic scientific research, a

proximity of R&D to provincial life-style or each natural environment is believed to yield certain advantages as a seed for new technology might be found in traditional craft techniques or natural surroundings, thereby inducing specialized know how and products. This is often referred to as kusano ne gijutsu kakushin (grass-root technological revolution). [19]

Technopolis and Industrial Structure

The technopolis scheme is also a response to a number of new needs in Japan's society and economy. For example, it is needed to revitalize the small- and medium-enterprise (SME) sector by stimulating the growth of start-up companies. As envisioned in the Industrial Policy for the 1980s, a new enthusiasm has emerged over this sector as a source of vitality expected to grow significantly in the higher-value-added industrial structure of the future, despite problems faced by many small firms in stagnating industries. [20]

According to Imai, two trends in particular seem to explain this enthusiasm. First, new opportunities for the creation of firms have opened up. During Japan's high growth era, Imai argues, the vertical multiplication of the division of labor progressed mainly through "backward breeding" -- i.e., the related effects triggered by demand

for a specific product, such as multiplying of a parts-related division of labor triggered by the demand for automobiles. In this process in Japan, a large number of small firms was born on the periphery of each large firm, supported by the growth of the "parent's work" -- the so- called "dual structure". This process came to an end when all the work of the "parent" had been completely segmented as this process had no mechanism which could generate further multiplication. But the new phase of technological innovation has brought this feature of the Japanese economy into greater relief as there is now more "forward breeding" -- i.e., a horizontal multiplication seeking uses for newly developed products and technologies. for example, when large-scale integrated circuits (LSIs) were developed, machine tools, measuring instruments and medical equipments using them mushroomed, giving birth to specialized makers in the respective markets; the work of these specialized makers was further segmented, leading to a new stage in the division of labor. [21]

Second, in contrast to the theoretical assumption since J. Schumpeter of the positive correlation between the size of the firm and R&D performance, there is a new hypothesis -- i.e., smaller firms have some advantages over large ones for their flexibility and marketability. [22] In the highly industrialized affluent society of today where people's needs have greatly diversified, consumer demands dictate ever higher quality of goods and services of greater variety and specialty rather than

standardized mass-produced products. Under these circumstances, smaller firms may have certain advantages in the following ways. First, the smaller scale of production gives them the flexibility and maneuverability to respond rapidly to changes in technology and in demand. Second, younger entrepreneurs (prevalent in start-up firms) possessed of business acumen and specialized know-how are more willing to shoulder the risks associated with the invention stage which often leads to product innovation, while more of the large firms' innovation tends to be process innovation. Third, personal rewards for innovation are in general proportionately greater for smaller firms. [23]

According to Imai again, in the case of small-scale segmented types of technology, the factor determining the effect of technological innovation is the size of the "system" related to the process of acquiring knowledge for the development rather than the size of the firm itself. [24] Therefore, he contended, an individual's creativeness in a small venture-type high-tech firm can yield decisive influence as long as it is augumented by the accumulation of established knowledge and know-how in society. [25] In other words, smaller firms can overcome their limited size if they exploit the economies of scope at the societal level. [26]

In short, the Japanese state introduced the Technopolis concept in the Industrial Policy for the 1980s because of a need to deepen the knowledge intensity of the economy, to improve the quality of life, to delegate some initiatives to local authorities, to strengthen basic scientific research, to locate new high-tech industries in a cleaner environment, and to stimulate growth in the outlying regions, particularly to revitalize small- and medium-sized firms. This concept was shaped, therefore, from the contradictions emanating from the nation's past industrial and regional development plans. Yet, there is a contradiction in the way the technopolis concept has been realized. On the one hand, due to a rising national budget deficit the past pattern of regional development in which large national fiscal expenditures took place was replaced by that of private-sector financing. This, in turn, was to take place under the initiatives of local governments against the backdrop of the relative rise of power of local authorities vis-a-vis the central elite hegemony. However, full control was never given to the local regimes. MITI retained its power to select technopolis locations and make other regulatory guidance. In this manner, the national elite hegemony maintained its control in the new regional development plan -- significant because of the ruling LDP's heavy dependance on rural constituents as its power base.

By creating R&D-intensive communities in rural areas through agglomerations of industries, academic institutes, research organizations, residential quarters,

conference halls, and communication and information networks, the Technopolis concept aimed to spread industries, population and R&D. The underlying assumption in this concept was that technopolises would inject new competition and stimulate growth in local economies and create a more knowledge-intensive economic structure as a whole. By encouraging collaboration of R&D activities among firms and across sectors as well as between industries and university or research laboratories, the capacity to maximize know-how and information was believed to be enhanced, and the emergence of new technologies, the "creative fusions" of existing technologies as well as the new venture business would be created. At the same time, the better living and working environment were believed to be achieved as urban ills were to be mitigated. In addition, by delegating initiatives to local regimes, the national elite hegemony would be able to ensure the implementation of its industrial policy nationwide. For these reasons, the Industrial Policy for the 1980s heralded this concept as a "new model of regional development for the 1980s and beyond". [27]

2. Tsukuba Science City.

Tsukuba Science City was conceived by the LDP regime in 1961 and approved by the cabinet in 1963. There were two main objectives involved in the establishment

of Tsukuba. Firstly, the LDP government sought to relocate some of the national scientific research activities away from overcrowded Tokyo so as to provide more space to cramped research facilities, and to strengthen the nation's indigenous research base in general. Secondly, it sought to neutralize students' radicalism of the 1960s by relocating the Tokyo University of Education, one of the main hubs of the student movement, and by introducing a "new approach" to tertiary education which students had come to demand. [28]

Although Tsukuba is not part of the 1980 technopolis project, this section will nevertheless examine the quality of life in Tsukuba because it has been the only newly created "science city" in existence for some time already. Tsukuba, moreover, is often regarded as the prototype of Japan's future high-tech community envisaged by the technopolis concept.

Situated about 60 km northeast of Tokyo in Ibaragi prefecture, Tsukuba consists of 1,700 buildings spread over more than 28,500 ha. (about half the area of Metropolitan Tokyo). After 17 years of slow preparation and construction, the city finally sprouted into shape by 1980. As of February 25, 1989, Tsukuba housed two national universities (with two more colleges planned), 47 public research institutes (most of them transferred from Tokyo), and 91 private research laboratories and R&D-oriented industrial plants (with 65 more planned). The city was staffed with

7,000 researchers (2,500 with a Ph.D.) and 4,000 supporting staff. About 40% of nationally funded natural scientists were in Tsukuba. Of the 220,000 planned population, about 160,000 settled. More than 1.5 trillion yen of national funds was expended in twenty years, and the annual research fund for these public institutes runs to over 150 billion yen. [29]

What type of community is Tsukuba turning out to be? Those who believe that Tsukuba is a proto-type of the city of the future emphasize its rich amenities from wide open space, clean air, numerous natural and planned parks, uncrowded wide boulevards, promenades and bike paths, state-of-the-art sports complexes, conference halls, concert hall, libraries, to videotex hookup, town-wide central heating, air-conditioning, and vacuum garbage systems buried underground. [30] By most accounts, Tsukuba qualifies as a city planner's architectural antidote to the ills of Japanese modern cities. Its 94 natural and planned parks translate into 10 square meters per capita of park area, which is about five times that of Tokyo and about twice the national average. [31]

The low cost of land is a genuine appeal. It was reported that a 245 square yard plot that cost US$81,000 (200 yen to a dollar) in Tsukuba in 1985 would have cost at least US438,000 in the suburbs of Tokyo. [32] The difference is believed to have widened within the last few years because land prices in Tokyo have more than

doubled on average while land prices in Tsukuba have risen by about 30-50% during the same period. [33] Needless to say, commuting within Tsukuba does not present the type of physical difficulties as in the Tokyo area. A new Japan Railway line planned to start around 1995 will reduce commuting time to and from Tokyo by half from the current 100 minutes, making it possible for more people to live in Tokyo and commute out to Tsukuba and vice versa. [34]

But the above factors have failed to impress many actual and potential residents. Because of Tsukuba's scientifically engineered environment, many residents have complained that they do not feel at home. They found Tsukuba sterile, boring and lacking in culture and character, as one scientist expressed it, "I feel spiritually disjointed here". [35] Some observers have attributed several suicide cases to the absence of a human touch at Tsukuba, though the overall suicide rate does not exceed the national average. [36] Critics argue that, because there are only scientists and bureaucrats at Tsukuba, it lacks the diversity of people that cities normally have. They are anxiously waiting for the planned arrival of the branch campus of Tokyo University of Arts, which they hope, might lead to a marriage of arts, music and sciences to the atmosphere of the community. [37]

Despite the existence of the U-turn phenomena in Japan, the efforts to make Tsukuba a "real city" by luring more department stores, brand name shops,

restaurants, movie theaters, bars, bistros, discos, etc. have yet to convince everyone because as one observer has put it, Japan's "driving force" crowd of researchers and high-tech engineers in general are predominantly "city folks" or at least "edge-of-the-city folks" who will not necessarily be satisfied with a rural environment. [38]

In addition, there are many of those who are committed to having their children continue their education without the problem of transfer, particularly in major cities where, they perceive, children can better prepare for "the entrance exam hell" to better known high schools and universities. They have elected to move to Tsukuba alone, leaving families in big cities and returning only on weekends, thus joining the ranks of "Tsukuba bachelors". Approximately 10% of the people hired at Tsukuba have chosen to do so. [39] This is a relatively high rate in view of the fact that the other 90% includes many of those who are naturally single. Needless to say, a divided family-life has given them not only psychological strains but also financial pressures since employers normally subsidize only one house.

In order to put Tsukuba on the map and to justify massive infrastructure spending as well as to propagate the nation's civilian emphasis on science and technology, the national elite regime staged an international science exposition on one portion of Tsukuba in 1985. [40] Besides 8.4 billion yen net profit, the exposition

helped to bring in local public transportation systems, stores, publicity (both positive and negative), and the research arms of several major firms. [41] The cost of the exposition to the local community was by no means small, however. Not only were there 13 bankruptcies in the expo-related business totaling 14 billion yen, the sudden surge in the size of retail business in the area (2.5 times rise in floor space) has left serious loss of business in Tsuchiura City several kilometers away -- the latter problem is expected to remain as Tsukuba retained most retail stores. [42]

The national government provided a special fund of 500 million yen in total annually to offset these costs up to 1985, but now that the construction of Tsukuba is completed this fund has been closed. Tsukuba must now rely on the regular prefectural budget and local revenues which they are not very optimistic about in view of the fact that the population and industries have not grown as fast as expected. [43]

Some of the local residents have complained of alienation because of the changed face of Tsukuba, from a tranquil countryside with rice paddies and cabbage patches to a planned city of ultra-modern buildings and manicured trees and bushes. They also find urbanite new comers distant and indifferent to their community's concerns. [44]

It appears clear that Tsukuba has provided better facilities and more space to many scientists than overcrowded Tokyo. But under the circumstances as examined

above, and if these prove to be not just transitional conditions, the quality of life in Tsukuba can hardly be described as an improvement for all. As one observer puts it, Tsukuba is something like a gigantic egg under incubation not expected to hatch until sometime in the next century. [45]

3. Technopolis Projects.

In 1984 MITI designated 19 locations where technopolises are to be built by 1990 and it has added 7 more since to include all the regions that wished to be so designated on the basis of the following criteria:

- Each site is within reach of a provincial city of over 200,000 people who can be mobilized in the establishment of the technopolis (core city).
- It is within a day's trip to three major cities (Tokyo, Osaka and Nagoya).
- The area is to be 800-1,000 ha.
- It is to have a population of about 50,000 upon completion. [46]

While all seek to lure various types of high-tech industries, many regions chose a leading field which can be directly connected to their local tradition, academic achievement or natural surrounding with the expectations of creating new technology

and products. Notwithstanding the above criteria, most technopolises extend to much larger areas and populations embracing the core cities within the area. (See Appendix IV for a list of these locations.) Local regimes lobbied hard for designation with the expectation of receiving subsidies, gaining local prestige, luring high-tech industries, and creating multiplier effects on local revenue and employment. Are these expectations justified? Notwithstanding the "technopolis fever", some sober observations and criticisms surfaced from the outset.

Initially, it was reported that even MITI was perplexed by the degree of local enthusiasm. [47] Some observers were concerned that, by designating 19 instead of two or three as originally planned, the limited public funds available might be spread so thin as to be ineffective. [48] But the fundamental problem was that many local authorities rushed to the idea with a "jumping on a bandwagon" mentality. [49]

As discussed above, unlike the past regional development plans and the case of Tsukuba, there was no large national chest set aside for these projects in the era of fiscal restraint. By euphemistically characterizing the scheme as "private sector-led regional development by local initiative", MITI expected the bulk of the costs to come out of industries attracted to the regions. [50]

According to one rough estimate, each project is expected to cost in the vicinity of 500 billion yen. [51] Up to now, the annual related budget has been in the range of

1.5 billion yen and annual tax incentives to local governments have been limited to only about 1 billion yen. [52] At this writing, it is unlikely that the additional funds needed to realize the plan would be forthcoming from the national budget. [53]

For the regions which sought to gain prestige from being designated a technopolis, their initial moral boost has been eroded by competing plans, such as Kanagawa prefecture's "Cultural-Industrial Zone" and "Academic New Town Concept". [54] Moreover, MITI designated five regions --including Hamamatsu, which is also a technopolis -- for the promotion of scientific research and the software industry under the Zunou Richi Ho (Brain Industry Location Law) of 1988. [55] All these regions have to compete when luring high-tech industries.

Evaluating the Technopolis Project: Luring High-Tech Industries

The progress in building technopolises around Japan is marked by unevenness to date. While such regions as Kumamoto, Kenboku-Kunisaki (Oita), Kagoshima, Hamamatsu (Shizuoka), Toyama, and Utsunomiya, in particular, are proceeding smoothly as planned, others are slower to realize their plans. For example, as of March 31, 1989, Kumamoto technopolis -- widely regarded as the most successful technopolis -- lured 163 firms (68 firms in the high-technology sector) since the

designation and its FY1990 production output target of 1,170 billion yen was already exceeded in FY1989. [56] Corporations such as Nippon Telegraph & Telephone's software development center, Fanuc, NEC, and Toshiba as well as such local venture firms as Sakaguchi Reito (electronics), Saishun-Kan Seiyakusho (pharmaceuticals), and Focus Systems (software) have moved into Kumamoto technopolis. [57]

Similarly, as of March 31, 1989, Oita technopolis has attracted 49 firms (25 firms in the high-technology sector) since the designation and its FY1990 production output target of 647 billion yen was also exceed in FY1989. [58] Newly built plants in Oita technopolis include such giant corporation as Toshiba, NEC, Texas Instruments, Fujitsu, Sony, Fanuc, and Canon as well as smaller local venture business such as Tenken Engineering (software), Takaki Gikou (IC), and Ishii Kosaku Kenkyujo (ultra-precision machinery). [59] The March 1989 announcement that Toshiba Oita plant will start mass producing 4M DRAMs, with an increase of 700-1,000 workers, has given a boost to Oita's position as a successful technopolis. [60]

Owing to its proximity to the Tokyo area, Utsunomiya Technopolis has succeeded in attracting one of the biggest private R&D centers -- i.e., one of five main Honda research centers. With 3,000 researchers, it undertakes extensive R&D. [61]

In contrast, Ube (Yamaguchi) and Kurume-Tosu (Fukuoka & Saga), for example, are just beginning to put their plans into shape. The delays were caused

mainly by the revaluation of the yen since the Plaza Accord of 1985. The higher yen not only cut down Japanese exports but also pushed many firms to relocate production facilities abroad and rationalize domestic production. This had slowed domestic plant relocations, thereby retarding the construction of technopolis projects. [62] Things began to move since 1987 owing to domestic demand expansion created by private capital investment and consumer spending.

In building technopolis, initial industrial and academic bases were vital factors determining the early success or delay. [63] While the semiconductor industry was already highly visible in Kyushu regions, such as Kumamoto, Oita, and Kagoshima, there was little accumulation of what can be termed as high-tech industries in the Ube and Kurume-Tosu regions. Kumamoto prefecture began to attract plants of major electronics concerns in the late 1960s and by the early 1983 possessed 42 semiconductor plants -- about 20% of the nation's share in the output. [64] Kumamoto, Oita, and Kagoshima regions, nevertheless, sought designations in order to maintain their positions as high-technology centers outside the Kanto area (surrounding Tokyo).

The Ube area and the Kurume-Tosu area, on the other hand, had to start from scratch since the former was heavily dependent upon the petrochemical industry and the latter was concentrated in rubber-related industries directly or indirectly linked to Bridgestone Tires (60% of Kurume city's production output). Since these basic

materials industries are often self-contained in production processes not requiring parts subcontractors as in the electronics or automobile industries, neither area possessed a high-tech industrial base. The emergence of high-tech industry did not occur in either place until 1984, when Ube Kosan, a large Ube petrochemical concern, created Yamaguchi Fine Chemicals, a joint venture with Takeda Pharmaceuticals, to manufacture drugs, and Kurume-Tosu officials brought in Hitachi Software Engineering. [65]

Or in the case of Hiroshima technopolis, although it was successful in luring 47 firms, only six are in the high-tech sector. Their difficulties in attracting high-tech firms derived from their distance to the information-intensive Kanto area and its absence of a concentrated of semiconductor industry like the aforementioned Kyushu regions. [66]

Moreover, the role of academic institutions seems clearly an indispensable component in disseminating knowledge-intensive industries. One NEC official noted that, in their attempt to build "software development bases" around Japan, they would only select areas where there is a science-oriented college or university to tap local talent. [67] Here again, Kumamoto was well endowed with R&D facilities when designated. Besides four universities, several colleges, and a prefectural laboratory in the vicinity, there is also a noted genetic engineering institute called Kaketsuken --

among the few world-wide to have succeeded in the production of a vaccine for B-type hepatitis by the mid-1980s. [68]

In contrast, Ube technopolis lacked a science-oriented academic institution. Acknowledging this weakness, Ube officials had to lure the electronics engineering and materials engineering departments of the Tokyo University of Sciences, which were searching for more space. [69]

Yet, the existence of an academic institution alone does not ensure a proliferation of knowledge-intensive industries. For example, Sendai in Miyagi -- designated in December 1986 -- has one of the top national universities in Japan, Tohoku University. Conspicuously missing in Sendai so far are high-tech industries due to the lack of local initiatives, both private and public. [70]

Meanwhile, in the case of Yamanashi technopolis -- designated in February 1988 -- a difficulty in securing land has already delayed the development of the "Eastern Industrial Subdivision" including the building of "Innovation Park" which is expected to serve as a software development center. This trouble made it more difficult for the prefectural officials to convince industries to relocate in Yamanashi technopolis. [71]

Research Consortia

One of the notable outcomes of the technopolises which helped induce knowledge-intensive activities is an emergence of inter-firm R&D consortia at a regional level. According to the MITI survey, research consortia in technopolises rose from 155 cases in 1984 to 219 in 1985, 244 in 1986, 304 in 1987, and 310 in 1988. [72] In most technopolises, the regional governments have been bringing together local businesses, universities, and public laboratories to create inter-firm technology consortia to overcome limited resources of local firms. As discussed above, these consortia are viewed as significant in creating and disseminating high technology in the current era of intense and rapid technological changes.

Indeed, research consortia in many technopolises are creating new technologies and products. Here again, Kumamoto had an early lead. In the early 1980s when seeking a nomination, Kumamoto authorities created several fora on joint R&D: the Kumamoto Society for Research on Semiconductor Technology Applications involving 23 firms, three universities and two technical colleges; the Society for the Promotion of Biotechnological Research involving a staggering 260 firms (divided into many groups for different areas of research), four universities and the prefectural and municipal research arms; the Kumamoto Council for the Promotion of Information Industry involving 34 firms, four universities, two technical colleges, Nippon Telegraph & Telephone and the prefecture and municipalities, the Kumamoto

Association of Industrial Tools involving 28 firms and the prefectural laboratory; and the Kumamoto Plaza for Technical Exchange involving 30 firms. The intensity of research activities and stature of the 46-member Prefectural Industrial Laboratory was enhanced not only by housing most of the above associations' secretariats but also a research budget that tripled in the initial two years (350 million yen in 1981 to 1.2 billion yen in 1983) to help upgrade the technological standard of local small-and medium-size firms. [73]

To further consolidate R&D collaboration, the Kumamoto government created the Kumamoto Technopolis Foundation with a 4.2 billion yen fund (2 billion yen from the private sector) in November 1983 as soon as designated. The Institute of Technology for the Application of Electronics Machinery was established out of this fund in March 1985 and began joint research with the engineering department of the University of Kumamoto. This institute expects to have about 180 engineers by 1990 with an annual budget of 650 million yen. [74] The Foundation sponsors various lecture series on high-technology and management training in order to nurture local entrepreneurs and to induce new technology. [75]

Assisted by the Foundation, joint research under the Society for the Promotion of Biotechnological Research, in particular, has led to such new technology as mass

production of LP gas from micro-organisms, the commercialization of mandarine orange brandy, and the continuous fermentation technology of yeast systems, etc. [76]

In Kagawa technopolis, joint research among the Prefectural Industrial Technology Center and two local firms -- Nagamine Seisakujo (a metal frame maker) and Takamatsu Ceramics -- has helped to develop new ceramics for construction and electronics at a cost of about 41 million yen. They were expected to be commercialized soon as of Spring 1989. [77]

In Hamamatsu technopolis, Hamana-Ko Zuno Center was established in April 1989 with funds from Shizuoka Prefectural Government, Hamamatsu City, and Hamamatsu Chamber of Commerce. It began collaborative research on factory automation of small-medium firms, a voice synthesizer system and vision processing system, as well as training system engineers and building of international information data base. [78]

Also in Hamamatsu technopolis, Nihon Automation, a local venture firm specializing in sensors, is taking a lead to bring together 10 firms across different sectors to start a research consortium on unspecified but multiple new technology and products (to be decided as research collaboration proceeds) by creating synergies among the sectors represented. [79]

In Kooriyama technopolis, 10 electronics firms, all subcontractors to major electronics companies, were united to develop and commercialize new products, still to be chosen by the 700 employees of these firms, in order to get out of subcontracting. Their efforts are assisted by the Fukushima Prefectural Industrial Laboratory and Technopolis Promotion Organization. Their search for independence was prompted by the major electronics companies' current propensity to shift production overseas due to the higher yen, or increasing in-house production owing to further automation. [80]

In Hakodate technopolis, 20 local firms from different sectors, with the help of Prefectural Industrial Technology Center, have created the "New Technology Development Saloon" to undertake joint research in new materials, vacuum machinery, opto-electronics, and biotechnology. This is an attempt to shift the business base of Hakodate from such traditional businesses as warehousing and apparel to high-technology. [81]

In Toyama technopolis, 14 local companies in various industries created the Integrated Information Center in April 1989 with the help of the prefectural government to develop software and information related technologies. [82]

In Ehime technopolis, "Incubator 21" -- a research consortium of 13 local firms from various sectors, assisted by a venture capital company affiliated to a local bank -- has already produced a self-heating bath tub using ultra-red rays. [83]

In Utsunomiya technopolis, the University of Utsunomiya and 70 local firms have established the "Academic and Industry Joint Research Center" which acts as a base for joint research, production, and distribution. [84]

As examined above, the research consortia in technopolises around Japan are mostly R&D consortia of smaller local firms that have collaborated for the first time rather than that of leading corporations collaborating for a long time. They are either trying to shift away from their stagnating traditional businesses and/or are trying to become independent from subcontracting, or newer firms attempting to succeed in venture businesses. Moreover, although some consist of firms from the same industry, many are cross-sectoral research consortia aimed at creating new technology and products from synergies among various industries.

It must be noted that the proliferation of high-tech plants in rural regions does not automatically lead to a dissemination of knowledge-intensive activities. For example, in the Kagoshima technopolis, although Kyocera's 2800 worker-plant created a R&D center with 150 researchers and it has since become one of the three most prominent fine ceramic and semiconductor labs in the world, the Sony plant in the same city undertakes no local R&D and relies entirely on R&D carried out in its Atsugi main office in Kanagawa prefecture, receiving technical guidance and information through the most advanced communications system. [85]

Impact on Local Revenues

The extent to which industries lured to a region contribute to local revenue varies among firms and regions over time. The example of Kokubu city in the area of Kagoshima technopolis is illustrative. Whereas corporate taxes from Kyocera's semiconductor plant have greatly contributed to the city's revenue, those of Sony's semiconductor plant have helped much less because of being merely an assembly plant with small profit. Yet, municipal property taxes from both plants amounted to little so far due to special tax incentives and depreciation allowances. [86] Inoue Yoshio and Ito Koretoshi believe that most firms in technopolises are evading about 60-70% of their income tax because, in high-technology areas, they can depreciate plant and equipment in three years. [87]

In the intense competition with other regions to draw industries and workers, local regimes are compelled to provide incentives with the expectation that future revenues will offset current costs. While some local regimes seem to be containing fiscal burdens of the projects relatively well as in Kumamoto and Kagoshima in particular, others have over-extended themselves by providing generous incentives, most notably in Oita, Akita and Nagaoka. Mainly due to the rising revenue from

high-tech industries settled in the area as well as the local bonds, Kumamoto prefecture has managed, without a major controversy, to absorb 8 billion yen spent to improve "soft" infrastructure like the theater, arts and crafts museums, sports complexes, etc., near the technopolis site to attract potential U-turners (those returning to their home towns). [88]

In Oita, Akita and Nagaoka, on the other hand, for example, local communities are shouldering the fiscal burdens with great concerns that technopolis may be benefitting only a few and other social services might have to be sacrificed as a result. To attract a Canon plant in 1981, Yasuki Township in Oita spent a total of 1.4 billion yen on land and infrastructure, while Canon was only obliged to pay 544 million yen. The latter was also provided with special tax write-offs for the first three years of the operation. To cover this revenue shortfall, the town relied not only on a 400 million loan from the prefecture but it also had to issue local bonds amounting to 779 million yen in 1981. Since the town had just undergone fiscal reconstruction after the crisis in 1975, an outburst of criticism erupted over the extent to which the Canon deal was jeopardizing the balance between social services and local development. [89]

The above difference in fiscal circumstances between Kumamoto and Oita derive mainly from the fact that, while Kumamoto's top earning product is already a high-tech product -- integrated circuits -- Oita is still heavily dependent on the

agricultural sector (top four products in the agricultural sector) with high-tech products amounting to much less. Because of this agricultural base, Hiramatsu Morihiko, the former MITI official turned Oita governor (Independent), placed urgency on industrial development as well as agricultural adjustments by taking personal charge in soliciting the designation of technopolis from MITI and advocating the "one industrial product and one agricultural product for each village" campaign -- i.e. each village to attract at least one high-tech industry and to cultivate one kind of higher-value-added specialty agricultural product which can be flown and sold at premium price to urban consumers. [90]

On the other hand, the Kumamoto governor (LDP) staked his tenure on his effort to improve welfare services, the environment, and programs for the aged by calling the technopolis a "community of intellectual inspiration" where Kumamoto expatriates can return to seek intellectually fulfilling work in the high-tech sector with a better quality of life. With research and industrial components of technopolis consolidating steadily without fiscal deficits, Kumamoto officials are confident that they are able to afford more attention to the amenities and needs of local residents. [91] It was not surprising under such circumstances that public controversy over fiscal burden of technopolis erupted in Oita but not in Kumamoto. [92]

The difference in fiscal circumstances between Kumamoto and Oita has also contributed to the contrasting strategies toward interfirm research consortia. Like other technopolises, the Kumamoto government initiated and paid a portion of the cost for various joint research efforts among firms and prefectural laboratories to create new technologies and products. As seen above, research consortia in Kumamoto have brought about some tangible results. [93] In contrast, partly constrained by tight budgetary reasons, the Oita authorities underplayed the importance of interfirm research consortia. They argued that firms in the highly competitive high-tech sector would not like to share proprietary information, although businessmen took an initiative to create a liaison council on inter-industry R&D but with no concrete results so far. The officials were convinced that trade secrets, an agrarian economic base, and a rural life-style would be better kept by segregating and scattering industries among farms. [94]

Meanwhile, to attract large corporations, Nagaoka city was selling 1 tsubo (3.305 sq. meter or 3.952 sq. yard) of industrial land priced at 100,000 yen, for only 60,000 yen if more than 10,000 tsubo was purchased as one plot. [95] The city is also expending massive funds to construct a housing development equipped with such modern facilities as the town-wide central vacuum garbage system like the one in Tsukuba -- this system alone is costing the city 2 billion yen. But unless people move

in as soon as each subdivision is built in stages up to 1995, the city would have to cope with unsold land and houses. Critics doubt whether the city would be able to fill all 10,000 units in view of the fact that the growth of the population from newly arriving industries is not likely to reach 40,000 (plus another 40,000 expected in Nagaoka city itself) by 1995. It is apparently unlikely that many neighboring residents will move into this development unless financial incentives are given as they are more expensive than the ones available in the area. [96]

Impact on Employment

The impact on the employment growth from new industries is mixed. Although to what extent the above local strategy has had influence is unclear, Oita has experienced a disappointment in the relatively small numbers of jobs created by the aforementioned Canon plant. This is mainly due to highly automated production processes, using computers, robotics and numerically controlled machine tools, etc. [97] Although some local residents in Yasuki township are delighted that there are more younger people now --particularly a local car dealer saw a sharp rise in his business -- as a result of "The Canon plant", others are disillusioned that 365 Canon employees are merely equivalent to another medium-size-firm. They do not expect that

this plant and other new industries in the region would create enough jobs to bring back to this town the 5,000 people which it lost from the late 1950s until the early 1980s (the population decreased from 15,000 to 10,000). [98]

Meanwhile, a labor shortage has been experienced in many of the designated regions. For example, 1,000 employees in the Sony plant and 3,000 employees in the Kyocera plant at the Kagoshima site already tightened the labor market since mid-1970s, making it extremely difficult for Fujitsu and Yamaha as well as local small firms to secure workers. [99] Younger people, in general, prefer to seek employment in the service sector in bigger cities rather than at factories even though the factory is high-tech and the living conditions are better. Even when jobs are created by high tech industries, aside from some R&D-related professional jobs, the rest seem to be concentrated in relatively mundane plant work. These firms' difficulties in securing workers have made them further dependent on automation. [100]

The economic boom since 1987 created by higher personal consumption and corporate capital investment has intensified the labor shortage, particularly of younger people, pushing down the unemployment rate from 2.8% in 1986 and 1987 to 2.5% in 1988 and 2.3% in 1989. (Table II-6) In order to overcome labor shortage, Toyama prefecture, for example, established a special task force to ensure a sufficient number of engineers and workers for their technopolis. "U-turner Information Center" were

created in Toyama's Tokyo, Osaka, and Nagoya offices to attract back former Toyama residents. [101] Similarly, Kurume-Tosu Technopolis Technology Promotion Center has established a system to match local firms with those who would like to return to the region. But in 1988, only 10 people were found through this system, leaving 28 local firms desperately seeking more engineers. [102]

The situation has become serious in Kofu where the NEC computer plant under construction has already reserved 200 engineers graduating from local universities and returning to the region. This put a strain on smaller local firms to secure enough engineers. [103]

Quality of Life

While all technopolises are consolidating new housing development, Kumamoto is the best example for paying attention to amenities and welfare of the residents for the reasons discussed above. [104] As in Tsukuba, it is still possible to purchase a decent size house in any technopolis area for half or even a quarter the cost of those in the major urban cities. Commuting to work in general seems considerably easier, too. One researcher in a private lab developing gallium arsenide wafers in Akita is delighted with his new lifestyle in which it takes him only five minutes to get to work

by car. This has meant that he can return to the lab whenever he is inspired by the slightest new idea, even at night. He is also relieved of big city hassles, convinced that a truly innovative discovery or invention does not necessarily come from urban crowds. [105] His new-found joy is not always shared by others, however. Although still much lower than those in large cities, a steady rise in land prices has been observed in most of the designated regions, making it more difficult for local people who planned to purchase a home and enriching those who stood to profit handsomely from selling land. [106]

Moreover, even local traffic is already a problem in some areas. During commuting hours, the residents in the areas of Nagaoka and Hiroshima technopolises face daily traffic congestions on national route 34 and 54, respectively. [107] Except for those areas where new transportation systems are planned like Akita, Nagaoka, Hamamatsu and Kurume-Tosu, a serious reexamination of local transportation systems is called for.

In some cases, life in a rural technopolis may have an added burden. Nagaoka's notorious snowfalls cost each household an average of 63 hours of labor and 90,000 to 210,000 yen extra annually.[108] Fully conscious of the difficulties which some urbanites may face in adjusting, many prefectural offices are actively courting natives from their regions currently working in large cities. Like Toyama, Kumamoto has

placed "U-turn advisers" in their Tokyo and Osaka offices, head-hunting those with expertise.[109] The experience at Tsukuba indicated, however, that those who are so accustomed to the excitement of a big city life style often prefer to live in a smaller house in a big city and commute longer hours rather than move into a much larger house closer to work in rural community regardless of various amenities. This is the reason why many people have turned a deaf ear to "U-turner" programs.

For those who are willing to move away from large cities, therefore, the technopolis scheme may offer a chance to pursue a life-style closer to their liking. For local residents, it may offer a chance to seek a new career opportunity closer to their hometown. For them, it may be an improvement in their quality and comfort of life. But for those who prefer bigger cities and particularly those who have to leave family behind in urban centers, life at a technopolis may be a psychological sacrifice and financial burden -- hardly an improvement.

As to the possible effect on the reallocation of population nationwide, it is difficult to conjecture at this writing. Even if we assume that each site would draw on average 50,000 new people (1.3 million in total) away from the three major urban centers (19 million in Tokyo-Kanagawa area, 16 million in Kansai area and 6 million in Aichi area), as the guidelines suggested, it is not sufficient to ease overcrowdedness in these urban centers. [110] In fact, in the five years to March 31, 1989, the regions

surrounding Tokyo had the fastest population growth. Of the average 2.5% rise nationwide in the same period, overcrowded urban Saitama, Chiba, and Kanagawa prefectures had the three highest population increases of 8.7%, 7.8%, and 7.5%, respectively, while rural Akita, Aomori, and Iwata prefectures in Tohoku region experienced the highest rates of population losses of 1.7%, 1.6%, and 1.0%, respectively. [111] However, if the technopolis scheme could in the future create a momentum in regional development and substantial numbers of firms, universities and other organizations would be spread into the outlying regions nationwide, more visible changes in population redistribution may occur. As evident from the experience of Tsukuba, all these circumstances seem to underscore the fact that a real community cannot be built overnight and, therefore, technopolis projects must be seen in a long-term perspective.

On the issue of environment, the scheme does not pay sufficient attention because high-tech industries' need for clean air and water is often conversely equated with the industries' cleanness. [112] Though they may not be as pollution-prone as most heavy/chemical industries in sheer quantity, the semiconductor industry involves polluting processes of electroplating and etching using toxic metals and chemicals. [113] Implications of genetic engineering to human-kind are beyond any environmental problems we have so far faced. The residents of Kagawa Seibu technopolis area have

raised concerns for the experiments undertaken by the local Microbiology Institute of Osaka University as well as for the nuclear power research at the Laboratory for the Durability of Nuclear Power Plant Against Earthquakes. [114] High-tech industries are not immune to labor accidents or occupational hazards, either. The abuse of eyes is a common phenomenon in computer-related work. In the case of Kibi technopolis in Okayama, genuine worries about long-term soil erosion and potential impact on flood problem are raised because the technopolis project would inevitably require a clearing of some land on a high plateau even though the thrust of the plan is to maintain natural forestry. [115] All the above questions must be addressed urgently although answers may not be readily available.

In conclusion as we have seen, there is no single pattern of creating a technopolis. Diversities among 24 technopolises -- whether that is in the number and type of industries that locate there, the extensiveness of research collaboration, the historical heritage, etc. -- are assets to the nation as they would seem to create comparative advantage to each region. On the other hand, they are likely to result in disparities among them.

There is no doubt that the projects are stimulating R&D activities in the outlying regions and creating new technologies. As Sheridan Tatsuno observed, the

technopolis plans are steadily being realized after a delay caused by an economic slowdown in 1986 and 1987 owing to the high yen. He noted that the establishment of technopolises has helped induce 40 other major high-tech related redevelopments elsewhere in Japan, such as Tokyo Bay Water Front Project. These projects, he concluded, are undoubtedly making Japan firmly establish itself as a "technology-based nation". [116] Similar conclusions have been drawn by others. After observing the development of technopolises for several years, one journalist believed that technopolises are indeed helping local industries shift to more knowledge-intensive fields by increasing higher value-added. [117]

Critics pointed out, however, that, because of a lack of information and coordination among the technopolises, there overlapping and repetitive research among technopolises, such as in the fields of biotechnology and integrated circuits. [118] Others argued that, although research facilities and industrial plants are built, researchers are so far unable to function to their maximum capability because of insufficient capital. [119]

Radical critics and the JSP and JCP members are skeptical of the scheme, contending that it may have the same fate as the concept of shinsangyo toshi (new industrial cities) of the first comprehensive national land development — that is, frenzied industrial development in certain areas with a resultant sharp rise in land

price, fiscal strains and destruction of rural life and nature accompanied by little gain to local residents except for developers. [120] To radical critics, technopolis projects represent the past contradictions in the accumulation of Japan's monopoly capital and the ruling class's attempt to perpetuate their rule by having local elite carrying out the details of industrial policy. [121]

Whether the establishment of technopolis would generally lead to greater regional disparities or ease them is impossible to predict at this writing. It is generally estimated that the establishment of technopolises would take about 20 years as it did to Tsukuba. In view of the fact that the formal designation of sites only took place seven years ago, the actual shape and implications of technopolises will not be known for another decade or two.

V. CASE II: The Textile Industry.

1. The Textile Vision of 1983.

This chapter will examine the textile industry in order to grasp how the Japanese state, through the Industrial Policy for the 1980s, attempted to adjust a senescent industry in which serious excess capacity existed. The textile industry is chosen here because, as the first major industry in Japan to have experienced the problem of structural excess capacity and of new protectionism abroad, it seems to best provide insight into structural adjustments. This is particularly true because the synthetic fiber segment has been revived through the combination of rationalization of inefficient production, upscaling of products into a higher value-added stage, and diversification into high technology areas. In contrast, the mid-stream sector has not been as successful as the upstream sector in rationalization or diversification.

As part of an effort to upgrade Japan's industrial structure as a whole, the Industrial Policy for the 1980s called for knowledge intensification of the textile industry. [1] To implement this broader policy in the textile sector, the micro industrial policy for textiles was announced in November 1983 as a report called Atarashii Jidai no Sen'i Sangyo no Arikata (The Textile Industry as it Should be in the New Era

--commonly referred to as the Textile Vision of 1983). It was prepared jointly by the Textile Committee of the Industrial Structure Council and by the Textile Industry Council, another advisory body to MITI. There were 120 members (many overlapping members of the two councils) representing each textile association covering various segments, such as synthetic fiber, woolen fiber, cotton fiber, woolen fabric, cotton fabric, silk fabric, knit, apparel, dye, polymers, etc. Also represented were Textile firms, including Asahi Chemical Industry Co., Ltd., Toray Industries, Inc., Teijin Ltd., Unitica, Ltd., Kuraray Co., Ltd., Toyobo Co., Ltd., and Kurabo Industries, Ltd., and textile workers unions, prefectural textile industry associations, small enterprise associations, women's groups (which also act as consumer groups), academia, press, retail stores, trading companies, financial institutions, and prefectural governments. [2]

In contrast to the generally held perception of the textile industry as a "declining" or "senescent" industry which had lost its international competitiveness, the 1983 Textile Vision proposed that the textile industry be made competitive again by transforming it into an "advanced industrial society type" industry. "Advanced industrial society type" industry was defined as: 1. a capital- and technology-intensive industry, 2. a "system type" industry, in which the manufacturing process from material to final product is organically linked to respond promptly to rapid changes in

consumer needs and tastes, and 3. an "internationalized" industry which promotes a multidimensional international division of labor with the LDC's rather than a protected, inefficient industry. [3]

As part of current structural adjustment efforts, the Japanese state encouraged the textile industry to take the following steps: (1) scrap excess capacities in the uncompetitive segments of the industry; (2) modernize the upstream sector (synthetic fiber producers) and the midstream sector (textile mill product manufacturers) through process innovation; (3) specialize in differentiated and higher-value-added products that satisfy changing consumer orientation in advanced industrial societies; (4) forge links between the three streams (up-, mid-, and down-streams) to create high-fashion/high-grade apparel and other end products; and (5) diversify into other industrial operations outside textile products. [4]

The above efforts were to be achieved without resorting to protectionist import restrictions. In fact, Japan was one of the rare developed countries that had not resorted to "new" protectionism in the textile sector as pledged in the Industrial Policy for the 1980s, until February 1989 when Japan Knit Industry Association charged Korean Sweater manufacturers of "dumping" and imposed voluntary export restraints. [5] Nevertheless, the upstream and midstream sectors have not resorted to new protectionism. Despite intense pressures to invoke the Multifiber Agreement (MFA)

from the Japan Textile Federation and a group of LDP politicians, who concluded in the mid-1980s that the state of Japan's textile trade met all the criteria used by the Reagan Administration to justify invoking MFA, MITI repeatedly averted such pressures out of a fear that such an action would further ignite foreign criticism of Japan as an "unfair" trader and inevitably invite a justification for protectionism against other Japanese exports. [6] MITI, with the support of the Industrial Structure Council, was able to convince those pushing for MFA that protectionism would ultimately harm Japan's textile industry and only through structural adjustment would it be able to maintain international competitiveness. With this conviction, MITI persuaded mainly large synthetic fiber firms to undertake concerted structural adjustment measures -- including an exemption from anti-monopoly law for an intra-industry agreement on capacity reduction -- as elaborated in the next section of this chapter. The New Textile Act (Temporary Law for the Structural Reorganization of the Textile Industry of 1974-1984) was extended until 1989 to carry out structural adjustments. [7]

In this manner, the Japanese state attempted to promote, through the industrial policy, a positive adjustment of the textile industry rather than to protect the industry or to do nothing and let the market determine the future shape of the industry. This stance was made possible by the fact that MITI and the Japan Textile Federation --

whose more powerful member firms have internationalized since the late 1960s and have overseas subsidiaries, mainly in Asia, exporting products back to Japan - both sought to keep the border open to imports through structural adjustment rather than to protect the Japanese textile industry from import competition, or to do nothing and potentially lose ground to international competitors. For example, Toray Industries, Inc., by far the most internationalized of all Japanese textile companies, had 35 overseas subsidiaries and joint ventures -- 8 in Thailand, 5 in Indonesia, 4 in Malaysia, 3 in South Korea, 3 in Taiwan, 2 in Hong Kong, etc. -- producing about 30% of its total output in value in FY1987, ended March 31, 1988. [8]

2. Past Adjustments.

The need for structural adjustment of the textile industry derived from a failure to adjust, in the case of the midstream, and an insufficient degree of adjustment, in the case of the upstream, in the 1970s. How and why did this happen? Like many other industries, the Japanese textile industry achieved growth through expansion of domestic demand and export by modernizing plant and equipment, thus exploiting the economies of scale. But, over the last three decades, as global competition intensified and excess capacity appeared worldwide, the textile industry in Japan, as in other

advanced industrial economies, was forced to adjust continually. Although the number of firms has not shrunk that much and employment remains high, as other industries grew faster, the textile and clothing industry's relative position in the overall economy declined from 19.1% of total shipment in the manufacturing sector and 37.3% of the nation's export in 1955 to 7.4% and 6.7%, respectively, in 1975. By 1982, these rates had shrunk to 5.6% and 4.4%,respectively. (Table V-1)

Table V-1: Japan's Textile Industry

(Synthetic & Natural Fibers, Mill Products, and Clothing Sectors)

	Number of Firms	Employees (thous.)	Shipments (100 mio. yen)	Exports ($ mio.) (% in all Exports)	Imports ($ mio.) (% in all Imports)
		(share in all manufacturing industries)			
1955	88,238	1,266	12,934	749	613
%	(20.4)	(23.0)	(19.1)	(37.3)	(24.8)
1965	125,202	1,720	34,616	1,882	904
%	(22.4)	(17.3)	(11.7)	(18.[illegible])	(11.1)
1975	157,381	1,589	94,038	3,719	2,838
%	(21.4)	(14.1)	(7.4)	(6.7)	(4.9)
1978	152,921	1,414	100,003	4,800	3,628
%	(20.5)	(13.0)	(6.1)	(4.9)	(6.0)
1979	150,826	1,431	116,531	4,908	6,280
%	(20.4)	(13.2)	(6.3)	(4.8)	(5.[illegible])
1980	147,467	1,391	122,778	6,296	5,873
%	(20.1)	(12.7)	(5.7)	(4.8)	(4.0)
1981	149,618	1,403	128,050	7,174	5,833
%	(20.1)	(12.5)	(5.6)	(4.7)	(4.1)
1982	147,202	1,385	129,610	6,240	5,761
%	(20.2)	(12.5)	(5.6)	(4.5)	(4.4)

1983	152,155	1,375	130,583	6,613	5,064
%	(19.5)	(12.1)	(5.5)	(4.5)	(4.1)
1984	151,816	1,346	131,750	6,753	6,358
%	(20.5)	(11.8)	(5.2)	(4.0)	(4.6)
1985	142,167	1,334	133,404	6,263	6,041
%	(19.0)	(11.6)	(5.0)	(3.6)	(4.7)
1986	141,405	1,333	129,245	6,874	6,980
%	(18.9)	(11.5)	(5.0)	(3.3)	(5.5)
1987	135,248	1,307	127,507	6,196	10,326
%	(18.8)	(11.5)	(5.0)	(3.0)	(6.9)

Source: Sen'i Nenkan (Textile Yearbook), Tokyo: Nihon Sen'i Shimbunsha, 1984, 1985, 1989, and 1990 editions.

The Japanese state began to implement a policy to adjust the textile industry in 1952, when the price of textile products slumped during an economic downturn in part caused by a slowdown resulting from the Korean War. Through the lobbying efforts of textile producers, consisting of mainly small- and medium-scale firms with strong political ties with the then-ruling Liberal Party, MITI allowed firms to form cartels for the regulation of production, shipments, and equipment under the Temporary Law Governing the Stabilization of Specified Medium and Small Scale Enterprises – the first circumvention to the Anti-Monopoly Law. [9] As Brian Ike observed, the program foreshadowed various measures taken in the postwar era to deal with the problem of excess capacity. [10]

During the 1950s and 1960s, when Japan's synthetic fiber industry grew, the midstream sector (spinning and weaving segments) suffered from a chronic excess capacity. This was created by a shift in domestic demand away from natural fibers and toward synthetic products, the imposition of voluntary export restraints in the U.S. market, the conclusion of the Long-Term Arrangement Regarding International Trade in Cotton Textiles (1962-1973) and a gradual loss of competitiveness to the LDCs due to rising wage rates and other domestic manufacturing costs. [11] Collaborating with the textile industry, the Japanese state introduced the Textile Old Act (1956-1964) and the Textile New Act (1964-1970) to scrap excess capacity through government

purchases of surplus equipment and limit new installation by establishing a registration system for spindles and looms. [12] Not being able to successfully reduce excess capacity, larger firms pressured the state to enact the Special Textile Act (1967-1974), intended to structurally rationalize and reorganize the midstream of the industry through equipment modernization and consolidation. [13] It was under this legislation that Toyo Boseki acquired Kureha Boseki in April 1966 and Dai-Nihon Boseki and Nihon Rayon merged to create a new company, Unitika in October 1969. [14]

Meanwhile, the upstream (synthetic fiber) sector in Japan experienced its "golden age" between 1955 and 1970 when it played a pivotal role in the nation's postwar industrialization, expanding domestic demand and exports. [15] But when the export of synthetic fabrics and textile products to the United States were placed under quotas set by the Japan-U.S. Textile Agreement of 1971, the Japanese state, pressured by the synthetic fiber producers, enacted the Temporary Textile Act (1971-1973) to financially compensate and encourage the scaling down of capacity of those firms hurt by the agreement. [16]

The general decline of the Japanese textile industry accelerated in the aftermath of the oil shock. The synthetic fiber industry was pushed into a state of structural recession by sluggish domestic and world demand and by the loss of international competitiveness due to the ensuing rise in labor costs and the skyrocketing costs of

both energy and chemical feedstocks, the steady appreciation of the yen, and increased competition from the LDCs, which had become either self-sufficient or net exporters. [17] These situations induced Japanese synthetic fiber producers to invest heavily in offshore production facilities, mainly in Asia, to overcome some of these constraints. [18] Moreover, the LDCs' access to the Japanese market was eased by a series of tariff reduction measures under the Kennedy Round of the Generalized System of Preferential Tariffs in 1971, and Japan's unilateral reduction of tariffs (1972-1979). The latter made possible in part by the lobbying of large synthetic fiber producers with overseas subsidiaries exporting products to Japan. [19]

The extent to which the Japanese textile industry had deteriorated in the 1970s was apparent from the fact that, while production of textiles and apparel in the LDCs expanded by 4.5% in 1973 and 8% in 1978 and the corresponding figures for the industrialized countries were 4.5% and 0% respectively, Japan's figures were -2.5% each year, and seven major synthetic fiber producers in Japan posted a combined deficit of $86.3 billion, and nine cotton spinners a combined deficit of $105.4 billion in their operating accounts between 1974 and 1977. [20] Urged by the textile producers, the Japanese state introduced the New Textile Act (1974-1984) to restructure and rejuvenate the industry through knowledge intensification, vertical integration of small- and medium-scale firms, and promotion of the apparel sector. - strategies rolled

over to the 1983 Textile Vision. Firms specializing in different stages of production which were willing to cooperate to develop new products and new technologies were eligible for special tax incentives and long- term low-interest financing. [21] Although there emerged in 1977 from the synthetic fiber industry a concept that the industry should be radically rationalized into three groups to reduce excess capacity, it was not realized mainly because of strong rivalries among the big seven -- Asahi Chemical, Toray, Teijin, Unitica, Kuraray, Mitsubishi Rayon, and Toho Rayon, together holding a 71.3% market share in polyester filament yarn, 69.4% in polyester staple, 80.8% in nylon filament yarn, and 65.9% in acrylic staple for the year ended March 1988. [22]

As the synthetic fiber industry continued to deteriorate, the producers lobbied the state to have the industry cited under the 1978 Structurally Depressed Industries Law in order to be exempted from the anti-monopoly law, which would force joint scrapping of about 15% in average of the production capacity in nylon filament, acrylic staple, polyester staple and polyester filament. [23] In essence, those adjustment measures were intended to dispose of excess capacity, and modernize production, and integrate units of production to help the industry realize economies of scale, regain competitiveness, and improve profit and wage rates.

The synthetic fiber producers continued to face difficulties, not because efforts failed but because they did not go far enough. The program to reduce production

capacity of four synthetic fibers under the 1978 Law ended in March 1982 and achieved an average of 17.4% level of production cutbacks as planned. [24] The reduction of excess capacity in synthetic fibers was achieved promptly mainly because the seven large firms which dominate Japan's synthetic fiber sector (as discussed below) carried out this program because they saw the advantage of industry wide collaboration in scrapping excess capacity. Faced with further intensification of competition from the LDCs, continuing rise in manufacturing costs, and a slump in domestic demand, however, the above rationalization efforts proved to be insufficient to enable the upstream to restore its competitiveness. [25]

The midstream remained generally weak and fragmented as adjustment efforts produced only mixed results. For example, while rationalization measures under the 1976 Law helped improve economic conditions of designated knitting, dyeing and finishing mills because of financial assistances, the scrapping effort was a failure. Instead of reducing 2.62 million spindles, the number actually increased by 204,000. Out of 116,000 looms (for cotton, spun rayon, silk and rayon) to be scrapped, only 26,000 were eliminated. [26] Also contrary to the aim of encouraging the concentration of production through horizontal grouping to achieve production efficiency, the number of establishments with nine or fewer employees increased in knitting, dyeing and weaving segments between 1967 and 1976. [27] In the case of the

program to promote knowledge intensification under the 1974 Law, underutilization was a major problem. Of the allocated budget in the fiscal years 1975, 1976, 1977, and 1978, only 18%, 33%, 28%, and 28%, respectively, were dispersed. [28]

Some of the above lack of success was attributed to the stringent requirements and insufficient dissemination of information concerning available assistances and benefits. [29] However, more important reasons impeding adjustment were found in the following two factors stressed by Robert M. Uriu. First, since the majority of firms in the textile mill sector consisted of smaller-size firms traditionally grown out of family operations, they were unable to coordinate adjustment policies with other sectors under a corporate umbrella to spread adjustment costs vertically to subsidiaries or contractors, or horizontally to affiliated firms. Thus, they were obliged to bear the consequences themselves. Second, unlike other declining industries such as shipbuilding or steel, in which capital is concentrated, the fragmented midstream held no coherent view regarding how to restore competitiveness, thereby perceiving fewer advantages in adhering to the restructuring programs. [30]

Because of manufacturers' long-standing ties with the ruling LDP as well as the Japan Federation of Textile Workers Unions' links to the Democratic Socialist Party, the textile industry has enjoyed bipartisan support for special fiscal measures and exemptions from the anti-monopoly law, thus aiding them against bankruptcies.

Ultimately, these measures acted, in Brian Ike's words, in a "de facto role as protector of last resort" providing negative incentives to shift resources out of the industry, thereby inadvertently hindering the very structural adjustment of the industry intended by these measures. [31]

Not having restored its viability, further structural adjustments were imperative because, despite its relative decline, the textile industry remained one of the key industries in Japan. In 1981, nearly 1.4 million people -- i.e., 12.5% of total workers in the manufacturing sector -- were employed by about 150,000 firms engaged in the manufacturing of fiber and textile products, and an additional 1 million people were employed by 200,000 firms involved in the distribution and sales of fiber and textile products. [32] And total shipments amounted to 12,805 billion yen in 1981. [33] Moreover, the impact of the slump in the textile industry had especially detrimental effect on some local regions, because many small firms in midstream are concentrated in the Hokuriku and Kansai areas. [34] A rejuvenation of the textile industry, therefore, was an urgent necessity for the elite hegemony to maintain the health of the local and national economies.

3. Factors Inducing Current Adjustment.

To explain the direction of change contained in the industrial policy and the 1983 Textile Vision envisage the particular transformation -- i.e. the shift into a knowledge- intensive and "advanced industrial society type" industry requires analysis of the three key trends that were intensifying at the time the Textile Vision was formulated. [35]

First, the sources of competitive pressure had broadened and intensified. Increased competitive pressures stemmed, for example, from the phenomenal growth of the textile industry in the neighboring Asian NICs and the PRC. Since the early 1980s, their total production capacity had exceeded that of Japan with more expansion on the horizon. Whereas the daily average output of Japan's synthetic fiber in 1981 was 5,982 tons, that of Taiwan was 2,219 tons, South Korea 1,401 tons, and the PRC 2160 tons. [36] But competition from firms in other advanced industrial countries had also stiffened as a result of investment in the modernization of plant and equipment during the 1970s and their oligopolistic strength -- such U.S. giant firms as DuPont in the upstream and Burlington Mills in the midstream regained competitiveness and maintained their preponderance in the international market. [37]

Second, the domestic demand structure had undergone changes. There was a stagnation in domestic demand for textile products in Japan with the economy's shift into slower growth since the oil crisis and with saturation of the market in clothing

stocks as people do not usually consume quantitatively more apparel in proportion to rises in their incomes. Although the total output of textile products in value quadrupled from 4 trillion yen in 1970 to 16 trillion yen in 1980, the average per capita consumption of textile products declined from 20 kg in 1970 to 16.5 kg in 1980, and the average rate of household spending on clothing fell from 7.7% of overall household expenditure in 1970 to 6.6% in 1980, as central heating and air conditioning systems proliferated and the expenditure on leisure rose proportionately. [38]

On the qualitative side, rapid diversification and individualization in the market were apparent as the baby-boom generation became adults and grew more sophisticated, demanding apparel to fit their own particular needs and tastes. With these changes, fashion cycles were shortened and a demand rose for a wider range of fabrics and for higher-grade products. [39] In the wake of diversification in consumer needs and tastes against the backdrop of global excess capacity and changing pattern of international competition, the past strategy to expand production and to seek economies of scale and price reduction was no longer the most appropriate one for Japan. To respond to consumer preferences and to overcome stagnation, many firms were compelled to shift their strategy from "expansion in quantity" to "pursuit of quality" or from "scale" to "scope". [40]

Moreover, the Japanese textile industry continued to maintain the comparative disadvantages of wage differentials with the LDCs on the one hand, and of the highest raw material and energy costs among the industrialized countries on the other. Crude oil, the main ingredient of synthetic fibers, and electricity rates remained about 20% and 40% higher, respectively, than those in the United States. [41] Reflecting the above situation, imports of textiles into Japan in volume more than doubled from 1975 to 1981 while exports remained flat. [42] (Table V-2)

Table V-2: Japan's Import & Export of Textiles by Volume

(Thousand Tons).

Year	Imports				Exports			
	Total	Fiber	Fabric Products	Finish	Total	Fiber	Fabric Products	Finish
1975	131.4	43.0	35.8	50.6	639.5	232.0	282.7	124.7
1976	169.0	67.4	33.7	71.9	636.9	211.9	297.5	127.8
1977	149.6	42.0	31.7	70.8	710.7	255.7	323.9	131.0
1978	283.8	139.9	58.3	92.6	606.8	220.1	275.1	111.7
1979	339.3	149.4	71.1	118.7	607.7	279.2	238.6	92.9
1980	277.8	116.7	62.4	98.8	600.6	219.2	267.2	114.5
1981	292.0	117.3	73.1	101.5	652.8	236.7	302.5	113.7
1982	330.0	158.3	68.5	103.3	605.4	208.6	285.2	111.5
1983	311.2	143.9	74.5	93.2	650.9	224.8	317.7	108.4
1984	438.8	217.3	101.8	119.7	645.9	226.4	304.5	115.1
1985	465.7	232.5	96.7	136.5	631.0	221.3	297.6	112.1
1986	493.2	204.4	180.0	181.1	612.0	237.6	278.0	96.4
1987	641.8	256.3	120.2	265.4	548.7	200.2	259.1	89.4
1988	791.9	292.4	149.6	349.9	450.6	158.0	210.5	82.0

Source: Sen'i Nenkan (Textile Yearbook). Tokyo. Nihon Sen'i. Shimbunsha. 1984. 1985. 1989. and 1990 editions

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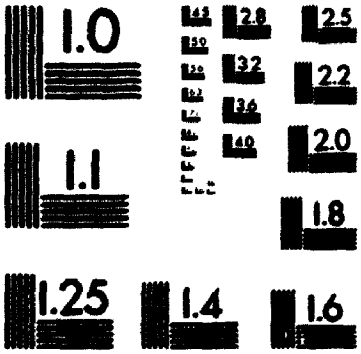

MICROCOPY RESOLUTION TEST CHART
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STANDARD REFERENCE MATERIAL 1010a
(ANSI and ISO TEST CHART No 2)

During the 1970s, however, the Japanese fiber and textile firms strengthened non-price competitiveness in differentiated and higher-priced products. [43] Such trends can be seen in the following statistics: from 1971 to 1981, Japan's export of textiles grew in value about 250% ($2.4 billion to $6.2 billion) although in volume it had not recovered from the 1971 level (652,800 tons in 1981 cf. 730,000 tons in 1971). [44]

It is often suggested that a part of Japan's non-price competitiveness derives from vertical and horizontal links among different sectors within the textile industry that are less commonly seen elsewhere. [45] While large Japanese synthetic fiber producers install facilities, provide technical advice and funds, determine product lines and guide the sales operations of about 50% of the textile mills, apparel companies take an active role in distribution and retail sales -- from sales promotion to merchandise management and inventory control, to actual introduction of company employees as sales personnel in store. [46] In addition, all three streams interact under the aegis of the Japan Textile Federation (comprising the Japan Chemical Fibers Association, the Japan Spinners Association, the Japan Cotton and Staple Fiber Weavers Association, and the Japan Clothing Makers Association), although smaller firms are disadvantaged in this respect because of their limited personnel and financial resources to actively participate. [47] Such vertical and horizontal integration helps

enhance the flow of valuable information concerning the type of fabric and the style of apparel that consumers desire, or conversely, information concerning technological breakthroughs in creating new materials. They, therefore, aid fiber and fabric manufacturers' ability to detect and respond quickly to changes in consumers' tastes and help apparel makers learn of the availability of new fiber or fabric. [48]

Third, owing to the advancement in mechatronics (electronic machinery) and other rapid technological changes, a wide array of new opportunities and possibilities opened up to increase the value added of products and the productivity of processing in all three streams: labor-saving, energy-conserving high-speed machinery of all sorts from preparation, spinning, dyeing, weaving to finishing; robotics to flexible manufacturing system and automated factories; the development of fibers with new function, such as synthetic fibers with natural fibers' features or fibers with enhanced fire-resistance, water resistance, and perspiration-absorption; and advanced composites and polymerization for hitherto untried areas. [49]

Faced with such unprecedented opportunities, many firms came to conclude that the only way to survive in the current global situation of structural excess capacity and intensified competition was to cut costs through rationalization, to create differentiated high-grade products, and to diversify into other fields of operations in which they can exploit their expertise gained from fiber and textile manufacturing. [50]

It is because domestic demand was diversifying, non-price competitiveness was strengthening, and technological changes were possible that the Textile Vision projected an optimistic picture of the Japanese textile industry as becoming an "advanced industrial society type" industry. [51]

Is the Japanese textile industry really restructuring to be competitive again and transforming itself into an "advanced industrial society type" industry? In what follows, we will look at the upstream synthetic fiber sector and the midstream textile mill sector, because the outcomes of restructuring by these two sectors contrast sharply -- one of relative success in positive structural adjustment in the former while one of relative failure in the latter, as in the past.

4. Adjustments in the Synthetic Fiber Sector.

As mentioned above, Asahi Chemical, Toray, Teijin, Unitica, Kuraray, Mitsubishi Rayon, and Toho Rayon dominated the synthetic fiber industry --holding a 71.3% market share in polyester filament yarn, 69.4% in polyester staple, 80.8% in nylon filament yarn, and 65.9% in acrylic staple for the year ended March 1988. [52] (Table V-3) Moreover, these seven plus four textile mill firms (Kanebo, Toyobo, Nisshinbo Industries, and Kurabo Industries) together accounted for about 95% of the

total synthetic textile market in Japan. [53] These firms have been under pressure to rationalize and diversify continuously since the "synthetic fiber recession" of the 1970s as discussed above. In the three years, ended March 31, 1990, these firms in general succeeded in structural adjustments and drastically improved earnings, owing to rationalization of inefficient textile production, moving into higher-value-added textile products, and aggressive business diversification into new areas against the backdrop of strong domestic demand created by high private capital investment and consumer spending. Whereas domestic production of synthetic fibers rose 16.0% in CY1987, 0.5% in CY1988, and 2.3% in CY1989, the combined recurring profits of these seven firms surged 67.8% in FY1987, 27.3% in FY1988, and 8.9% estimated in FY1989. [54] In diversification efforts, however, except for Toho Rayon, which has concentrated its efforts on new materials businesses (carbon fibers, etc.) because of its relatively small firm size, many of these companies have expanded into a similar set of new high technology areas --such as life sciences (pharmaceuticals, biotechnology, etc.), microelectronics, new materials, plastics, and other businesses -- without any regard to a division of labor, as discussed. [55]

Table V-3: Japan's Major Synthetic Fiber Manufacturers

(Year ended March 1989).

	Affiliate Group	Sales (billion yen)	R & D Spending	Share of Textiles (Sales) 1980	1989
Asahi Chemical Industry Co. Ltd.	DKB	817.8	38.0	38%	19%
Toray Industries, Inc.	Mitsui	553.1	24.6	74%	56%
Teijin Ltd.	Sanwa	312.3	16.5	70%	64%
Unitika Ltd.	Sanwa	249.8	5.1	81%	63%
Kuraray Co.	N/A	211.1	8.0	73%	56%
Mitsubishi, Rayon Co., Ltd.	Mitsubishi	200.3	10.0	61%	46%
Toho Rayon Co., Ltd.	Fuji	71.0	0.6	96%	83%

Source: Toyo Keizai, Kaisha Shikiho (Company Report), Winter 1981 and Winter 1990

These firms pressured the state to enact the Structural Adjustment Law of May 1983, superceding the Structurally Depressed Industry Law of 1978, so as to allow them to form a restructuring cartel to set prices in return for not expanding capacity in the synthetic fiber sector. [56] They rationalized their production by scrapping old inefficient plants and building new ones without expanding capacity -- and in many cases contracting capacity -- to improve earnings through enhanced spinning speed, higher energy savings and new types of fibers called shingosen (new synthetic fibers). [57] After peaking in 1985 with 1,550.8 thousand tons, the output of synthetic fibers in Japan declined to 1,505.8 thousand tons in 1986 and 1,487.4 thousand tons in 1987. [58]

MITI, however, did not assign a quota on how much each firm should reduce. Instead, it pressured those plants with least efficiency to shut down through a form of "administrative guidance". [59] Moreover, MITI gave some support and technical assistance when Unitika and Kuraray began a complicated form of joint production of vinylon to regain competitiveness against not only the bigger firms in Japan but also producers abroad. [60] MITI also helped organized the special "Round Table for R&D of Synthetic Fibers" held in 1983 when the seven firms collaborated to help these firms rationalize further, to create ultra-energy- efficient production processes, and to

develop textiles with revolutionary functions. As part of this roundtable, engineers from the seven firms were given a chance to visit three polyester filament plants at Toray, Kanebo, and Toyobo in November 1983 -- an endeavor unprecedented in the industry. [61].

MITI also helped organize two inter-firm research collaboration agreements. Firstly, it brought together 28 firms on a voluntary basis --including Asahi Chemical, Toray, Toyobo, several apparel makers, dye makers, and machinery producers -- to form the Technology Research Association of Automated Sewing System in 1982. As a part of "large projects" under the auspices of MITI's Agency of Industry Science and Technology, this association has developed an automated production system (flexible manufacturing system) to produce apparel -- eg. jackets, skirts, pants, dresses, sportswear, and nightwear -- eventually in half the time that it currently takes to do so. A prototype plant has been in operation since May 1990. While the total R&D cost of this project to the national budget is estimated to be around 10 billion yen, the expenses for individual firms has not been disclosed other than to note that the several seconded their own engineers to the project. [62]

Secondly, as part of its "next generation of industrial technology projects", MITI helped organize in 1981 the Research Association for Basic Polymer Technology, consisting of three projects. Details regarding the cost and responsibility

of each firm have not been disclosed. Asahi Chemical, Toray, Kuraray, Teijin, and Toyobo participate, along with four other companies in chemicals and electronics, in the high-efficiency polymer membrane project. Asahi Chemical, Toray, and Teijin, with Sumitomo Chemical and Sumitomo Electric, participate in the conductor polymer project. Asahi Chemical, Toray, and Teijin, with Mitsubishi Petrochemicals and Mitsubishi Chemicals, participate in the high-crystalization polymer project. [63]

In the winter of 1983-84, Toray and Teijin ran a joint public relations campaign to publicize men's suits made of polyester-wool blend fabrics. [64] These collaborations stemmed from a proposal made in 1977 by Oya Shinzo, then Teijin's CEO, to drastically reorganize the seven firms into three groups. Although this proposal was never even seriously debated because of a strong opposition within the industry -- which felt that the sector had not deteriorated enough to require such a drastic measure -- it left a belief that some integration within the sector, particularly in the areas of production and marketing, may be inevitable. [65]

Indeed, owing to rationalization and diversification, all seven firms were performing well by March 1985. [66] But this upturn in business was reversed in September 1985 when the yen began to appreciate sharply against the U.S. dollar (about 100% by the end of 1987) and other currencies which were basically linked to the U.S. dollar, most notably those of South Korea and Taiwan. A currency shift not

only caused major profit losses for these firms from their dollar-denominated export contracts but it weakened the Japanese firms' competitiveness, particularly in polyester, vis-a-vis such major U.S. producers as DuPont and Hoechst Celanese, which had modernized their plants. [67] The problem was exacerbated by weakening demand in the Middle East, then Japan's largest export market for synthetic fabrics, whose purchasing power was eroded by plummeting oil prices. [68]

Under these circumstances, the seven firms reembarked upon kozo gensan (structural production curtailment) in 1986 within the same restructuring cartel discussed above. For example, Teijin closed down a plant in Ehime and cut production in Matsuyama by half, and Toray shut down its Mishima plant, integrating only a small portion of its operation into its Ehime plant. [69] In all, these seven firms permanently cut an average of 25% of their polyester production capacity and a slightly smaller cut in production capacity of other fibers, as they collectively posted a 12.6% drop in sales and 46.2% drop in operating profits from the second half of fiscal 1985 to the first half of fiscal 1986. [70] The restriction on production capacity for the four items of synthetic fibers under the Industrial Restructuring Law of 1983 ended in June 1986, effectively thrusting synthetic fiber producers into "free" competition. [71]

As mentioned above, business in the synthetic fiber sector improved substantially in 1987, 1988, and 1989 because of domestic demand expansion

supported by strong consumer spending and capital investment. While rationalization in the textile divisions, including scaling down of workforces and cutbacks in unprofitable exports, naturally helped, the accelerated growth in high-value-added non-textile businesses greatly contributed to this improvement. For example, in the case of Toray, Japan's largest synthetic fiber manufacturer, recurring profits reached a new high for the first time in 15 years in FY1988 (a 40.3% gain from the previous year) and again in FY1989 (a 5.3% gain). [72] These solid results owe not just to rationalization in the textile division, but also to favorable demand for synthetic resins for the automobile, home appliance and video cassette film industries as well as such new areas as pharmaceuticals and composite materials. [73] In addition, after 15-20 years, Toray's affiliates in ASEAN countries finally became profitable in the last few years. In fact, Toray leads the textile industry in establishing a global production base, and its volume of textile production in ASEAN countries is now on a par with its domestic operations. [74]

The New Textile Vision of November 1988 extended the New Textile Law for five years beyond June 1989. This extension is not intended to reduce capacity at all. Instead, MITI encouraged the "linkage production unit" (LPU) concept to enable the textile industry in Japan produce higher value added, particularly subcontractors under tremendous pressure to adjust to higher technological production from their contractors

but less capable of doing so because of their smaller capital reserves. LPU is an inter-firm collaboration linking the three streams in the textile industry to exchange information on new technology and products of small-lot, short-cycle, and large varieties to suit changing demand patterns through the creation of Textile Resource Center, a joint research center, and low-interest loans to small- and medium-size firms that are keen to start LPU projects. [75]

It appears that diversification is one of the keys to the success of structural adjustment so far, because Japan's synthetic fiber producers' dependence on fiber is comparatively high. This is due to the fact that, unlike their counterparts in the United States and Europe, they are fiber producers and not chemical producers that are also producing fibers. [76] Toray, for example, was established as a "textile" firm as part of the Mitsui group, separate from Mitsui's petrochemical firm. [77] In April 1986, it announced that it would become a "new function" comprehensive chemical producer in April 1986. [78] Toray's CEO, Ito Yoshikazu, claimed that its current diversification efforts are to place itself in the heart of "New Chemistry Age" of the 21st century -- which is seen in Japan as a combination of chemistry and electronics as well as chemistry and biotechnology. [79] Although MITI encouraged all synthetic fiber firms, chemical firms, and others to move in this direction as it saw a great growth, it

did not assign a particular specialization of diversification to each firm, nor did it organize inter-firm collaboration to determine specialization. [80]

Like all other synthetic fiber firms, Toray has been trying to reduce the weight of textile-related operations in the firm's total sales from 65% in 1985 to 38% by 1995. [81] For this purpose, about half of its R&D spending has been allocated to new projects and a quarter to the existing non-textile divisions while the remaining quarter has been allocated to the fiber divisions. [82] Within the fiber divisions, Toray has been attempting to correct the shortcomings of existing fibers, such as by creating new ultrafine fibers through an innovation in microlevel processing. [83]

To intensify R&D and marketing under the campaign of "R&D&M" (R&D and marketing), Toray has set up two organizations: the Strategic Business Unit (SBU) to conduct R&D, production and sales as one unit on an individual project basis to overcome any inefficiency and inflexibility inherent in the traditional multidivisional structure, where these three functions are separated; and the Technology Center in Shiga to streamline and reinforce its 2,000 researcher R&D. [84] Toray's emphasis on in-house R&D, particularly on generic technology, is nothing new. It built its foundation by developing its own know-how on nylon rather than purchasing it from abroad -- apparently only bought a booklet explaining the patent. [85]

To accelerate diversification into nontextile areas since the 1970s, Toray has created some generic technologies, such as engineering plastics, polyester films (for video, audio-magnetic tapes and floppy disks) and carbon fibers, mainly through subsidiaries or tie-ups. These have served as Toray's strategic product lines, for example capturing 50% of the domestic polyester film market. [86]

As for carbon fibers, it developed and began producing polyacrylonitrile (PAN) carbon fibers in 1971. Currently, Toray is the world's largest producer with over 30% of the global market share. [87] First produced for the aerospace industry, Toray had to seek other applications to achieve sufficient volume of scale -- a wide array of products including such sporting goods as golf clubs, fishing rods and tennis rackets, to industrial sectors including airplanes, space equipment, parts for X-ray equipment and office automation equipment, and construction of skyscrapers. [88] Because of an enormous potential demand for carbon fibers, which boast of relatively lighter weight than steel (equal to aluminium) and extra sturdiness six times as powerful as steel, Toray has been intensifying its efforts in developing new uses to expand the market. [89] It is developing a new type of carbon fiber with Mitsui Coke Co. so that medium-grade carbon fibers can be produced mainly for use in automobiles, as PAN carbon fibers remain too expensive. [90] Carbon fibers are also contributing to the firm's exports through licensing to Union Carbide Corporation,

which produces for U.S. air- and space-craft manufacturers and to France's Societe Nationale Elf Acquitaine, which produces for European manufacturers. [91] With facility expansion planned for July 1990, carbon fibers are finally becoming one of the mainstays of growth for Toray, with sales targeted at 20 billion yen, or 3.6% in fiscal 1989. [92]

Like its competitors, Toray is actively seeking projects to develop technologies for the next generation of basic materials that can meet the needs of Japan now and in future -- alternative materials and processes to save labor and thus overcome high labor costs and labor shortages; to conserve energy and other raw materials so as to reduce country's vulnerability to imports of raw materials; to cure diseases that are becoming more common, particularly to tackle the problem of the aging of the Japanese society; and to advance the information revolution to benefit from its growth. Although sales of these new businesses are still only about 10% of the total in fiscal 1989, their share will rise and contribute to the company's profits within the next few years. [93]

Mainly basing its expertise in the fields of polymer science gained from carbon fiber development and of ultrafine fiber processing for synthetic suede, Toray has been engaged in R&D for high-performance polymer materials, as noted above, and other advanced composite materials, some of which have already born some fruit. It is also involved in R&D on high-crystalization polymer materials as a long-term project. [94]

For example, membranes made with high performance polymer have been developed for use not only in separating substances in industrial processes but also in such artificial internal organs as the kidneys and heart, and soft contact lenses. [95] The research in electric conducting polymer is expected to yield a great deal of advancement in materials used for very large size integrated circuits (VLSI) and other data processing systems. [96] There are also developing fiber reinforced plastics (FRP) and carbon fiber reinforced plastics (CFRP). [97]

Another main field into which Toray has diversified is in the bio-industry. With a belief that life sciences would offer them potentially high profitability and market share in the future, Toray created "in-house venture business" by bringing in researchers from outside. [98] After successfully developing human interferon-B, Toray built the world's first mass-production plant in 1984 and began sales in September 1985. [99] In addition, several other pharmaceutical products are presently developed and tested. [100]

Other leading synthetic fiber producers are also diversifying into similar fields. Diversification is nothing new to Asahi Chemical -- the least dependent on textiles among the seven. Originally a maker of ammonia, it moved into acrylic, a by-product of ammonia, and hence became a synthetic fiber producer. It has embarked upon a major diversification effort with particular emphasis on biotechnology (using the

fermentation skills acquired from monosodium glutamate production) and electronics (through subsidiaries organized by a group of venture-minded young employees). [101] Already into synthetic resins, synthetic rubbers, chemical products, construction and housing materials, and food and pharmaceuticals since the early 1960s, it has recently developed several cancer and leukemia related drugs and various membranes used in salt production, uranium enrichment and artificial livers, etc. The firm has also commercialized highly specialized parts for electronic systems including custom-made large-size integrated circuits by creating a joint subsidiary with a U.S. firm, which had know-how in the field because Asahi Chemical saw a big potential growth in this area. [102]

Similarly, Teijin has been attempting to revitalize its textile sector and, at the same time, is renewing its push to the buoyant nontextile sectors, such as polyester film, resins, pharmaceuticals and aramid (aromatic polyamid) fibers. Teijin broke DuPont's monopoly in the world market for aramid fibers by developing its own aramid technologies, featuring materials, structures, polymerization and fibers totally different from that of DuPont. Because of its relative lightness and strength comparable with carbon fibers, but stronger than carbon fibers against pull and more heat-resistent than epoxy and silicone resins, demand for aramid fibers has been

surging for use in automotive tire reinforcement, aircraft structures and other strong, lightweight products. [103]

Mitsubishi Rayon has become the nation's largest synthetic resin producer and the world's largest producer of optical fibers. It has been trying to establish itself in the optoelectronics field through the development of optic fibers by exploiting its plastics technology acquired in synthetic resin production. It is also attempting to develop markets for carbon fibers and hollow-fiber membranes. [104]

Toho Rayon has become the world's second largest carbon fiber producer since absorbing Toho Beslon, a subsidiary producing acrylic fibers and carbon fibers, in October 1985. It is emphasizing R&D into new applications for its PAN-series carbon fibers. [105] Kuraray has diversified into medical, biochemical, optical-electronics, man-made leather, and high- performance composite materials, many based on technologies acquired from the development of vinylon -- the first Japanese indigenous synthetic fiber developed in 1943 by Kuraray's forefather. [106] Finally, Unitica -- founded through a merger of Nichibo and Nippon Rayon in 1969 -- has succeeded in developing the world's first "U-polymer" (a highly heat-resistent resin used in parts for automobiles and electric machinery) and exploring various amorphous metal fibers as well as commercializing over 15 kinds of heat-resistent enzymes. [107] As Table

V-3 above indicates, these firms are reducing their dependence on the textile sector by realizing a considerable amount of diversification.

However, this structural adjustment process has had a major impact on workers in the upstream sector as a result of labor rationalization and cost cutting. Although these labor rationalization measures adopted by the seven synthetic firms have avoided outright dismissal of workers, relocation often created uncertainties and anxieties for workers as they were uprooted from their familiar surroundings. Even though there were no layoffs when plants were closed down and workers relocated, there were always indirect consequences of unemployment as there were many people whose livelihood was dependent on the existence of a plant, such as neighboring retail stores, restaurants and other service-related businesses, not to mention small subcontractors to the plant. [108]

Although newly diversifying operations have accommodated redundant workers and expanded related service jobs in R&D, marketing, consulting and after-care services, the capacity to absorb blue-collar workers is increasingly eroded as further factory automation takes place. Under such circumstances, firms may attempt to resort to more drastic labor rationalization, such as forced retirement, when the current economic boom ends. For workers, the flexibility to shift to other types of work and

willingness to be retrained are basic conditions to survive in the current industrial changes. [109]

Within the synthetic fiber sector, it is uncertain how much longer these firms will be able to maintain competitiveness in such fiber as polyester filament where Japanese producers have about a two-year technological lead, particularly in fineness, compared with the firms in South Korea and Taiwan. [110] The future of synthetic fiber production by Japanese firms seems increasingly depended on at their ability to differentiate and specialize fiber products, especially linking them with mid- and down-stream manufacturers to upscale products.

Product differentiation and diversification may be the manner in which these firms can survive, but they do not always lead to success in new businesses, particularly as these firms scramble to expand into many of the same high-technology fields. The case of carbon fibers is a good example. Toray, Toho Rayon, Asahi Chemical and Mitsubishi Rayon have all been expanding capacity at a rapid rate. In addition, Asahi-Nippon Carbon, Kureha Chemical and Nippon Carbon have also entered the market, while Nippon Steel, Sumitomo Metal, Mitsubishi Chemical and Sumitomo Chemical are now contemplating doing so as well. [111] The future of each firm seems to be determined by how quickly it can develop differentiated and specialized carbon fibers and cultivate a market, particularly domestically. [112]

In the fierce production diversification race, many new business operations soon turn into congested sectors even before a profit can be realized. For example, besides Toray, over 20 firms are known to have gone into inteferon-B just within Japan. According to some medical experts, however, projected demand may allow only one or two firms to generate a profit. [113] Under such circumstances, it is difficult to predict how each firm would be able to carve out a market share large enough to justify the huge investment necessary to develop a new high-technology product. At the moment, there is no talk of inter-firm collaboration in R&D among these firms. It is a reminder that it took Toray six years to recover the initial sunk-cost of carbon fibers and 15 years to start generating a profit, and the company continues to pour in more investment at present (over 20 years later). [114] Relentless diversification effort and ensuing expansion in R&D costs have earned Toray the sarcastic label of a "permanent dream pursuer". [115]

5. Adjustments in the Textile Mill Sector.

In contrast to the upstream sector where, despite the possibility of congestion, structural adjustments have thus far succeeded in restoring profitability in the major synthetic fiber manufacturers, the same cannot be said about the midstream sector, where conditions are more complex. The midstream sector continues to face problems created by excess capacity, although the production of textile fabrics steadily declined from 6,565 million sq. meters in 1984 to 6,326 million sq. meters in 1985, 6,000 million sq. meters in 1986, 5,623 million sq. meters in 1987, and 5,718 million sq. meters in 1988. [116] This sector is still fragmented, consisting of 9 major spinning and weaving mills -- Toyobo, Kanebo, Nisshinbo, Kurabo, Nitto Boseki, Daiwabo, Fuji Spinning, Omikenshi, and Shikibo; about 1,000 smaller spinning mills; and nearly 63,000 mini weaving mills (1-10 employees). [117] (Table V-4) These nine major firms together accounted for about 60% of total capacity in 1988. [118] Although the combined sales of these nine firms rose 3.8% in FY1987, 9.4% in FY1988, and estimated 5.1% in FY1989, their combined recurring profits nearly doubled (107.1% surge) in FY1987 and dropped 14.5% in FY1988, with another decline of 0.1% estimated in FY1989. [119] While Kanebo and Toyobo have enjoyed steadily improving sales and recurring profits in the last four years since 1986, the other seven

firms all suffered lower profits in FY1988 and FY1989, with the estimated FY1989 profits still not recovering to FY1986 levels. [120]

Table V-4: Japan's Major Textile Mills

(Year ended March 1989).

	Affiliate Group	Sales (billion ¥)	R & D (spending)	Share of Textiles 1980	1989
Toyobo Co. Ltd.	--	315.6	9.0	80%	78%
Kanebo, Ltd.	--	481.6	10.4	59%	42%
Nisshinbo Industries, Inc.	Fuji	174.8	4.5	76%	67%
Kurabo Industries, Ltd.	--	130.7	1.2	91%	81%
Nitto Boseki Co., Ltd.	--	121.7	2.3	61%	48%
Daiwabo Co., Ltd.	--	80.4	1.1	100%	100%
Fuji Spinning Co., Ltd.	--	79.8	0.5	98%	95%
Omikenshi Co., Ltd.	--	63.1	0.08	94%	89%
Shikibo Ltd.	--	61.4	0.05	99%	97%

Source: Toyo Keizai, Kaisha Shikiho (Company Report), Winter 1981 and Winter 1990

The discrepancy in performance among these 9 firms seems to stem from a degree of diversification and an accumulation of technology. A jump in the profits of both Kanebo and Toyobo in the last two years was caused by improved sales in the nontextile business. [121] The textile mills sector is still too fragmented and not strong enough to unite to implement a concerted strategy to positively restructure, as mentioned earlier in this chapter. Except for the period between December 1978 and October 1979, when the production of woolen textiles and cotton textiles were cut by 11% and 4.7%, respectively, under the Structurally Depressed Industry Law of 1978, concerted efforts to reduce production capacity significantly never took place in this sector. [122]

Instead, many firms waited until they had huge losses before they were forced to cut or shut down production when imports of cotton yarn, fabrics and finished goods began to rise in the mid-1980s. They were hurt because 1) the international raw cotton market plummeted due to two consecutive years of bumper crops (especially in the U.S.) in 1986 and 1987; 2) demand in the Middle East slowed; 3) after jumping from 100,100 tonnes in 1983, to 161,000 tonnes in 1984, cotton yarn imports soared to 199,600 tonnes in 1988 (particularly from Pakistan, South Korea, and the People's Republic of China), and likewise, the imports of cotton fabric climbed from 292

million sq. meters in 1983 to 496.2 million sq. meters in 1984, and to 688.6 million sq. meters in 1988. [123]

Only a few major firms had a strong enough capital backing and flexibility - ability to shift rapidly between products, ability to retrain workers, and power to squeeze and even abandon subcontractors --to make structural adjustments by accelerating production cutbacks and diversification. Toyobo, the top cotton textile maker and a leading comprehensive textile maker, accelerated restructuring efforts through a series of plant shutdowns, labor rationalization measures, and disposal of real estate. Under a drastic retrenchment plan, 100,000 spindles, capable of making only low value-added products were discarded in 1985 and 1986. [124] A mill with 64,000 spindles and 800 weaving machines was closed down and a printing mill, capable of printing about two million meters per month, was phased out. 400 workers from the former mill and 250 workers from the latter had to be absorbed into Toyobo's new lines of business by 1987. [125] A total of over 3,000 jobs have been eliminated through natural attrition and voluntary early retirement. [126]

To reduce its dependence on textiles, Toyobo, like Toray, has diversified into new areas of business by establishing 21 Strategic Business Units. Each unit contains R&D, production and sales sections centered around each product within a parent firm. It has so far expanded into polyester films for video tapes and food wraps, nylon

photosensitive resin relief printing material, engineering plastics, biotechnology, and electronics -- the same fields as the synthetic fiber producers. [127] In addition, in 1981 Toyobo bought Cosmo Electronics, a subcontractor of parts assembly for Sony and IBM Japan, in Yokkaichi and turned it into a subsidiary. This unconventional move by Toyobo to create a subsidiary that would be a subcontractor to other large firms which provides technology was yet another attempt to diversify. [128]

Kanebo, the most and the earliest diversified of the textile firms engaged in all seven main textile materials (nylon, polyester, acrylic, cotton, silk, wool and rayon), is determined to shift the weight of their products away from basic textiles into higher value-added textiles, fashion goods and apparel. [129] For example, by creating Comprehensive Marketing Office, Kanebo experienced surging sales, at their franchise cosmetics stores, of ladies' undergarments and nightwear that can be color-coordinated with Kanebo cosmetics. [130]

By reinforcing its Pentagon Operation -- i.e. five pillars of businesses established over the years, including textiles, cosmetics, foods, pharmaceuticals and other consumer goods, Kanebo is pushing forward with product differentiation and diversification. It has developed new product lines in "bio-cosmetics" and "fine-ceramic cosmetics" using fine-flake white titanium in place of acid titanium and sericite to enhance coating consistency and transparency. [131] Kanebo is developing

new drugs for the areas in which great demand is expected, such as cancer, high blood pressure, and digestive system, liver, and gynacological diseases. [132] And Kanebo has established a joint venture with Mitsubishi Electric to produce semiconductors as part of an attempt to expand into information process and software businesses. [133]

Other major textile spinners/weavers are also pressing forward with adjustments. With investment in plant and equipment raised from the capital markets, Nitto Boseki and Nisshinbo have significantly upgraded their cotton spinning, weaving and dyeing machinery. Nitto Boseki has not only expanded into various construction materials but also become Japan's top producer of glass fibers and is currently attempting to widen use for a glass-carbon hybrid fiber and a nickel-coated glass fiber. [134] Nisshinbo, on the other hand, has diversified into anti-skid brake systems, paper, and machine tools. [135] Although these new businesses have helped both firms' earnings, they were not sufficient enough to overcome the deficits of their textile divisions. [136]

It is believed that the worst from the "yen recession" is over for the textile mill firms thanks to an expansion of domestic demand since 1987, particularly in upscale products. However, there is still a long way to go before a majority of the firms in this sector have healthy profits. [137]

The small- and medium-sized textile mills sector faced a much harsher situation, because larger firms often forced down prices of woven cloths. Some small- and medium-size textile mills have taken a big leap in adjustments by upscaling operation or diversifying, as described below. But in general, various laws introduced to consolidate this sector and the 800 billion yen of national funds expended in this endeavor in the last 30 years have not so far helped this sector to make the necessary positive adjustments to restore competitiveness. It is because, as elaborated above, the firms in this sector are too fragmented to act in a concerted manner and do not possess a structural flexibility (sufficient numbers of employees and subcontractors, etc.) nor financial resources to spread necessary costs even with the aforementioned national assistance. [138]

Among the more successful cases, the silk weavers' cooperatives in Fukui (composed of 65 small firms with 950 employees) undertook an active sales promotion directly appealing to the apparel makers and consumers by stressing quality and versatility, often hosting exhibits, instead of remaining totally dependent on the wholesalers. Thanks to such efforts, their domestic sales share in light double woven silk fabric jumped from 30% in 1975 to 65% in 1986, and their exports rose 9% in volume and 29% in value in just one year from 1985 to 1986 despite the yen's rise. [139]

Fujii Woolen Weaving, a family-owned mid-size firm, has adjusted itself on the basis of quality -- by producing the world's most expensive woolen textiles and goods made of only the best Chinese cashmere, Middle Eastern camel, Australian Merino wool, Tasmanian Winton wool, and top quality English wool. Extending from upstream to downstream from men's, women's, and children's apparels to interior decorating and bedding goods, produced in small lots, Fujii's business has been steadily growing, undaunted by imports. [140]

Others are pushing forward with product differentiation. Daito Woolen Spinning and Weaving and Mizushima Silk Industry, both medium-size firms, jointly developed what is dubbed as "biotech wool" by extracting fibroin (the protein found in silk that gives the material its characteristic feel and gloss) from silk, modifying it slightly and then slipping it into the tiny spaces found between molecules of raw wool. This "biotech wool" apparently yields cloth that is lighter, warmer and more comfortable than regular wool. Since such techniques can be replicated to blend the properties of any natural fibers, these firms plan to develop a fluffier, woolier wool by adding extra wool proteins. [141] The birth of "biotech wool" represents non-price competitiveness deriving from horizontal linkages of firms in different sectors -- in this case, one in the wool and the other in the silk industry.

Notwithstanding these successes, however, by having been unable to make the necessary adjustments before the slump worsened by the yen's rise, most small and medium textile mills continue to be exposed to the difficulties caused by excess capacity. While it is hard to grasp the entire picture of the nation's small and medium textile mills as they are fragmented, the circumstances in which they operate in the Hokuriku area -- Japan's principal textile region covering Fukui, Ishikawa and Toyama prefectures with 80% share of the nation's total textile production -- have been indeed compelling. Out of about 4,400 firms in the Hokuriku area in 1985, over 80% were those extremely small firms with less than 10 employees and with less than 50 weaving machines, many of them serving as subcontractors to large synthetic fiber producers. [142]

Although the total number of textile mills in Hokuriku decreased from about 5,700 in 1980 to 4,400 by 1985 (some merged but most left the business) and 37,974 standard weaving machines were discarded, the total capacity during these years expanded rather than contracted, thereby exacerbating the problem of excess capacity. This was because the 12,496 water jet looms (WJL), air jet looms and Rapier looms introduced during this period are 7 to 8 times faster and more efficient than the traditional looms they replaced. [143] Just as the Hokuriku Weavers' Structural Adjustment Cooperatives was created in 1985 to implement a three-year plan to

discard excess capacity of 20% and buy up existing surplus stock (1,270,000 rolls) so as to revive the market and to raise the rate charged for weaving each roll. the yen's rapid rise struck the industry, necessitating much more drastic production cuts than planned. [144]

Hence, textile mills was thrown into a panic in the industry's worst recession since World War II. Under pressure from the big synthetic fiber firms and wholesalers, the rate which the textile mills (subcontractors) can charge to weave each roll was cut to half from June 1984 to July 1986 -- from an average of 1,400 yen to 600 yen per roll for taffeta and from 2,500 yen to 1,000 yen per roll for georgette. [145] The Weavers' Cooperative in Komatsu City in Ishikawa prefecture called for a stoppage of operation for five days to prevent any more excess supply of fabrics, in an attempt to raise the rates charged, but to no avail. [146]

Sakekiyo Weaving in Fukui, a Toray subcontractor weaving nearly 120 kinds of polyester fabrics, was managing to make a profit until May 1986. But as the yen's appreciation began to take effect after June, the firm has been operating at a loss. Thirty high-speed weaving machines out of a total 380 had to be shut down -- the first time such action had to be taken since the firm started to receive contracts from Toray. Sixty-five out of 300 workers had to be cut from the payroll through early retirements and laying off part-time workers. Since the rate for weaving rolls of cloth has plunged,

the cost of labor to the firm has jumped from 30% to 60% of total operating costs, even with the labor rationalization. [147]

In Ono City in Fukui, which in the early 1980s experienced a boom for its polyester crepe georgette, only 20 out of about 50 mills which belong to the local weavers cooperative were in operation, while 30 mills suspended production altogether in the autumn of 1986. Only 5 out of these 50 firms were able to pay their employees an annual summer bonus in 1987. [148]

According to the Fukui Structural Improvement Cooperative's study, 9,813 (1,032 WJL) out of 57,983 looms belonging to 1984 member firms were mothballed in September 1986. This figure for after 1987 was forecast to have climbed to 13,794 (2,424 WJL) looms. [149]

Closures and bankruptcies were not contained among extremely small independent mills, which was the tendency in the past recessions, but spread to medium-size subcontractors, although the big nine and other major mills are still intact: an Asahi Chemical subcontractor in Kanazawa went bankrupt and a Teijin subcontractor in Fukui stopped its operation in September 1986. [150] The rate of bankruptcies in the textile industry --the majority in the mid-stream sector -- rose 6.7% in 1982, 7.8% in 1983, and 9.7% in 1984, then decreased 8.1% in 1985, 0.6% in 1986, 22.5% in 1987, and 16.2% in 1988, reflecting Japan's overall economic upturn since

since 1987. [151] Yet, a slower rate of bankruptcies in the textile sector does not look so great when compared to the figures in all sectors -- decline of 9.5% in 1986, 44.6% in 1987, and 5.7% in 1988. [152]

With the forecast that the number of textile mills in the Hokuriku area will be reduced by 50% in a few years, local financial institutions began to provide consulting services in how to shift into other business. [153] It is uncertain how many firms will be able to make a successful switch into other fields. The textile industry as a whole lost 2.1% of its labor force in 1984, 0.9% in 1985, 0.1% in 1986, and 2.0% in 1987. [154] Particularly affected by such labor cutbacks have been part-time women workers as textile mills traditionally hired many women part-time workers for their labor-intensive segment of operation as they can easily be discharged. [155]

As examined above, the synthetic fiber sector has succeeded in making structural adjustments with much less cost and pain than the textile mill sector, which is still in a slump. It is still uncertain to what extent the textile industry as a whole can be revived and transformed into an "advanced industrial society type" industry, or to what extent new businesses can absorb labor reallocation when the current economic boom ends. Meanwhile, fundamental and far-reaching changes currently under way as a result of structural adjustments in the textile industry may be presenting opportunities

to some individuals and firms but they are also causing enormous costs and deep pains to others as they are relocated and retrained.

To a certain extent, structural adjustments taking place in the textile industry in Japan at the moment can be described as that of positive adjustment because the industry has been under pressure to phase out uncompetitive segments of the industry and to revitalize through product differentiation with more value-added and diversification into high technology areas while accommodating increasing imports.

VI. CASE III: ROBOTICS

1. Socio-Economic Factors Inducing Robotization.

Preceded by the 1977 report of the Industrial Structure Council's Subcommittee on the Machinery and Information Industries, the Industrial Policy for the 1980s called for a growth of the robotics industry and a diffusion of robotization and other microelectronic (ME) automation. [1] This chapter will examine the robotics industry in order to grasp how the Japanese state, through the Industrial Policy for the 1980s, attempted to nurture a nascent industry as part of an effort to transform the economy into a more knowledge-intensive one as a whole. The robotics industry is believed to provide good insights into structural adjustments not only because it is one of the fast growing knowledge-intensive nascent industries but also it can affect industrial change more broadly by making senescent industries competitive again through process innovation.

How has the Japanese state through its industrial policy helped build the robotics industry? How has the Japanese state through the industrial policy helped to diffuse robotics? Have the emergence of the robotics industry and the diffusion of it helped improve the quality of life in Japan?

Before exploring these questions, this chapter will analyze why robotization and other ME automation were encouraged in the industrial policy. First, Japanese industries were compelled to seek a greater degree of automation as the economy experienced a labor shortage of skilled and semiskilled workers since the late 1960s with the impression that the shortage was going to intensify. With a near ban on immigration, robotics was perceived as a way to ameliorate the problem of labor shortage. As noted by Leonard Lynn, the theme of the 1967 robotics symposium in Japan was "What can the robot do for a society that is short of labor?" [2]

Although Japan entered an era of moderate growth since the mid-1970s, shortages of skilled workers in such areas as machinists, welders, painters and assembly workers were forecast to remain high unless further automation could alter this situation. [3] The securing of good skilled workers in these areas continues to be a concern as the new workforce entering the manufacturing sector is expected to decline owing to generally slower growth in labor supply, the aging of the workforce and the higher educational attainment of youths. [4] One figure indicates that by 1990 the number of workers in the industrial sector would be down 2,530,000 from the 1980 level, and the working population in general would see an additional decline of 1,860,000 among workers in their 20s and 30s. [5] Under such circumstances, robots

are viewed as becoming a necessary part of filling in the gap not occupied by young workers and assisting older workers in physically demanding tasks.

Second, as we saw in the previous chapter the rapid wage increases which overtook the growth rate in the mid-1970s forced intense labor rationalization efforts. Particularly in such labor intensive industries as consumer electronics, textiles, apparel, and plastic goods that lost a comparative advantage in terms of labor to those countries where wages were much lower than in Japan, it was imperative to robotize the production. [6]

Third, unlike their counterparts in many other industrialized countries, some enterprise unions, such as Nissan Motors Union, encouraged the introduction of robotics and other ME machinery as a means of liberating workers from dangerous and de-humanizing work. [7]

Fourth, mass production based on traditional specialized industrial hardware was no longer able to keep up with the new pluralization of consumer demands -- i.e., a greater variation of high-quality products at a low cost, thereby necessitating flexibility in production by means of robotics and factory automation (FA) systems/flexible manufacturing systems (FMSs). [8]

Hence, robotics has also come to be viewed as a means to raise efficiency, productivity and competitiveness in the era of moderate growth and changes in consumer demand.

Moreover, besides the pressures from the larger firms which rely heavily on smaller subcontractors, the Japanese state was compelled to help small and medium-sized enterprises (SMEs) adopt robotics to ensure their survival not only because of the SME sector's large share in the economy and their vital support in linking different industries by supplying intermediate goods and services but also for the following socio-economic conditions surrounding SMEs. First, many, but not all, SMEs in Japan are often more vulnerable to shortages of workers due to their generally inferior wages, less attractive fringe benefits, and less established lifetime employment security than are larger firms. [9]

Second, as large firms adopted a shorter inventory period and tightened quality control to raise efficiency since the 1970s when the economy slowed down and international competition intensified, subcontracting SMEs were placed under more rigid time frameworks for production and delivery and also under stricter conditions for quality and cost. In addition, as large firms proceeded with further automation, there has been a tendency toward more in-house production and less subcontracting.

For these reasons, many SMEs had no choice but to robotize and attempt to reduce the gap in efficiency and competitiveness. [10]

2. Emergence of The Robotics Industry.

Why and how did Japan's robotics industry emerge? Japan's robotization began in the late 1960s when AMF of the United States established its subsidiary, AMF Japan, in 1967,and Kawasaki Heavy Industries signed a licensing agreement with Unimation in 1968 while Toshiba in 1967 and Ishikawajima Harima and Yaskawa Electric in 1968 developed their own robots. [11]

Most Japanese robot producers originally began as robot users to fulfill their own factory automation (FA) needs -- some by developing technology in-house and others by licensing technology from abroad and adapting it -- because there were none on the market to suit their specific needs. Pressed with difficulties in securing skilled workers, rising wages, increasing energy and other material costs as well as pollution control expenses, Japanese manufacturers were far more willing to install the first generation of rather primitive robots for relatively simple tasks such as spotwelding and plastic molding than their counterparts in the United States or Europe. [12] There was a strong determination and less hang-ups among management to introduce

primitive robots as they were fulfilling the specific needs of each firm even though they were well aware of the limitations of these robots. [13]

Intended strictly for a narrow range of applications and despite their limitations, however, these robots have been applied to save labor as they were often more effective than conventional hard automation. Since they can be made to move in various ways without costly retooling required in traditional automation, such industries as consumer electronics, where a competitive edge lies in the firm's ability to bring out new products and variations rapidly and continuously, found this flexibility and adaptability to be of particular importance -- that is, the economies of scope. [14]

The manufacturers' willingness to adopt relatively basic robots of specific types of application created a big market for them. A number of large and small firms rushed to fill the demand by producing specialty robots which they developed originally for their own needs. Neil W. Davis called this a "forced entrepreneurial" pattern and noted that it was rather unique to Japan. [15] (Only around 1984 did foreign producers, such as IBM, GM, Bendix, Sweden's ASEA, and West Germany's Volkswagen, also start to make their own robots.) [16] Firms in such diverse areas as machinery, electronics and plastic molding have thus emerged as leading robot producers.

In some cases, production and sales of robots promised a great potential offsetting the slow growth in sales of their traditional products. The 1983 Survey by the Economic Planning Agency, called Strategies of Firms To Surmount this Confusing Period, revealed that in the era of slower growth many firms were not only staking their survival on further rationalization through robotization and office automation but also on the production and sales of robots and other automation products. [17]

This strategy to start out by making robots for their own needs and, once successful, place them on the market explains what Leonard Lynn described as the two salient features of the Japanese robotics industry. First, the Japanese producers began with relatively simple special purpose robots while the U.S. producers such as Unimation and Cincinnati Milacron started with more expensive general-purpose robots. Second, the Japanese industry is far less concentrated and more diverse in the number and types of firms in it than those in the United States. [18] Writing in 1983, Lynn contended that, while virtually all of the U.S. robot production was accounted for by half a dozen firms, with Unimation having 40% and Cincinnati Milacron 30% of the market share, the Japanese industry had about 150 firms, with the largest Japanese producer, Kawasaki Heavy Industries, accounting for only about 8%. [19]

3. Measures and Instruments to Build the Robotics Industry and to Diffuse Robotization.

Against neo-classical convention, intra-industry collaborations and an important role for the state were indispensable to the growth of Japan's robotics industry. Unlike during the high growth era of the 1950s and 1960s, however, the Japanese state's role, mainly that of MITI -- in the growth of the robotics industry has been less one of direct financial assistance and more one of bringing the industry together to organize R&D in order to reduce the expense and risk involved in creating new technology. Collaborating with the industry, the Japanese state has taken the following direct and indirect measures and instruments to create demand and inject competition in order to build the robotics industry and to induce diffusion of robotics.

In 1971, MITI brought together 35 firms to set up the Industrial Robot Roundtable with the main objective of exchanging information. In 1972, MITI endorsed the transformation of this Roundtable into an incorporated private trade association named the Japan Industrial Robot Association (JIRA). [20] Over the years, JIRA has emerged as the foremost information center on robotics in Japan, publishing journals and occasional papers, organizing conferences and symposia, gathering data, making projections, and arranging low-interest or interest-free loans. Though

maintained at arms-length. JIRA exemplifies the Japanese state's unequivocal endorsement of robotics. [21]

In September 1978, the Law for Extraordinary Measures for the Promotion of Specific Machinery and Information Industries was created to supercede the 1971 Law for Extraordinary Measures for Promotion of Specific Industrial Machinery and Electronics Industries. Under the new law, the industrial robot industry is explicitly categorized as machinery which promotes R&D, industrialization and labor rationalization. This provision enabled the firms installing designated computer operated robots a regular depreciation allowance plus an additional 13% (10% after 1982) depreciation at the time of installation between April 1980 and March 1985 (initially until 1983, later extended). [22] In addition, under the 1985 tax revision on basic scientific research promotion, 6 R&D areas including robotics were allowed to deduct 7% of profits from tax. [23]

Since December 1978, MITI's Agency for Industrial Science and Technology, with the pressure from the industry, has been coordinating intensive public and private joint R&D on robotics under its Large-Scale Industrial Technology Development or so-called Large-Scale Research Projects. [24] The biggest project currently underway is the Advanced Robot Technology Research Association to develop robots that can replace human labor in nuclear power plants, undersea operations, disaster-fighting, or

any other environment that defies direct human intervention with high radiation dosage, high water pressure, high temperature, or other highly hazardous factors. [25]

Launched in 1983 as an eight-year Large-Scale National Research project, it is coordinated by the Electro-technical Laboratory and the Mechanical Engineering Laboratory, which are research arms of MITI's Agency for Industrial Science and Technology. Participating in this project are two organizations -- International Robotics & Factory Automation Center and Japan Power Engineering and Inspection Corporation -- and 18 leading robotics manufacturers -- IHI Co., Ltd., Oki Electric Industry Co., Ltd., Kawasaki Heavy Industries, Ltd., Kobe Steel Ltd., Komatsu Ltd., Sumitomo Electric Industries, Ltd., Toshiba Corporation, JGC Corporation, NEC Corporation, Hitachi, Ltd., Fanuc Ltd., Fujitsu Ltd., Fuji Electric Corporate Research & Development, Ltd., Matsushita Research Institute Tokyo, Inc., Mitsui Engineering & Shipbuilding Co., Ltd., Mitsubishi Heavy Industries, Ltd., Mitsubishi Electric Corporation, and Yaskawa Electric Mfg. Co., Ltd. It is estimated to cost about 20 billion yen of public funds in excess of unspecified private funds by the firms involved. [26]

This project has already yielded substantial advancement in the following areas: processing visual information technology, manipulators, horizontal locomotion on floor, vertical locomotion on the wall, remote-control work, propulsion and

maneuvering system, ultrasonic imaging systems, hydraulic muscle type actuators, vision sensors, proximity sensors, and heat-resisting technology, among others. [27]

There are less expensive projects on robotics in which the state is directly involved: the "Flexible Manufacturing System Complex (FMSC) Provided with Laser" project, which attempts to make a quantum leap with a new generation of FA systems; the Juvenescent Pioneering Technology for Robots (JUPITER) project which strives to develop a robot that can amble along at a humanlike speed of 2.5 mph; and the Silver Robotics project, which aims to develop robotics that are to assist older workers in order to expand employment and improve the working environment for senior citizens. [28] These projects are in general organized by MITI with the collaboration of robotics manufacturers, which send engineers to these projects and intend to commercialize once prototypes are created by a joint state-private enterprise consortium. [29]

After it was agreed at the Williamsburg 7-nation summit in 1983 to promote a joint study on advanced robots, JIRA, with MITI's endorsement, established the International Technology Center of Robotics and Flexible Automation in May 1985 to facilitate international collaboration on studies aimed at stimulating economic growth and improving working conditions. [30]

Moreover, with pressures from the larger firms which have smaller subcontractors, MITI undertook measures that are explicitly aimed at the SME sector to gain benefits of robotization such as cost-cutting and ensuring quality. First, in April 1980, MITI helped create the Japan Robot Leasing Company (JAROL) -- originally organized with capital from 24 robot manufacturers affiliated with JIRA and 10 non-life insurance companies and banks. [31] While JAROL's leasing is not exclusive to the SME sector, MITI helped the establishment of JAROL because it recognized the following: the SMEs were underutilizing industrial robots; the SMEs general lack of capital for the investment; and therefore, it would be more advantageous for the SMEs to lease robots than to purchase as technologies are changing rapidly and continuously, making robots obsolete in short period of time. [32] This system allows JAROL to acquire loans from listed financial institutions, purchase robots from manufacturers, and lease them to users. JAROL not only offers leasing terms that are more attractive than those offered by commercial leasing firms, but also provides systems engineering and consulting services that are badly needed in the SMEs. [33]

Second, those robots which meet safety standards set by JIRA have been added to the category which may receive Provision of Special Loans for Industrial Safety and Hygienic Equipment to improve the working environment of the SMEs. Under this provision, the SMEs can obtain special loans from the Small Business Finance

Corporation and the Public Finance Corporation for the purpose of installing specified robots in dangerous production areas to enhance safety and hygiene of the workplace. [34]

Third, again in 1980, industrial robots were designated in the Provision of Loans and Leasing for the SME Modernization. The first scheme under this provision provides special loans to those SMEs attempting to introduce robots for the rationalization of production and the enhancement of productivity. Funds for these loans are supplied by both the national and the prefectural governments in equal amounts. Up to 50% of necessary funds to a maximum 12 million yen is loaned interest-free for SMEs with less than 100 employees. The second scheme grants a portion of capital necessary for the leasing of equipment up to 15 million yen and free technical assistance for firms with less than 20 employees that are unable to come up with enough capital investment to modernize their production. [35]

4. Growth of the Industry.

Backed by the above measures, the robotics industry in Japan experienced fast growth with resultant reduction in prices, which in turn helped diffuse robotics even into the SME sector, further broadening the market. Even some reisai kigyo

(extremely small firms with 1-30 employees) have introduced robots in their operations, making some of them literally one-man factories. [36]

As the JIRA statistics shown in Table VI-1 indicate, the output of Japan's industrial robot production grew 22 times from 1968 to 1975 and 4.5 times from 1975 to 1980. It grew from 78.4 billion yen in 1980 to 259.9 billion yen in 1984 and an estimated 370.0 billion yen in 1988. The total sales value of 300.1 billion yen in 1985 is nearly three times the size of the U.S. market (104 billion yen or $580 million in 1985). [37] Sales are forecasted to reach 600-690 billion yen for 1990 and 960-1,390 billion yen for 1995. (Table VI-1)

Table VI-1: Output of Industrial Robot Production in Japan.

Year	Unit	Value	Annual Rate of Increase (%)
1968	200	400 million	
1970	1,700	4.9 billion	562
1975	4,400	11.1 billion	25
1980	19,900	78.4 billion	121
1981	22,069	107.8 billion	37.4
1982	24,782	148.4 billion	37.7
1983	30,544	181.8 billion	22.5
1984	40,923	259.7 billion	43.0
1985	48,490	300.1 billion	15.5
1986	42,066	278.7 billion	-7.1
1987	48,000	310.0 billion	11.2
1988	58,000	370.0 billion	19.4
1990	51,400-60,200	600.0-690.0 billion	20-26
1995	81,200 115,800	970.0-1,390.0 billion	12-20

Note: Figures for 1988 are rough estimates. Figures for 1990 and 1995 are forecast.

Source: JIRA; drawn from "Waga Kuni no Robotto Sangyo" in Sangyo Gurafu, vol. 16, no.116, March 1984, p. 8. Sangyo no Subete (All About Industry). Tokyo: Yamaichi Keizai Kenkyusho, 1988, p. 126.

After the 7.1% decline in value and the 13.2% drop in volume in the production output in 1986 due to the high-yen recession, the robotics industry has resumed its steady growth since the latter half of 1987. The years 1987 and 1988 saw a double-digit growth thanks to strong plant and equipment investments amid the current phase of domestic demand-led economic expansion. [38]

In 1968 when production of industrial robots started, there were fewer than 10 robot makers in Japan. The number grew to 50 in 1970, over 120 in 1976, 140 in 1980, 200 in 1983, and about 280 in 1988. [39] It is difficult to compare the numbers of units in use as older models are continuously replaced by new models. As of the end of 1984, 64,600 robots were in operation in Japan, 13,000 in the United States, 6,600 in West Germany, 2,750 in France, 2,700 in Italy, 2,623 in the United Kingdom and 2,400 in Sweden. [40] Other data showed that out of 40,000 second-generation robots in 1984, 16,500 were operating in Japan. [41] JIRA estimated that about 60% of the world's robots were in operation in Japan in 1987. [42]

As to the rate of diffusion, the precise level of robotization is difficult to probe as almost all Japanese surveys within the last several years are compiled on the basis of microelectronic (ME) machinery, including robotics, numerically controlled (NC) machine tools and factory automation/flexible manufacturing systems (FA/FMS's). According to the 1985 Labor White Paper -- the most recent comprehensive

government study -- 59.3% of plants with over 100 employees in the manufacturing sector have installed ME machinery. The rate is 95.6% among firms with over 1,000 employees compared with 51.2% among those with 100 to 299 employees. Those figures led this Labor White Paper to conclude that robotics and other ME machinery have penetrated broadly even into the SME sector. [43]

The broad diffusion of robotics, particularly in the SME sector, was made easier by the declining cost of robots. For example, when welding robots began to appear in SME factories in the early 1978, they were in the 13 million yen range. With sudden advances in the field of microchips, they were brought down to the 10 million yen range by 1980. [44] They remained about the same level until 1983 and then dropped to the 6 million yen range by 1985. [45]

With profits and broad operational experiences from the fast-growing domestic market, the industry was able to grow in a relatively short period of time from the first to the second generation of robots and then into more advanced versions of the second generation of robots. [46] During the slowdown in the robot boom in 1982-1983 due to a general saturation in the market and the ensuing glut of the first and second generations of robots, many producers replaced old models with more advanced ones, thereby stimulating further growth. [47] (Table VI-2)

Table VI-2: Types of Robot Production in Japan

UNITS

Generation	1979	1981	1983	1985	1987	1988
Types						
0						
Manual Manipulator	1,051	964	935	1,177	1[illegible]8	66
Fixed Sequence	10,721	12,923	11,032	13,289	1[illegible],151	14,281
1						
Variable Sequence	1,224	2,478	4,457	6,263	7,201	7,250
2						
Playback	662	3,928	7,873	14,384	13,027	16,930
Numerically Controlled	89	1,138	3,947	10,469	10,909	14,008
3						
Intelligent	788	638	2,300	2,908	2,644	3,314
Total	14,535	22,069	30 544	48,490	45,050	55,900

VALUE (million yen)

Generation	1979	1981	1983	1985	1987	1988
Types						
0						
Manual Manipulator	1,936	3,016	3,424	3,296	3,355	755
Fixed Sequence	19,011	23,947	18,746	30,137	22,537	26,056
1						
Variable Sequence	7,356	14,398	19,503	23,211	18,565	27,536
2						
Playback	6,653	33,388	58,304	90,978	72,176	92,804
Numerically Controlled	1,745	16,080	47,690	95,498	108,433	133,421
3						
Intelligent	3,698	10,702	19,242	26,862	30,362	42,302
Peripheral Equipment	1,307	4,977	11,113	25,746	36,282	41,590
Total (including parts)	42,420	107,781	181,753	300,148	300,628	367,727

Source: JIRA; annual issues of Sangyoyo Robotto ni Kansuru Kigyo Jittai Chosa Hokokusho (Survey of Industrial Robots).

Table VI-3: Share of Shipments by Value in Robotics Industry

(%)

Industry		1981	1983	1985	1987	1988
Electric/Electronics		31.6	32.0	34.7	31.7	33.1
Autos		29.6	19.9	16.5	19.9	21.6
Export		5.7	18.2	19.8	21.4	19.7
Plastics		9.5	7.5	6.0	5.1	4.8
Metal Products		5.0	5.2	2.5	1.6	2.6
Metal Processing	6.3	3.0	1.8	2.0	-	
Others		12.3	14.2	18.7	18.3	18.2
(Precison Machinery, Building Machinery, Steel, Textile, Chemicals, Clay & Stone Products, etc.)						
Total		100	100	100	100	100

Source: Various issues of Asahi Nenkan (Asahi Yearbook).

With the advent of more sophisticated robots, the share of shipments grew in sectors where new demand was created, such as in the electrical and electronics industries, away from saturated sectors like in the plastics, metal products, and metal processing. (Table VI-3) By improving technologies in sensors, motors, materials, and memory and control equipment capabilities, there emerged the third generation of robots, which are aware of their environment and able to react to it by learning to adapt their own programmes as they go along. [48]

For example, in 1982, Toshiba introduced the world's first visual sensor "robot system" that interacts like two human hands on an assembly line. Equipped with a pair of distinct robot-hand instruments, one which uses a Charge Coupled Device (CCD) camera, this system is used to perform the hand movements of skilled assembly-line employees, such as those of electrical products soldering workers. [49] Around the same time, several firms brought out robots equipped with optical sensors that can mimic the workings of animal eyes by reconstructing three-dimensional shapes, extracting perspectives, distinguishing colors, and ignoring extraneous information. [50] These sensors have been greatly improved in the last few years, for example, to produce a robot that can move arms with a precision of 1 millimeter. [51]

Despite some drastic advances in sensing and agility, many more major breakthroughs are necessary before robots can be equipped with better vision, hearing

and robot language. [52] The success of the third generation of robots is still largely contingent upon the outcomes of the fifth-generation computer projects (artificial intelligence), although there is also a study to short-circuit the problems of artificial intelligence by improving the link between operators and robots by refining sensor and manipulator technology to such a degree that the human being in control would feel as if robots' eyes and hands were effectively extensions of his own body (dubbed as "telepresence"). [53]

Among different types of robots, demand for more sophisticated robots is expected to grow faster. The output for the advanced NC robots (those which perform motions according to numerically loaded instruments) is predicted to be 155-180 billion yen (12,900-15,100 units) for 1990 and 219.5-313.0 billion yen (18,200-26,100 units) for 1995, up from 21.8 billion yen (992 units) in 1980 and 78.6 billion yen (7,620 units) in 1984. [54] The output for intelligent robots (those which modify operation in response to their sensing and recognition capacity) is forecast to be 60-70 billion yen (6,700-7,800 units) for 1990 and 146-209 billion yen (16,200-23,200 units) for 1995, up from 10.7 billion yen (638 units) in 1981 and 30.4 billion yen (2,644 units) in 1987. (Table VI-2) [55] These two types of robots together are expected to account for 60% of the output value of all robots combined in 1990 and 63% in 1995, up from 45% in 1984. [56]

As the robotic manufacturers experienced a slowdown in the boom in 1982-1983 with the saturation of the second-generation robotics, aside from upscaling their products to stimulate new demand as seen above, producers attempted to seek growth through the following strategies. One, firms emphasized sales of complete systems rather than just units because peripheral equipment sales can be very lucrative, even though this requires custom design to adapt conveyer systems to move goods among robots and other components in factory automation. According to Yaskawa's assistant manager of sales, for a robot costing $35,000, peripherals such as machines that hold, rotate, and load parts for robots to use, can easily run to $130,000 or more. [57] The output of peripheral equipment in value has gradually been growing -- 1,307 million yen in 1979, 11,113 million yen in 1983, and 36,282 million yen in 1987. (Table VI-2) Demand is rising for FA/FMS's combining third generation robots, NC or computer numerically controlled (CNC) machine tools, machining centers (MC's), central computer control, conveyers, etc., closer to the idea of the unmanned factory. [58]

In view of managements' desire to automate further to raise productivity, many robotic producers tried to become "FA system makers" pushing FMS's. Some producers also envisioned this direction as a strategy to stabilize relations with users. Since to build FA systems would require detailed knowledge of operations and

managerial plans of firms involved, users would have to trust producers who design their factories. By so doing, some producers believed, they could build better and lasting reliance between customers and themselves. [59] To secure sufficient numbers of computer engineers and systems engineers to build expertise in FA/FMS, such firms as Dainichi Kiko, Matsushita Electric and Toyoda Machine Works recruited engineers from university and research labs and "head-hunted" from other firms like Hitachi, NEC and Fujitsu -- a novel practice in Japan. [60]

Many firms expanded markets abroad. Although exports rose from 3% of total domestic output on a value basis in 1980 to 5.7% in 1981, exports were not a significant factor until 1982-1983, as the domestic market grew so rapidly that most producers were not even able to meet local demand until then. [61] The share of exports in sales grew to 18.2% in 1983, 19.8% in 1985, and 21.4% in 1987. (Table VI-3) [62] About 60% of exports was destined for the United States. [63]

Several firms teamed up with foreign companies through original equipment manufacturing (OEM) system, technical tie-ups and joint ventures to overcome the lack of worldwide marketing networks to provide the technical support and after-service that customers demand. [64] For example, Fujitsu Fanuc, the second largest robot manufacturer in Japan, entered into partnership with General Motors and established GM Fanuc Corporation in the United States in 1982. The joint venture was

to sell Fanuc's robots at first and eventually market GM's and its own robots in the U.S. market and to export to South America and Australia. This arrangement was mutually beneficial because, while Fanuc could provide robot hardware knowhow, GM was more advanced in some software technologies. In 1984, GM Fanuc became the largest robot maker in the United States, with sales of $70.7 million. [65] Shortly before the above agreement, Fanuc also signed sales and technical tie-up contracts with Siemens AG of West Germany, the 600 Group of Great Britain and Manurhin Automatic SA of France. 600 Fanuc Robotics, for example, is engaged both in production and sales of all the industrial robots developed by Fanuc with control equipment supplied also by Fanuc. [66] Since 1982, Fanuc has a sales tie-up with Taiwan's Tatung Engineering Co. and provides robot production technologies and know-how for royalties upon request -- the first signed with an Asian firm. [67]

5. Evaluation

As examined above, aided by industrial policy, the robotics industry has grown and robotics has diffused in a relatively short span of time. The industry has grown steadily from low-end specialty robots, continuously advancing into top-end products

in greater variety and to tailored factory automation (FA) systems. In this process, opportunities have opened up for many firms to expand the scope of business operations, often offsetting other stagnating areas. Some smaller robot makers, users and consulting firms have emerged. [68] Such changes have in general helped firms adjust, and the economy has become more knowledge-intensive overall.

There is, however, concern as to whether the Japanese robotics industry can continue to grow and whether firms can manage to survive. On the one hand, it is expected that demand for robots will continue to grow because of the following factors: a push toward more FA/FMS to ensure further productivity increases and to produce goods of greater variety in smaller lots efficiently to suit consumer demand; the expected technological advancement in the current relentless search for more sophisticated sensors, LSIs and VLSIs: and the needs in other areas, particularly in the nonmanufacturing sector, to adopt robotics. On the last point, even though only about 10% of the robots are presently utilized in the nonmanufacturing sector -- mainly in ocean development and the nuclear power industry, 233 tasks are identified by MITI as fields where robotics will penetrate in the near future, from agriculture, forestry and fisheries, construction and civil engineering, mining, gas and water supply, nuclear power, space, medical treatment and welfare, firefighting, disaster relief, waste processing and other service sectors. [69] JIRA's estimate puts the total value of

robotics used in the nonmanufacturing sector at 49.3 billion yen in 1990 and 182.5 billion yen in 1995. [70]

One area in which a substantial growth is imminent is in the construction and civil engineering industries. Concerned with the "graying" trend of Japanese construction workers and inherently dangerous nature of operations as well as a grim reality that the construction industry had little productivity gain since 1965, construction companies -- some on their own and others in collaboration with firms with robotics experience in other industries -- developed and adopted robots. [71]

For example, Shimizu Construction and Kobe Steel jointly developed and started using intelligent-type construction robots which spray rock-wool and cement mixture on the steel beams of a 40-story Toshiba building under construction in Tokyo. [72] Komatsu and Goyo Construction also jointly developed a large-scale submersible robot which is used to roll and level gravel foundations for building of concrete breakwaters with laser control signals coming from the land. [73] In addition, a mortising robot for tunnel construction was built by Kashima Construction and Toyo Kogyo, the maker of Mazda automobiles. [74] Other leading construction firms such as Obayashi, Taisei, and Takenaka Komuten chose to develop robots on their own by creating internal R&D division on robotics. Some of this R&D is expected to yield results in a few years. [75]

Medical care and welfare services are other promising areas. Demand for a "nursing robot" to assist elderly and sick people is expected to rise sharply due to the aging of the population and younger people's disinclination to join blue collar ranks. [76] For these reasons, demand in the nonmanufacturing sector is estimated to jump to 66.4 billion yen in 1990, from 6.4 billion yen in 1985. [77]

On the other hand, it seems extremely difficult to sustain double digit growth in the long term. [78] How much longer the present rate of growth can be sustained and whether the forecasted levels in Table VI-1 can be achieved are impossible to predict. As the U.S. robotics industry experienced a major shakeout in 1984, a pervasive fear felt among Japanese producers is that a "selection process" is inevitable and, just as the U.S. automobile industry is now concentrated in the Big Three from some 200 manufacturers at one point, it may be imminent that only 10-20 firms would survive worldwide at some future time. [79] During the yen recession of 1986, Dai-Nichi Kikko, a medium-size robotics producer, went bankrupt. [80]

According to some experts, the producers best positioned to survive in the coming years are those with ability to supply full FA/FMS's by integrating complex robots with LSI- or VLSI-based computers and the right software to run the processes quickly bring R&D breakthroughs to commercialization; and effectively penetrate new markets both at home and abroad. [81]

The underlying rationale for promoting diffusion of robotics is that industrial robots are alleged to have many advantages: the ability to perform tasks requiring uniformity and continuity beyond that of human workers, thus raising productivity and filling gaps in the labor market; conserving material input and reducing the rate of defective products, thus making production more efficient and upgrading quality control; allowing flexibility in manufacturing a greater variety of products in small lots without major retooling, thereby providing economies of scope; reducing occupational hardships and accidents, thus improving the work environment; and creating new employment opportunities. [82]

The results of robotization in Japan to date, however, are by no means uniform. They are complex and often contradictory. In one of the most comprehensive studies, Mitsuo Nagamichi found that 2,438 workers in seven large manufacturing firms felt the effects of robotization as below:

	(%)
Rise in productivity	48.6
Fall in productivity	3.9
Rise in product quality	27.2
Fall in product quality	7.0

Rationalization of labor	32.3
Reduced dirty work	8.2
Reduced physically demanding work	18.3
Reduced dangerous work	12.1
Regularized work hours	7.4
Irregularized work hours	14.4
Increase in overtime	10.9
Expansion of operations	31.3
No change	16.7 [83]

With the rise of technological levels, it is undeniable that robotization had an immense impact on productivity. [84] Unfortunately, there is absolutely no data available as to what productivity gains the robotics have brought to the Japanese economy as a whole. One writer has suggested that since robotics allowed in some cases nearly one-man 24-hour plant operation, it has raised the output by 200-300% (and made a plant competitive against those in lower-wage countries). [85] Mainly thanks to robotization and other automation, Honda was making 80.9 cars per worker in the second quarter in 1983 while it was making 41.6 cars per worker in the second quarter in 1974. [86] Likewise, the aforementioned submersible construction robot

developed by Goyo Construction and Komatsu is capable of rolling and leveling 200 square meters of gravel in 5 hours at 30 meter below water. This apparently translates into a 20-40 times productivity gain from human divers. [87] Many smaller firms have also experienced a rise in efficiency and productivity after robotizing their factories. [88]

Yet, there have been many cases in which productivity has not necessarily shown any increase. Some manufacturers have even experienced a drop in productivity due to improper or incorrect set-up particularly at the time of initial installation, requiring extra manhours reprogramming software or readjusting positioning of a robot. [89] The absence of productivity gains from robotization has been more commonly observed among smaller firms where technical expertise and systems-engineering assistance have been deficient compared with larger corporations. [90] In cases where the main objective of robotization was to improve working conditions or product quality, or to undertake tasks which are impossible or too dangerous for humans, productivity often remained unchanged. [91]

The idea that robots would reduce material waste has not always been met. Material efficiency has in a few cases declined either temporarily because of improper adjustment, or permanently due to the nature of a particular robot or the nature of operation. [92] Similarly, product quality has not always improved. [93] For example,

in one firm, the painting robot could not pick up lint on the object painted as humans could. [94] As warned by Watanabe Shigeru, only with the right conditions such as speed, time cycle, position, shape, weight, size, system layout, space, relations with surrounding equipment, system engineering, programming and the right kind of robot, can one expect the right results from robotization. [95]

With regard to the notion of economies of scope, many manufacturers have found that their robots and other ME machinery can be reprogrammed to create variations in functions easily without any remodeling of equipment and large reinvestment. For the first time, FMS's have enabled the auto industry to handle multiple styles of car body on the same assembly line. [96] All carmakers in Japan are taking advantage of the programmability of robots to develop mixed-model assembly lines that are capable of producing several hundred variations of a few basic models. It allows them not only to change the production mix quickly in response to market demands at home as well as the vastly dissimilar export markets of North America, Europe, the Middle East, Southeast Asia, Africa, and Latin America, but also to accommodate yearly model changes without extensive plant shutdowns and retooling. [97]

Similarly, Brother Industries uses 25 robots, developed for internal use, to produce electronic typewriters of many variations of lot sizes as small as 10 for export

to various countries with varying requirements for special symbols. Seiko Epson built a 47-robot assembly line which turns out 100,000 high end watches a month produced in a mix of styles and variations in lots as small as 1000. [98]

According to an assessment made by a private Study Group on Introduction of Industrial Robots, conditions most suited to achieve economies of scope through robotization and FMS's when compared to the conventional machine tools are:

1. When the number of product variations is high (5 to 100 variations).
2. Particularly when these variations are to be produced repeatedly, mixed in a same production line.
3. When the frequency of product changes is relatively high.
4. When the overall time cycle of operations is relatively long and within that time, there are multiple operations of the same kind in different parts.
5. When repositioning of flow of parts is easily obtained.

Under the above conditions, this group concluded, robotics and FMS's provide highly beneficial results. They believed, however, that if there are less than several product differentiations, or even when there are many differentiations if only a few kinds are to be produced at one time, and if changes are infrequent (such as every three

months), then retooling of heads in conventional machine tools are more effective and much simpler. [99]

How has the diffusion of robotics affected workers and employment? Although robotization may relieve workers from dehumanizing and dangerous jobs, the quality of working conditions has not always improved. In Nagamichi's study, 37.6% of the 2,438 workers interviewed felt that the overall work became easier but 19.6% found the contrary. [100] While the Labor White Paper of 1985 -- the most recent comprehensive study -- showed that robots and other ME machinery helped improve working conditions from circumstances including dirty air, extreme heat and humidity, excessive light and glare, excessive noise, continuous heavy operation and unnatural posture, it also warned of potential hazards. [101] The first "robot murder" -- a lone operator working on a night shift in quasi-unmanned factory was struck by a robot -- in 1981 sparked alarm about the dangers of robots. Although the overall assessment of safety in robotized workplaces must be made in a larger context, which would incorporate a trade-off from the conventional workplace, the dangers associated with robots and other ME machinery have become the subject of major scrutiny by labor federations and the Ministry of Labor. [102]

It is commonplace for workers to find themselves required to work much more rapidly than before to keep pace with robots, or required to work in shifts as some

factories switched to 3 shifts/24 hour operation since robotization and factory automation. [103] This irreguralized working time is reflected in Nagamichi's survey -- while 7.4% found their working time regularized, nearly double the rate, or 14.4% experienced the opposite. [104]

Despite some alarm that skilled workers would be reduced to perform tasks of un-skilled workers, most studies found that, in adopting ME automation, skills of workers rarely become unnecessary but new additional skills become essential. [105] Analyzing the Japan Economic Survey Council's questionnaire, Koide Kazuo pointed out that a large number of respondents felt their "ability to plan how to perform a task and to make the basic preparations for it has become more important than before", the "R&D element has increased" and the "leeway to devise manners for improving work methods has been enhanced", while only a few found that the work became simplified. [106] According to the 1985 Labor White Paper, the majority of firms with ME automation undertook both on-the job training (80%) and off-the job training (60%) to equip workers with new skills. In general, however, larger firms tended to offer better programs (nearly all offered both types of training) than smaller firms (only half of smaller firms offered off-the job training). [107]

Although 70% of the firms expressed the view that new technology is compatible with middle-aged/older workers and these workers can be retrained for

them. ME automation tends to favor younger workers. About 20% of the firms assessed that some middle-aged/older workers have difficulties in fully mastering new required skills. [108]

With regard to employment, there are two streams of emphasis. On the one hand, by citing the British experience of spinning machines and power looms of the first industrial revolution in the late 18th century and the U.S. experience of conveyers and other mass-production systems in the auto industry, JIRA's executive director, Yonemoto Kanji, for example, stressed new employment opportunities created by the growth of the robotics industry. [109] It is often cited among the reasons for Japan's relatively broad diffusion that its employment system with lower-level job identification and job security in life-time employment system is more conducive to the introduction of mechanization and less likely to lead to a sudden lay-off of workers. [110] A few even went a step further to assert that, unlike their counterparts in other industrialized countries, the Japanese workers do not harbor animosity towards robots but instead established a symbiosis with them by giving each robot a name, for example. [111]

On the other hand, some labor leaders, journalists and academics caution against the euphoria of "robot fever", warning of potential massive unemployment.

[112] The fear of potential massive unemployment gained force when the cost of robot declined sharply and induced further robotization. [113]

It is true that, in some cases, employees asked for installation of industrial robots for physically demanding portions of the production process. [114] It is also true to some extent that Japanese labor unions in general have shown relatively little resistance to robotization. According to a survey conducted by the Japan Institute of Labor in May 1984, 53.6% of nearly 700 principal labor unions covered consented to the introduction of ME machinery and another 36.6% regarded it as inevitable, while only 2% opposed. [115]

Some unions have signed "ME pacts" obliging the management to undertake extensive advance consultation with the union. After four-and-a-half years of negotiations, Nissan Motor's 74,000-member union was the first to enter into such an agreement, in March 1983, setting the pace for others. In this pact, Nissan management accepted the following: the union membership will review all plans to introduce new robots and FA systems before they are finalized; workers will not be discharged or put on furlough owing to the introduction of new technologies, demotions, wage cuts, and other adverse changes in working conditions will be avoided; and any reassignments made will be based on workers' abilities, and necessary retraining will be provided. [116] Since 1983, such labor federations as the

Japan Federation of Automobile Workers Unions, the Japan Federation of Electrical Machine Workers Union, and the International Metal Workers' Federation -- Japan Chapter (IMF-JC) have all established policy guidelines, each setting out a "model ME pact", basically along the lines of the Nissan pact, for their member unions to follow. [117]

It is true as well that the displaced workers have, in most instances, been relocated within the firm. The Ministry of Labor's statistics showed that hardly any of the 10,000 firms in the manufacturing sector surveyed in 1983 dismissed any worker or asked for voluntary resignation upon introducing ME machinery. [118] The 1983 White Paper on Labor, the only labor white paper to have dealt with the question deriving from the ME revolution, indicated that 70% of firms with robots reduced numbers of workers while 30% saw no change. Of the former, 97% relocated surplus workers within the firms and 3% relocated them in related firms. [119] Even among the SMEs in which a life-time employment is less established, according to the 1983 White Paper on the SMEs, only 2% of those SMEs which introduced robots had to dismiss workers. [120] Likewise, the 1985 White Paper on Labor showed that although 29.5% of firms had to undertake readjustments of workers at the time of robotization and factory automation, nearly all were able to do so within the firm without resorting to any dismissal or voluntary retirement. [121] Judging from these

surveys, it seems safe to conclude that the problem of job displacement from labor rationalization so far is contained relatively well, limiting it to a small number of firms in the SME sector.

As several reports have revealed, labor savings in production have not resulted in reductions of firms' total payroll because sales and employment tended to increase among firms which had vigorously automated factories and gained competitiveness. [122] Or conversely, those firms which did not adapt to new technologies tended to lose competitiveness and sales, straining such firms. [123]

Moreover, until the present, most studies, including the 1985 Labor White Paper, have come to the conclusion that robotization and other ME automation in Japan have so far not caused a sharp rise in the unemployment rate, containing adjustments within the firm or among related firms, but instead expanded employment opportunities particularly in such fields as operation, programming, maintenance, systems engineering, inspection, central controlling, R&D, and sales. [124]

Meanwhile, that most firms were able to relocate displaced workers within their own firm or a related firm seems to indicate that labor in general was more complacent toward robotization because it posed little direct threat to workers' job security as the firm, the industry, and for that matter, the economy was growing because of a particular symbiosis which Japanese workers were alleged to have established with

robots. In this regard, on-the-job and off-the-job retraining have helped many workers adapt to new demands of technological changes. However, many tales abound indicating that workers have emotional stresses from relocation of work, such as moving away from accustomed working environments, friends and even communities, and that many workers are alienated by not being able to fully adjust to technological changes. [125]

The need for workers to adapt to technological changes have led some writers to conclude that the bi-polarization of the labor market between those who are technologically literate and adaptable and those who are not is already taking place. [126]

Whereas some believe that part-time workers -- currently consisting mainly of women -- are the hardest hit by factory automation due to the absence of job security, others show an expansion of part-time jobs by automation at the expense of the erosion of mainstream full-time/life-time employment system with job security and seniority wage increments, because part-time workers give firms flexibility to expand and contract their payrolls. [127] As it stands at the moment, the number of part-time jobs are on the rise at least at the aggregate level, and the traditional life-time employment system is, in general, basically intact. [128] Beyond this larger picture, however, individual part-time workers are more vulnerable to a termination of employment, and

full-time employees with life-time employment security are susceptible to a relocation of work. [129]

As to the overall attitude of workers toward ME automation, Nagaoichi's study revealed that even though 45.9% were not anxious about the technological changes and 13.2% had no view one way or the other, 40.9% were a little to very anxious. [130] These attitudes seem to tell us that, behind somewhat smooth adjustments in general, many individuals are feeling uncertainties emanating from the present technological changes.

For the future, several studies have predicted that the expansion of employment would continue to offset labor rationalization preventing a contraction in the employment at least at the macro level and in the long run. [131] However, the above prediction seem to be entirely contingent upon the ability of Japanese society to provide retraining of workers, to supply enough R&D workers, to develop new areas of demand for both goods and services, and most importantly, to inject economic growth. One authoritative study on the subject undertaken by Shakai Keizai Kokumin Kaigi (National Council on Socio-Economics) in 1984 suggested that the impact of full-fledged factory automation would begin to be felt most severely from the late 1980s among middle-aged and older workers who tend to have more difficulties adapting to new skills. [132]

While it is impossible to predict the future impact of robotization on Japanese society or to imagine the future structure of labor, as the current ME revolution moves further into full factory automation coupled with more advanced level of office automation (OA), laboratory automation (LA), store automation (SA) and etc., profound implications for future employment opportunities and constraints, and education and training needs are anticipated.

If firms perform poorly, industries contract, or the economy slips into a severe recession, and not enough employment opportunities are created in the growth areas to offset labor rationalization from ME automation, massive unemployment is a real possibility even with a no lay-off ME pact, as they only cover those who are already in the firm. Not all workers are safeguarded by such a pact, either. The survey provided in the 1985 White Paper on Labor showed that such prior consultation agreements are better established among larger and unionized firms than in smaller non-unionized firms, indicating a need for more intensive communications on these matters between management and workers in smaller firms. [133]

If sufficient job opportunities are not created, thus causing massive unemployment, and if serious erosion in the traditional employment system takes place, the Japanese myth of "coexistence and coprosperity" between workers and robots as well as between labor and management is certainly to disintegrate rapidly.

The single most critical issue confronting each worker and management at present is, therefore, how to adapt and adjust to the impending changes in technologies which, in turn, they help shape. In search of a manner in which to adapt these changes, each individual may be forced to revaluate the meaning of work.

In short, the state's policy to develop robotics -- by means of initiating private/public R&D consortia and of tax incentives -- was vital to the growth of the robotics industry and the diffusion of robots in Japan, particularly in the SME sector. The growth of the industry and the broader diffusion have, in turn, helped many firms and industries adjust in a more knowledge-intensive and higher value-added direction (the first national goal). The growth of the industry and robotization have had a mixed impact on individual people, however. There are many who have had positive benefits from them, often making the quality of their work better and their lives more comfortable (the second national goal). Yet, there are others who are alienated from these technological changes and concerned with uncertainties such changes may bring in the future.

While the robotics industry is less likely to face major trade friction as some Japanese robotics firms are collaborating with foreign firms through joint ventures, technical tie-ups, or OEM agreements, and they are also beginning to relocate production of standardized robots abroad, there is no guarantee that the rapid export

expansion would not cause trade tensions. By enhancing production efficiency and productivity, robotization and other ME automation are making a broad range of Japanese industries more competitive, aiding them to expand their global market shares. In some industries, they are helping retain international competitiveness where it may have otherwise lost to lower-wage countries. They are also enabling industries to manufacture products of a greater variety competitively to suit the diversity of consumer needs and tastes of affluent societies. Under these circumstances, in those areas where Japan could regain competitiveness because of robotics, Japan may not expand manufactured imports quite as fast as otherwise (a part of the third national goal) unless deliberate efforts are made in other areas to offset increased international competitiveness achieved through ME automation.

CONCLUSIONS

Unlike other advanced industrial countries where state intervention had a protectionist cast or market forces took the place of a national vision, Japan's industrial policy implemented mainly by MITI attempted to restructure the entire economy upward into a more knowledge-intensive one in order to minimize the need for new protectionism. The Industrial Policy for the 1980s thus represented an effort by the Japanese state to match the economic outcome of market forces to social objectives. In particular this policy sought to 1. improve the quality and comfort of life; 2. ensure economic security by working toward a "knowledge-based" society, thereby reducing the nation's vulnerability; and 3. make a contribution to the world community to earn the trust of other nations.

As this thesis argued and the three case studies have demonstrated, efforts by the Japanese state to restructure the entire economy are inducing profound and lasting technological and industrial changes -- a trend hastened by the yen's appreciation against the U.S. dollar and other currencies since the Plaza Accord of September 1985. The process, however, has not been without its contradictions.

Far from shifting the Japanese development model away from its emphasis on output growth, for example, all trends point to an overall acceleration in the rate of

growth in the Japanese economy over the 1980s. Except for fiscal year 1986, when the economy was rocked in the wake of global currency realignment and the growth rate slowed to 2.7% -- the endaka resesshion (high yen-recession), the Japanese economy achieved a robust expansion for an advanced industrialized country -- growing at an average 3.5% annually between 1980 and 1985 and picking up to a pace which averaged 5.2% annually between 1987 and 1989. [1] Prompted by the 22.2% year-on-year increase in the supplementary budget of fiscal 1987 to counter a cyclical downturn, lowering of the official discount rate to the historical low of 2.5%, low oil prices, and lower import prices were combined to contribute to buoyant private capital investment and consumer spending, leading to a strong domestic-demand led expansion. [2] In fact, the economy is currently experiencing the second longest economic expansion since the war, with a strong possibility of surpassing the longest growth spurt known as Izanagi keiki (Izanagi Boom) of November 1965-July 1970. [3] In other words, faced with structural and cyclical slowdown of the economy, the Japanese elite hegemony massively invested in order to create technological and industrial changes. This process did transcend some of the structural obstacles and renewed economic expansion. The current strong private capital investment, for example, has been concentrated more on technological innovation such as automation, than strictly on expanding production capacity. In all manufacturing industries in Japan

during the late 1980s, only about 30% of investment in plant and equipment was spent on capacity expansion whereas the corresponding figure for 1973 was 44.1%. [4]

The current industrial changes, however, are complex, uneven, and fluid, as the case studies have shown. While there has been a birth and expansion of technology intensive industries such as robotics, there has been a contraction of the heavy and basic materials industries, such as textiles. This is not necessarily a bad thing. However, despite the similarity in the measures taken under Japan's industrial policy -- the special tax provisions, exemptions from the anti-monopoly act, and administrative guidance on the strategies of adjustment -- the process of change has not been uniform even within the same industry. As we saw in the textile industry, the concentrated upstream sector was more conducive to less painful structural adjustment, than the fragmented midstream sector. There are, moreover, major differences among firms within the same industry. [5] Small firms in the contracting industries, for example, possess neither sufficient capital or technological and managerial know-how, nor the commitment to keep up with domestic and international competition to respond positively to these policy inducements. This was particularly true in the mid-stream textile industry.

Even in those industries or parts of an industry (the upstream portion of the textile industry, for example) in which the industrial policy was most successful in

achieving needed structural adjustments. the abruptness and sharpness of the yen's revaluation in 1986-1988 necessitated far more drastic rationalization than anticipated. Likewise. although industrial policy, partly through the creation of technopolises, has helped to create new venture businesses and develop knowledge-intensive industries in some provincial areas, such as in Oita and Kumamoto on the island of Kyushu, there is nothing to guarantee the resilience of such individual venture firms. Many venture companies have sprung up and disappeared in Japan although not to the same extent as in the United States. [6] Bankruptcies as a whole, moreover, were down considerably from their high of 20,841 in 1984 to 7,234 in the economic boom year, 1989. [7]

To be sure, these industrial changes are dynamic and there have been a number of reversals over the 1980s. The years immediately following the Plaza Accord witnessed the worst polarization among industries since World War II. Export-producing manufacturing firms in the steel, shipbuilding, chemical, and machinery industries were hard hit by the deflationary impact of the higher yen, while domestic demand oriented non-manufacturing firms in the construction, public works, utilities, real estate, and other service industries experienced windfall gains from the higher yen and lower oil prices and/or an upturn in demand due to lower interest rates. [8] Nonetheless, by the end of fiscal 1989 on March 31, 1990, a majority of listed firms in Japan were reporting fair to exceptional profits. The export-oriented

electric/electronic equipment makers and automobile manufacturers were enjoying record profits by stressing the high-end domestic market and shifting production to overseas transplants; those in the heavy industries, such as the steel makers and the shipbuilders, were also enjoying rapidly rising profits from rationalization and improvement in their financial status through equity financing; the domestic demand-oriented construction firms and machinery makers were continuing to thrive on the current wave of massive capital spending. [9]

Two other changes were also occurring. First, Japan's tertiary industrial sector grew, on a value-added basis, from 47.2 % in 1970 to 56.1% in 1985 and remained around the same level throughout the late 1980s. In contrast, the share in GDP of the secondary industrial sector fell from 46.4% to 40.4% and that of the manufacturing sector declined from 37.5% to 31.9%. [10] Second, the main impetus to real economic growth was the domestic market. Whereas in fiscal 1980 domestic demand and net-foreign demand grew 1% and 3%, respectively, in fiscal 1985, domestic demand increased 3.7% and net foreign demand by only 0.8%. Over the next four years, moreover, net-foreign demand registered negative growth of 1.5%, 0.9%, 1.5% and 0.7% whereas domestic demand underwent a strong expansion, increasing by 4.1% in fiscal 1986, 6.3% in 1987, 6.8% in 1988, and 5.7% in 1989. [11] Recognizing that exports were no longer the key to growth, major firms shifted corporate strategies,

combining an emphasis on the domestic market with increased overseas direct investment and the relocation of production facilities. [12]

What these changes collectively demonstrate is the extent to which Japan's economy has been undergoing a gradual transformation towards a knowledge- and service-based structure and a reliance on domestic demand as the principal engine of growth and away from dependence on net exports. These changes thus appear to conform to the new directions for the economy laid out in the Industrial Policy for the 1980s and reaffirmed in the April 1986 Maekawa Report. [13] The impact of current industrial changes on the three national objectives laid down in this policy, however, have been mixed. With regard to the first goal of improving the quality of life, technological and industrial changes have, in some cases, automatically cleaned up the environment or, in other cases, created great opportunities which people have exploited to improve the quality of life. For example, the residents in the leading industrial regions of Kanto, Kansai, and Nagoya have benefitted from an improvement in environment by a series of plant closures in such heavy industry as steel, synthetic fibers, and chemicals. [14] The proliferation of high-technology industries into provincial regions has enabled many people to live in a less crowded area with better amenities and more leisure time as we saw in the case of Tsukuba and other technopolises. The same changes, however, have also brought serious dislocations to

others, as the technopolis case study in particular has shown. A new set of environmental concerns have arisen in the emerging high-technology industries, such as fluoron gas used in the semiconductor industry and potentially immense implications contained in the biotechnology industry. [15] As the environmental activism of the 1960s and the 1970s has receded somewhat in the 1980s with a general decline in the construction of smokestack plants, the opposition to new environmental hazards remains at its infancy, still fragmented and weak as a coherent political force. Municipal agreements to regulate new types of pollution associated with high-technology industries have begun to appear only within the last few years. [16]

Regional disparities in the distribution of population have also widened. This goes against the implicit assumptions of the industrial policy. Thus, although a burgeoning of high technology industries in such rural prefectures as Miyagi and Ibaragi helped to raise their population 3.7% and 3.[illegible]%, respectively, in the five years to March 31, 1989, it did little to equalize the nation's population. [17] As a result of the tendency of the information-processing and financial industries to concentrate in the Tokyo area and a steep land price hike experienced in the late 1980s, life in metropolitan Tokyo and the neighboring regions became even more difficult and expensive. [18]

Structural changes in the economy have helped to push down the unemployment rate from 2.8% in 1986 to 2.3% in 1989. [19] In fact, there is a labor shortage in Japan -- the effective job opening to application ratio stood at 1.30 in 1989. [20] Since November 1987, moreover, those firms with labor shortages began to outnumber those with excess labor, particularly among smaller firms in the construction, machinery manufacturing, service, and retail sectors, leading to many bankruptcies. [21] We should note, however, that the current 2.2-2.3% level of unemployment rate is still much higher than the 1.3-1.4% level enjoyed until the early 1970s. This seems to imply that the structural adjustments and the biggest economic boom in two decades are not resulting in the same extent of job-distribution/equalization as during the high growth era of the 1960s, perhaps providing a credibility to the notion of rising technological job displacement.

Indeed, while there has been a surging demand for engineers, scientists, and technicians, in the emerging knowledge intensive sectors, giving a birth to "head-hunting business" in Japan, there remain a large number of people who are adversely affected by the changes. As the case studies have illustrated and a large body of periodicals report daily, workers' psychological anxieties associated with the increasingly common practice of job relocation, job retraining, and being relegated to madogiwa-zoku (group by the window) are considerable. The emerging phenomena of

the merit pay system and "head hunting" and "outplacement" services are undermining the established system of life-time employment and seniority-based wages and promotion (even though these do not cover all workers). [22] The impact of these changes in the long-run may be immense, because the system helps firms foster the value of stability and loyalty among employees and serves as a sort of privatized social safety network. The gradual erosion of life-time employment could create a special difficulty in a nation where so much of an individual's identity is tied to work and with the firm.

The 1989 White Paper on National Life concluded that while Japanese have a sense of being able to acquire more goods and services, they continue to decry the lack of time and space -- the same set of deprivations as in the 1970s -- particularly among those in the 30s and 40s. [23] Under such circumstances, the Industrial Policy for the 1980s achieved only limited success in improving the quality of life in Japan.

With regard to the second national goal of reducing Japan's vulnerability, results are also mixed. The industrial changes, aided significantly by global oversupply of natural resources in general and the rise of the yen, have mitigated some areas of Japan's economic security, while intensifying others. For example, the contraction in the heavy/basic materials industries coupled with conservation efforts and diversification to other energy sources has reduced Japan's import of crude oil from

billion in 1981 to $99 billion in 1985, and to $628 billion by the end of 1989 -- has increasingly exposed Japanese capital not only to rampant fluctuations in foreign exchange, but also to political and social tensions deriving from the acquisitions of such foreign corporations as Columbia Pictures and transplants of such Japanese businesses as automobiles. [28] Under such circumstances, the Industrial Policy for the 1980s can hardly claim to have reduced Japan's vulnerability -- only that the nature of vulnerabilities has evolved.

With regard to the third national goal of making contributions to the world community as an economic power, the results are also mixed and complex. While the Japanese economy continues domestic demand-led expansion, its size is still too limited to influence growth of other major economies in a significant manner. Meanwhile, Japan's ODA grew rapidly to become, since 1984, the second largest donor, following the United States, and its $9.13 billion in fiscal 1988 accounted for 19.2% of total ODA by the Development Assistance Committee of the OECD. [29] But its ratio to GNP remained only around 0.31-0.35% in the late 1980s -- below the OECD average of 0.36% and far below the OECD target of 0.7%. [30]

There are other criticisms of Japan's development assistance programs including its use of foreign aid projects that result in lucrative contracts for Japanese businesses and its relatively low interest rates which, other donors have complained,

287 million kl. in 1973 and 280 million kl. in 1979 to 210 million kl. in 1990. [24] The dependence on crude oil as a share of overall domestic energy consumption continued to fall from 78% in 1973 to 71% in 1979, then to 61% in 1983 and remained around 56-7% in the late 1980s. [25] The reduced vulnerability to the supply of oil was also eased by a glut in the world oil market and the higher value of the yen. Similarly, the nation's vulnerability to the import of other natural resources has also been reduced as a result of global over-supply in most raw materials and agricultural products. [26]

On the other hand, Japan's vulnerability has been heightened in other areas, particularly to the politicization of trade. The nation's persistent external trade imbalance in its favor ($77 billion in 1989) -- in part a reflection of the growth of high-technology industries -- remains the focal point of Japan-U.S. bilateral relations. Japan's trade frictions with the United States and Western Europe have proliferated from television sets, video cassette recorders, and automobiles to such high-technology products as semiconductors, supercomputers, and telecommunication equipment; from beef and citrus to rice; from liberalization of foreign exchange to that of the "fire wall" between commercial banking and securities brokerage business; and the question of the keiretsu system -- many of these placed under the Japan-United States bilateral Market Opening Sector Specific (MOSS) talks, followed by the Structural Impediment Initiative (SII). [27] The build-up of substantial external assets -- soaring from $61

make aid-giving cheaper for Japan, hence providing a "unfair advantage" to Japanese firms doing work on aid contracts. [31] In addition, Japan's growing fundings for multilateral development agencies, such as the World Bank and the International Monetary Fund, have created frictions with other advanced industrial members over the redistribution of voting shares. [32] Yet, more importantly, there is a fundamental question as to whether Japanese economic assistance is serving the best interests of recipient nations. Some of Japan's bilateral aid projects have raised doubts that Tokyo's aggressive lending may have led to inadequately studied or doubtful projects which in the end translated into a disservice to ordinary citizens of recipient nations -- the most notorious experience being with the Phillippines under the Marcos regime. [33]

On the pledge of increasing manufactured imports to "contribute to the world economy", Japan's manufactured imports surged, particularly in the second half of the 1980s owing to the higher yen. For example, encouraged by cheaper import prices, Japan's import of manufactured goods increased about 20% by volume from 1981 to 1985 and nearly doubled from 1985 to 1989. [34] The higher yen also encouraged the growth of overseas direct investment by Japanese manufacturers -- from $4.9 billion in 1981 to $6.5 billion in 1985, and to $43.8 billion in 1989, as firms relocate production abroad -- which, in turn, is expected to raise the ratio of output by Japanese

manufacturers coming from foreign factories from 4.4% to 6.5% by the end of 1990 [35] Although such trends raised the share of manufactured goods in total imports from 29.7% in 1984 to 49.0% in 1988 (the latest comparisons available), the figure is still much lower than those of the United States (82.0%), the United Kingdom (79.1%), France (77.7%), and West Germany (75.1%). [36]

But the expansion of direct investment has created a new set of frictions both with LDCs and with industrialized countries, as mentioned above, over the issues of local purchase of parts and equipment, technology transfer, personnel and other labor-management practices, often flaring up anti-Japanese feelings and resentment. [37] Many LDCs have expressed dissatisfaction that Japanese "market opening packages" have so far been oriented too much toward the interests of industrialized nations, particularly the United States, thus overlooking the LDCs' desperate need to export. [38] The boom for NICs' products -- particularly cheaper electronic products - which swept Japan in early 1988 by the opening of the "NICs Super Shop" faded by 1990, because of the lessened price differentials due to the appreciation of the currencies of South Korea, Taiwan, Hong Kong, and Singapore, etc., and the lack of after-sales service. [39] The absence of drastic measures to reduce the trade surplus or to raise the market share of imported manufactured goods continues to plague Japan's trade relations with many nations. Under these circumstances, Japan's "comprehensive

economic cooperation" exercised to date falls short of qualifying as Japan's "burden sharing" in the "world community" as envisaged in this policy.

In essence, structural adjustments in the Japanese economy -- made possible by the rapid development of new technology -- have given a tremendous impetus to growth on the one hand, but have created new uncertainties on the other. Although many thrive on newly created growth and opportunities, others suffer from technological dislocation. Although Japan overcame some of its vulnerabilities, it has confronted new ones. Although Japan seeks to be accepted by other countries through various measures, these fall short of international expectations. This situation differs significantly from the vision of Japan contained in the Industrial Policy for the 1980s. With some old contradictions unresolved and some new ones arising, one can hardly assert that the structural adjustment efforts under the Industrial Policy for the 1980s have successfully achieved the three national goals outlined in this policy.

At this juncture, the Japanese economy seems to possess two faces -- one of a structurally adjusted, highly knowledge-intensive economy with dynamism for growth, as some optimists have described, and one of a polarized and uncertain economy, heavily dependent upon its accumulated capital as the world's largest creditor, as some pessimists have warned. [40]

Meanwhile, the industrial and technological changes in the economy seem to have eroded the power of Japanese labor unions during the 1980s. Against the backdrop of a booming economy, Shunto negotiations seem to receive faded applause. The labor union federations' efforts to strengthen their political base through reintegrations in 1989 did nothing to ignite renewed enthusiasms. [41] The relative decline of the labor movement in Japan -- the number of unionized workers remained around 12.2-12.5 million and the ratio of unionized workers failed to climb beyond the 26% level during the late 1980s -- is caused by the continuing structural weakness of enterprise unions and young people's apathy for collective bargaining in times of ample job opportunities and rising wages. [42]

The current propensity among young people to be depoliticized and be less inclined to identify themselves with a particular political party than their earlier counterparts may explain in part the volatile outcomes of recent national elections mentioned in Chapter 3. As many observers have noted, the current industrial changes, particularly with doubling and tripling land prices in the Tokyo and Osaka regions within the last few years, might be widening the stratification of Japanese society, fading the "middle class mass consciousness" so prevalently perceived among a large segment of the society during the 1960s and the 1970s. [43] This, too, has had its impact on recent elections.

Although the LDP's 1986 and 1990 electoral successes do not necessarily signify a continuing trend of increasing support for the LDP, any talk of opposition coalition government or the demise of the 1955 regime -- such as a collapse of LDP rule, however, faded quickly after 1986. It has, instead, been replaced by the concept of the "1980s regime" -- that is, the formation of a new, stable conservative system by incorporating a part of the opposition by the LDP as the LDP has always done since its creation to the present. [44]

In sum, the results of structural adjustments in Japan as seen in this thesis are so mixed because a continuous interaction between technology, capital, states and other forces, and responses to these changes differ by sector, industry, firm, or individual. But more importantly, the uneven development and inconsistent results of structural adjustments merely reflect asymmetrical distribution of power to define national economic priorities -- asymmetry between the elite hegemony of the ruling LDP, the national bureaucracy, and the peak federations of big business and financial institutions, on the one hand, and subordinate social forces of labor and the middle class and the progressive opposition parties, on the other.

The Japanese elite hegemony thus continues to orient the nation's economic development in a way that would ensure its own cohesion and that of the whole system through continued growth without fundamentally altering the social and political

structures on which the Japanese capitalist system has been built. By preempting and taking up some, but not all of the demands from subordinate forces as their own issues, it is perpetuating their reign of power. It is these social and political rigidities that limits the extent to which the Japanese economy has been able to transform itself and that the Industrial Policy for the 1980s brought only partial success.

Appendix II-1: Changing Volume of Output in Selected Commodities, 1950-1989

(1980 = 100)

	Textiles				Chemicals		Iron & Steel	
	Yarn(a)		Fabrics(b)					
	1000 tons		(million sq. meters)		(1000 tons)		(1000 tons)	
1950	368.4	(42.4)	1,796	(29.8)	3,917	(22.7)	10,629	(3.5)
1960	1,060.9	(122.2)	5,474	(90.8)	8,783	(50.9)	51,354	(17.1)
1970	1,127.4	(129.8)	6,543	(108.5)	16,548	(96.1)	237,303	(79.0)
1971	1,113.1	(128.2)	6,401	(106.2)	16,282	(94.5)	236,079	(78.6)
1972	1,092.9	(125.9)	5,963	(98.9)	16,616	(96.4)	253,054	(84.3)
1973	1,082.9	(124.7)	6,313	(104.7)	17,747	(103.0)	311,064	(103.6)
1974	927.2	(106.8)	5,532	(91.8)	17,689	(102.7)	307,896	(102.6)
1975	833.6	(96.0)	5,165	(85.7)	15,411	(89.5)	275,024	(91.6)
1976	903.8	(104.1)	5,750	(95.4)	15,690	(91.1)	287,020	(95.6)
1977	792.8	(91.3)	5,838	(96.8)	16,038	(93.1)	278,212	(92.7)
1978	789.5	(90.9)	5,897	(97.8)	16,105	(93.5)	271,988	(90.6)
1979	886.9	(102.1)	6,024	(99.9)	17,210	(99.9)	297,170	(98.9)
1980	868.4	(100.0)	6,028	(100.0)	17,228	(100.0)	300,196	(100.0)
1981	800.2	(92.1)	5,767	(95.7)	15,961	(92.6)	274,802	(91.5)
1982	815.6	(93.9)	5,626	(93.3)	15,695	(91.1)	269,072	(89.6)
1983	772.2	(88.9)	5,849	(97.0)	16,218	(94.1)	260,953	(86.9)
1984	773.6	(89.1)	5,924	(98.3)	16,618	(96.4)	284,824	(94.9)
1985	780.4	(89.9)	5,685	(94.3)	16,847	(97.8)	285,381	(95.1)
1986	767.4	(88.4)	5,367	(89.0)	16,706	(97.0)	266,076	(88.6)
1987	781.0	(89.9)	4,981	(82.6)	17,235	(100.0)	265,627	(88.5)
1988	770.8	(88.8)	4,608	(76.4)	18,131	(105.2)	284,200	(94.7)
1989	762.3	(87.8)	5,098	(84.6)	18,740	(108.8)	290,793	(96.9)

	Steel Vessels (1000 tons)		T.V. Sets (1000 units)		Passenger Cars (1000 units)		Video Recorders (1000 units)	
1950	227	(3.7)	---		1.6	(0.02)		
1960	1,759	(28.4)	3,578	(23.5)	165.1	(2.3)		
1970	10,172	(164.3)	13,782	(90.6)	3,178.1	(45.2)		
1971	10,996	(177.6)	13,231	(87.0)	3,717.9	(52.8)		
1972	12,768	(206.3)	14,303	(94.1)	4,022.3	(57.2)		
1973	14,734	(238.1)	14,414	(94.8)	4,470.6	(63.5)		
1974	16,782	(271.1)	13,406	(88.2)	3,931.8	(55.9)		
1975	15,227	(246.0)	12,453	(81.9)	4,567.3	(64.9)	119	(2.7)
1976	15,263	(244.7)	16,545	(108.8)	5,027.8	(71.4)	288	(6.5)
1977	11,705	(189.1)	15,210	(100.0)	5,432.0	(77.2)	762	(17.2)
1978	6,295	(101.7)	13,927	(91.6)	5,976.0	(84.9)	1,470	(33.1)
1979	4,982	(80.5)	14,236	(93.6)	6,175.8	(87.7)	2,199	(49.5)
1980	6,189	(100.0)	15,265	(100.0)	7,038.1	(100.0)	4,441	(100.0)
1981	8,306	(134.2)	14,578	(95.9)	6,974.1	(99.1)	9,498	(213.9)
1982	7,983	(128.9)	12,796	(84.2)	6,886.9	(97.9)	13,134	(295.7)
1983	6,459	(104.3)	13,276	(87.3)	7,151.9	(101.6)	18,21	(410.2)
1984	9,631	(155.6)	15,493	(101.9)	7,073.2	(100.5)	27,124	(610.8)
1985	8,906	(143.9)	17,727	(116.6)	7,646.8	(108.6)	28,283	(636.9)
1986	7,656	(123.7)	13,862	(91.2)	7,809.8	(111.0)	31,272	(704.2)
1987	5,651	(91.3)	14,286	(94.0)	7,891.0	(112.1)	27,489	(619.0)
1988	3,972	(64.2)	13,219	(86.9)	8,198.4	(116.5)	28,154	(634.0)
1989	-----		12,578	(82.7)	9,052.4	(128.6)	28,242	(635.9)

Source: Ministry of International Trade & Industry, Industrial Statistics Monthly, various issues

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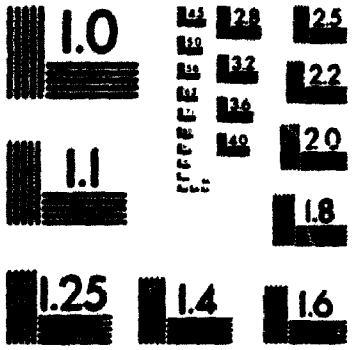

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS
STANDARD REFERENCE MATERIAL 1010a
(ANSI and ISO TEST CHART No. 2)

Note: (a) includes rayon filament yarn, cotton yarn, raw silk, woolen yarn, and spun rayon yarn.

(b) includes cotton fabrics, spun rayon fabrics, rayon filament fabrics, and synthetic fibre fabrics

(c) includes sulphuric acid, causic soda, soda ash, ammonium sulphate, pure benzol, urea resin, and polyvinyl chloride.

Appendix II-2: Changes in Japan's Industrial Structure

(Share of Industries in GDP, %)

	Primary Industry	Secondary Industry	(Manufacturing)	Tertiary Industry
1950	23.5	31.9	(25.3)	44.6
1960	14.6	36.4	(29.3)	49.0
1970	6.6	41.3	(28.4)	52.1
1972	6.7	37.3	(28.6)	56.0
1974	6.2	37.3	(28.4)	56.5
1976	5.2	38.4	(29.5)	56.4
1978	4.6	39.5	(30.0)	55.9
1980	3.7	39.3	(29.3)	57.0
1982	3.5	39.4	(31.5)	57.0
1984	3.1	39.7	(32.4)	57.2
1986	2.8	39.3	(29.3)	57.9
1988	2.7	40.8	(33.5)	56.5

Source: Computed from Economic Planning Agency, Annual Report on National Income Statistics, various issues.

Appendix II-3: Structure of Employment

(%)

	Primary Industry	Secondary Industry (Manufacturing)	Tertiary Industry
1950	52.4	22.9 (18.0)	24.6
1960	32.5	27.7 (21.3)	39.8
1970	17.4	35.3 (27.0)	47.3
1972	14.8	35.8 (27.0)	49.4
1974	12.9	36.5 (27.2)	50.6
1976	12.2	35.3 (25.5)	52.5
1978	11.9	34.9 (25.1)	53.2
1980	10.5	34.9 (24.7)	54.6
1982	9.7	34.4 (24.5)	55.9
1984	8.9	34.3 (24.9)	56.8
1986	8.5	33.9 (24.7)	57.6
1988	7.9	33.6 (24.2)	58.5

Source: Computed from Prime Minister's Office, Labor Force Survey, various issues.

Appendix II-4: Structure of Employment in Manufacturing Industry (%).

	'50	'60	'70	'72	'74	'76	'78	'80	'82	'84	'86	'88
Textiles	21.6	15.3	9.6	10.1	9.0	8.6	8.0	7.4	6.3	5.8	5.4	5.3
Chemicals	8.5	5.6	5.0	4.0	4.1	4.0	3.8	3.8	3.9	3.7	3.6	3.7
Ceramics, Stone & Clay Products	5.1	5.0	5.0	4.9	5.0	4.9	4.9	4.8	4.7	4.4	4.2	4.2
Iron & Steel	5.5	5.6	4.5	4.5	4.3	4.1	4.0	4.0	3.7	3.3	8.0	3.3
Non-Ferrous Metals	2.1	2.0	1.9	1.9	1.8	1.8	1.7	1.7	1.7	1.5	1.5	1.5
Fabricated Metal Products	3.7	5.7	6.5	7.6	7.7	7.5	7.6	7.5	7.2	7.0	7.2	7.2
General Machinery	8.6	9.6	10.5	9.8	10.2	9.7	9.7	9.9	10.1	10.1	10.3	10.0
Electrical Machinery	4.2	8.7	13.2	11.3	11.1	11.4	11.4	12.4	14.3	16.7	17.1	17.2
Transport Equipment	7.0	6.6	8.6	8.0	8.3	8.4	8.2	8.3	8.7	8.6	8.4	8.4
Precision Instruments	1.3	1.9	2.2	2.1	2.2	2.2	2.4	2.5	2.5	2.4	2.4	2.3

Others	32.0	34.0	31.8	35.8	36.0	37.2	38.1	37.7	36.6	35.9	36.5	36.9

Source: Computed from Ministry of International Trade & Industry, Indexes of Industrial Production, various issues.

Appendix IV: List of 26 Technopolises

Technopolis region (prefecture)

1. *Core city (population)*
2. *Area (10,000 ha.)*
3. *Core university*
4. *Special feature*
5. *Earlier economic specialization*
6. *Industries to be developed*

Dochu (Hokkaido)

1. Chitose
2. N/A
3. Nihon Koku Gakuen Chitose Campus
4. Large Aiport
5. Agriculture
6. High-technology housing

Hakodate (Hokkaido)

1. Hakodate (320,000)
2. 9.6
3. Hokkaido University
4. Northern marine resource development
5. New waste treatment system
6. Fishing, pulp, and paper, marine resources, biotechnology, electronics, and mechatronics

Aomori (Aomori)

1. Aomori (295,000)
2. 4.4
3. Aomori University
4. "Cell-compact city" -- transcending obstacles to snowfalls
5. Farming (rice & apples) and fishing
6. Semiconductors, marine electronics & software

Kirakamigawa (Iwate)

1. Morioka
2. N/A
3. Iwate University
4. Cold river
5. Agriculture
6. Bioreactor from sake

Akita (Akita)

1. Akita (285,000)
2. 9.1

3. Akita University
4. New transportation system, development of the gallium-arsenide wafer - electrons travel six times faster in a wafer made of gallium contained in a black ore more commonly found in the region than that of silicon
5. Farming and heavy industries.
6. Electronics, mechatronics, new materials, biotechnology, and new energy

Sendai (Miyagi)

1. Sendai
2. N/A
3. Tohoku University
4. Old cultural and educational city with excellent metals department of Tohoku University
5. Agriculture
6. New metals and Fine ceramics

Yamagata (Yamagata)

1. Yamagata
2. N/A
3. Yamagata University
4. Rice region
5. Agriculture
6. Fast photo processing, designing, and plastics

Kooriyama (Fukushima)

1. Kooriyama
2. N/A
3. Tohoku University
4. Sake and rice region
5. Agriculture
6. Fermentation technology and computers

Niigata (Niigata)

1. Nagaoka (180,000)
2. 2.6
3. Nagaoka University of Technology and Science.
4. New transportation system
5. Metals, machinery, chemicals and farming
6. High-fashion and design products, and electronics

Utsunomiya (Tochigi)

1. Utsunomiya (378,000)
2. 5.7
3. Utsunomiya University
4. New housing development
5. Electric machinery, transportation equipment, rice and vegetables
6. Electronics, mechatronics, fine chemicals, new materials and softwares

Kofu (yamanashi)

1. Kofu
2. N/A
3. Yamanashi University
4. Plateau
5. Grapes and wine
6. Higher quality wine and design simulation system

Asama (Nagano)

1. Asama
2. N/A
3. Shimshu University
4. Japan Alps mountain range
5. Tourism and agriculture
6. Fine ceramics for machinery

Hamamatsu (Shizuoka)

1. Hamamatsu (491,000)
2. 6.5
3. Shizuoka University and Hamamatsu Medical University
4. Future home sound culture
5. Motorbikes, music instruments, tea, and fruits
6. Optoelectronics, CAD/CAM/FMS, and software

Toyama (Toyama)

1. Toyama (305,000)
2. 7.3
3. Toyama University and Toyama Medical and Pharmaceutical
4. University, centralized energy system
5. Pharmaceuticals, steel, metals, chemicals, textiles and machinery
6. Biotechnology, mechatronics, new materials, and information technology industry

Ehime (Ehime)

1. Matsuyama
2. N/A
3. Ehime University
4. Mandarine oranges
5. Agriculture
6. Compound materials

Nishiharima (Hyogo)

1. Himeji (451,000)
2. 10.5
3. Himeji University

4. Medical-welfare development and new information system
5. Ship-building, machinery, steel and metals
6. Electronics, mechatronics, biotechnology

Kibi Kogen (Okayama)

1. Okayama (546,000)
2. 13.8
3. Okayama University and Okayama University of Sciences
4. Community of life-sciences
5. Fruits, chemicals, and machinery
6. Biochemicals, bioengineering, AI software, medical equipment

Hiroshima Chuo (Hiroshima)

1. Kure (235,000)
2. 6.8
3. Hiroshima University
4. New information system and linking traditional fermentation techniques found in Japanese food to biotechnology
5. Shipbuilding and automobiles
6. Biotechnology, industrial robotics, automated manufacturing system, electronics, fine ceramics, optic fibers, laser, and software

Ube (Yamaguchi)

1. Ube (169,000)
2. 10.5
3. Yamaguchi University and Tokyo University of Science
4. New information system and museum of future industrial development
5. Petrochemicals, cement and steel
6. Electronics, mechatronics, biotechnology, new materials, and marine development

Nishi Kagawa (Kagawa)

1. Takamatsu (329,000)
2. 4.7
3. Kagawa University
4. Development of solar energy system
5. Metals, machinery, rice and vegetables
6. Mechatronics, solar energy-related industry, biotechnology and information industry

Kurume-Tosu (Fukuoka-Saga)

1. Kurume (217,000)
2. 3.1
3. Kurume University of Technology and Kurume University
4. New transportation system
5. Rubber, tires, farming machinery, textiles and porcelain wares.
6. Mechatronics, fine chemicals, biotechnology and fashion-related industry

Sasebo (Nagasaki)

1. Sasebo (249,000)
2. 4.3
3. Nagasaki University
4. New waste treatment system
5. Shipbuilding, coal-mining, steel, chemicals, and textiles
6. Mechatronics, marine development and alternative energy development related industries

Kenboku Kunisaki (Oita)

1. Oita (360,000)
2. 12.3
3. Oita University and Oita University of Medicine
4. Development of recreational resources of Kunisaki Penninsula
5. Farming
6. Electronics, biotechnology, high-tech farming machinery, and software

Kuntamoto (Kumamoto)

1. Kumamoto (526,000)
2. 9.6
3. Kumamoto University and Kumamoto Univeristy of Technology
4. Linking Higo (old name for Kumamoto) heritage to high technology
5. Auto parts, chemicals, machinery and farming
6. Electronics, biotechnology, data processing industry, and robotics

Miyazaki (Miyazaki)

1. Miyazaki (265,000)
2. 8.7
3. Miyazaki University and Miyazaki Medical University
4. Centralized solar-energy system and to maximize technological spin-off of the near-by linear motor car test course
5. Electrics, textiles, machinery and farming
6. Biotechnology, electronics, and electro-gravity transportation system

Kokubu Hayato (Kagoshima)

1. Kagoshima (505,000)
2. 13.2
3. Kagoshima University and Kyushu Gakuin University
4. Centralized energy system, exploit infinate supply of volcanic ashes for ceramics, and to maximize technological spin-off of the near-by national space center
5. Beef, chicken, and vegetables
6. Electronics, mechatronics, new materials and biotechnology

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68. Shinohara, Industrial Growth -, p. 23. Komiya & Suzuki, op. cit., pp. 313-316. Ackley & Ishii, op. cit., p. 180. Uchino, op. cit., p. 197. Nakamura, The Postwar -, p. 225. Masamura, Sengo Nihon -, pp. 232-234. Kawata Tadashi, "The Japanese Economic Disequilibrium", The Developing Economies, XIV, 4, March 1976, pp.3-5. Miyazaki Yoshikazu, Gendai no Nihon Kigyo o Kangaeru (Considering Contemporary Japanese Enterprises), Tokyo: Iwanami Shoten, 1984, pp 3-41. Capital gains from land price increases reported by private corporations in 1972 amounted to 15 trillion yen and those from securities appreciation amounted to 5 trillion yen. The effect of this kind of speculation on prices in general was so great that the subsequent inflation was sometimes called "capital gains inflation" Uchino, op. cit., pp. 192-198. Yoshitomi Masaru, Nihon Keizai: Sekai Keizai Aratana Kiki to Nihon (The Japanese Economy: New Crisis in the World Economy and Japan), Tokyo: Toyo Keizai Shinpo Sha, 1981, p. 4. Ackley & Ishii, op. cit., pp. 209-210.

69. Op. cit., p. 324.

70. "Keizai Anzen Hosho ni Kansuru Saikin no Ugoki" (Recent Trends Relating to Economic Security), Ekomonisuto, Sept. 1, 1980, pp. 26-27. Kosaka Masataka, "Keizai Anzen Hosho no Igi to Kadai" (Meaning and Objectives of Economic Security), Kokusai Mondai, 217, April 1978, pp 2-15 Fukami Hiroaki, "Keizaiteki Anzen Hosho eno Kyoi to Sono Kakuho Seisaku" (Threats to National Economic Security and Policies to Ensure It), Kokusai Mondai, no. 217, April 1978, pp. 24-41. Yuize Yasuhiko, "Taikoku no Shoku Senryaku to Nihon no Anzen Hosho" (Big Powers' Food Strategies and Japan's Security), Asahi Janaru, April 11, 1980, pp. 32-37. Yuize Yasuhiko, "Shokuryo Anpo Koso wa Naze Hitsuyo Ka" (Why We Need Food Security", Chuo Koron, Jan. 1981, pp. 122-135. Endo Kouchi, "Nihon no Shokuryo Seisaku to Shokuryo Anzen Hosho" (Japan's Food Policy and Food Security), Kokusai Mondai, 253, April 1981, pp. 69-85.

71. Yoshitomi Masaru, "The Recent Japanese Economy: The Oil Crisis and the Transition to Medium Growth Path", The Developing Economies, XIV, 4, Dec. 1976, p. 322 & p. 329.

72. Yoshitomi, "The Recent -", p. 329.

73. Nakamura, The Postwar -, p. 229.

74. Kaneko Yukio, "Changes in Japan's Industrial Structure Since the Oil Crisis", The Developing Economies, 18, 4, Dec. 1980, p. 485.

75. Masamura, op. cit., pp. 254-255.

76. Nakamura, The Postwar -, pp. 231-233.

77. Uchino, op. cit., p. 217.

78. Yoshitomi, Nihon Keizai, p. 4. Uchino, op. cit., p. 212.

79. Kawashima, "Nihon Keizai no -", p. 20.

80. Kaneko, op. cit., pp. 484-485.

81. Yoshitomi, "The Recent -", p. 328.

82. Uchino, op. cit., pp. 218-219.

83. Yamamura, "Success That -", p. 92.

84. Uchino, op. cit., p. 218. Asahi Nenkan (Asahi Yearbook), 1989, p. 151.

85. Soda Toshio, "Sengo Nihon no Sangyo Seisaku to Dokkin Seisaku" (Postwar Japan's Industrial Policy and Anti-Monopoly Policy), in Kitada Yoshiji & Soda Toshio, Gendai Nihon no Keizai Seisaku (Contemporary Japan's Economic Policy), vol. II, Tokyo: Otsuki Shobo, 1979, pp. 49-50.

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87. Uchino, op. cit., p. 218.

88. Nakamura, The Postwar -, p. 231.

89. Kawashima, op. cit., pp. 21-22. Nakamura, The Postwar -, p. 250. Thomas Rohlen, "Permanent Employment Faces Recession, Slow Growth and Aging Work Force", Journal of Japanese Studies, 5, 2, 1979, pp. 235-272.

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92. Inoguchi Takashi, "Japan: Foreign Policy Background" manuscript to be published in Herbert J. Ellison, ed., Japan and Pacific Quandrile: The New Phase, Seattle: Univ. of Washington Press, forthcoming, p. 14.

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94. Noguchi Yukio, "The Government-Business Relations in Japan: The Changing Role of Fiscal Resources" in Yamamura, ed., Policy and Trade -, pp. 132-136. Masamura, op. cit., p. 256 & pp 263-264. Nakamura, The Postwar -, p. 244. Uchino, op. cit., p. 212.

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Chapter III

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4. Namiki Nobuyoshi, "Nihon Sangyo Kozo no Bijon ni Tsuite" (On the Vision of Japan's Industrial Structure). Toyo Keizai, Ringi Zokan, July 18, 1974, pp. 18-19.

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8. Masamura Kimihiro, Sengo Nihon no Shihon Shugi Shi (The Postwar History of Japanese Capitalism), Tokyo: Nihon Hyoron Sha, 1983, p. 188.

9. Edwin S. Mills & Ohta Katsutoshi, "Urbanization and Urban Problems" in Patrick & Rosovsky, op. cit., chapter 10, p. 680.

10. The population density of Japan in 1971 was 283 per sq. km., not much different from those of U.K. and West Germany and lower than Belgium's 319, Netherlands' 323 and South Korea's 324. However, due to large mountainous areas, Japan's population density in habitable land is extremely high: about 1500 per sq. km., while that of the Netherlands is 600 per sq. km. Japan Almanac, 1974, Tokyo: The Mainichi Newspapers, 1974, p. 26.

11. Bruce Roscoe, "The Rabbit-Hutch Image -- Embarrassing But True", Far Eastern Economic Review, June 13, 1985, p. 91. Isomura Eiichi, "Urbanization and City Planning Policies", The Developing Economies, 10, 4, Dec. 1972, pp. 451-67.

12. Mills & Ohta, op. cit., p. 699.

13. Sato Kazuo, "Japan's Savings and Internal and External Macroeconomic Balance", in Yamamura, Policy and Trade -, p. 153.

14. Mills & Ohta, op. cit., pp. 685-6.

15. Economic Planning Agency, White Paper on National Livelihood, Tokyo: 1970. According to one source, the average floor space of a new house in Japan in the early 1970s was 71.2 sq. meters compared with 85.5 in U.K., 84.6 in West Germany, 81 in Sweden, 77 in France. Japan Almanac 1974, p. 141. Per capita average space for city parks : 70.5 sq. meters in Canberra, 68.3 in Stockholm, 40.8 in Washington, D.C., 18.9 in Los Angeles, 11.4 in Montreal, 11.4 in Rome, 10.7 in Copenhagen, 3.7 in Bern, 1.5 in Seoul, 1.4 in Tokyo, 3.7 in Nagoya, 2.0 in Osaka, 2.2 in Kyoto and 3.9 in Kobe. Sangyo Kozo Shingikai, Sangyo Kozo no Choki Bijon (Long-term Vision of Industrial Structure), Tokyo: 1978, p. 572.

16. Komiya Masahiro, "Tochi-Jutaku Seisaku" (Land and Housing Policy) in Kitada & Soda, eds., Gendai Nihon no -, vol. 1, chapter 8, pp. 270-271.

17. Op. cit., pp. 262-271. Capital gains from land sales have become such a conspicuous feature that tochi narikin (instant millionaires who made fortunes by selling their land -- often small farmers) are the overwhelming majority (around 95 out 100) of top earners in Japan. Various issues of Asahi Nenkan.

18. Mills & Ohta, op. cit., p. 701.

19. Mills & Ohta noted that almost no land within ten kilometers of central Tokyo was worth less than $1 million an acre even in 1972. Mills & Ohta, op. cit., pp. 700-1. Although the situation has greatly improved since, competition to rent or acquire public housing was extremely stiff until the mid-1970s. Except for the low-income bracket, competition for public housing is intense. According to one account, in Tokyo in 1969 there were 250,757 people applying for 2,557 rental units -- 1 to 98; and 22,054 people in Japan applying for 2,500 houses for sale. White Paper on National Livelihood, 1970, p. 395. More on the problems of land price and housing, Hanayama Yuzuru, "Urban Land Prices and the Housing Problem", The Developing Economies, 10, 4, Dec. 1972, pp. 468-78.

20. Miyamoto Ken'ichi, Chiiki Kaihatsu wa Korede Yoika? (Is the Current Regional Development Acceptable?). Tokyo: Iwanami Shoten, 1973, p. 17.

21. Oka Namiki, Toshi to Kotsu (Cities and Traffic), Tokyo: Iwanami Shoten, 1975. Mills & Ohta, op. cit., pp. 717-27.

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23. Japan's record on industrial pollution goes gack to 1882 -- four years after Ashio copper mining operation began -- when a dead fish was found in the nearby river, prompting the governor of Tochigi prefecture to place a ban on fishing. Hanayama, Kankyo Seisaku -, pp. 4-5. According to the OECD report on Japan's environment, Japan's pollution policy in 1877 was quite progressive even by today's standard. Environmental Policies in Japan, Paris: Organization for Economic Cooperation and Development, 1977, p. 7.

24. Iwata Yokimoto, "Environmental Pollution in a Rapidly Growing Economy", The Developing Economies, 10, 4, Dec. 1972, pp. 79-95.

25. Overviews on pollution in Japan: Kamioka Namiko, Kindai Nihon no Kogai (Contemporary Japan's Pollution), Tokyo: Shin Jimbutsu Orai Sha, 1971; and Iijima Nobuko, "Nihon Kogai-Shi Kenkyu Nooto" (Notes on Japanese History of Pollution), Kogai Kenkyu, vol. 3, nos. 3-4, 1974, vol. 4, nos. 1, 3-4, 1975.

26. Ui Jun, Kogai no Seiji Gaku (Politics of Pollution), Tokyo: Sanshodo Shinsho, 1968. Minamata-Byo Kenkyukai, ed., Minamata-Byo ni Taisuru Kigyo no Sekinin (Responsibilities of Firms Toward Minamata Disease), Tokyo: Minamata-Byo o Kokuhatsu Suru Kai, 1970. Harada Masazumi, Minamata-Byo (Minamata Disease), Tokyo: Iwanami Shoten, 1972.

27. "Tokushu: Itai-Itai-Byo Hanketsu" (Special Edition: Judgement onItai-Itai Disease), Jurisuto, August 15, 1971.

28. Shoji Hikaru & Miyamoto Ken'ichi, Osorubeki Kogai (Fearful Pollution), Tokyo: Iwanami Shoten, 1964. When Shoji and Miyamoto wrote this book, a word Kogai (public damage or pollution) did not even exist in dictionaries. Tajiri Munaaki, Yokkaichi: Shi no Umi to Tatakau (Yokkaichi: Struggle Against Dead Sea), Tokyo: Iwanami Shoten, 1972. Ono Eiji, Yokkaichi Kogai Junen no Kiroku (Ten-year Record of Yokkaichi Pollution), Tokyo: Sokei Shobo, 1971.

29. John W. Bennett & Solomon B. Levine, "Industrialization in Social Deprivation: Welfare, Environment, and the Postindustrial Society in Japan", in Hugh Patrick, ed., Japanese Industrialization and Its Social Consequences, Berkeley: Univ. of California Press, 1976, pp 457-9. Water Pollution Control in Japan, Tokyo: Environment Agency, 1972. Hanayama, Kankyo Seisaku -, pp. 39-47. Hoshino Yoshio, Setonaikai Osen (Pollution in the Inland Sea), Tokyo: Iwanami Shoten, 1972. Kobayashi Jun, Mizu no Kenko Shindan (Health Examination of Water), Tokyo: Iwanami Shoten, 1971. Environmental Agency, Air Pollution Control in Japan, Tokyo: 1972. White Paper on Pollution in Japan, Tokyo: Environment Agency, 1971, passim. Problems of the Human Environment in Japan, Tokyo: Okurasho Insatsu Kyoku, 1971.

30. Bennett & Levine, op. cit., p. 450.

31. Matsushita Keiichi, Toshi Seisaku o Kangaeru (Considering Urban Policies), Tokyo: Iwanami Shoten, 1982, pp. 25-30. Bennett & Levine, op. cit., p. 450.

32. Kaneda Toshiro, Shushin Koyo Sei (The Permanent Employment), Tokyo: Kyoiku Sha, 1978. Maruo Naomi, Kirigi Itsuro & Nishihara Teshiaki, eds., Nihon Gata Kigyo Fukushi (Japanese-Style Enterprise Welfare), Tokyo: Mitsumine Shobo, 1984. Asahi Nenkan, 1982, p. 391.

33. Pempel described this attitude as "- international glory was domesticated and treated as measurable through increases in GNP -" in his "Japanese Foreign Economic -", p. 742. Masamura, op. cit., p. 196

34. Miyamoto, Chiiki Kaihatsu -, p. 10. The term kakushin jin'ei refers to the opposition parties of the Japan Socialist Party, the Japan Communist Party, the Democratic Socialist Party, the Komeito and the Social Democratic League, while hoshu jin'ei is used for the ruling Liberal Democratic Party and the New Liberal Club.

35. Iida attributed Japanese economists' inability to recognize high growth as real to their ingrained belief in Japan's backwardness that its economy could never achieve such high growth in spite of the experience of high growth during the 1930s. Iida Tsuneo, Nihonteki Chikarazuyosa -, pp. 197-202. Shimomura's contention: Shimomura Osamu, et. al., Nihon Keizai no Seichoryoku: Shimomura Ron to Sono Hihan (Growth of Japanese Economy: Shimomura Thesis and Its critique), Tokyo: Kinyu Zaisei Jijo Kenkyu Kai, 1959.

36. Iida, ibid.

37. Matsushita Keiichi, "Shimin Sanka to Sono Rekishiteki Kanosei" (Citizens' Participation and Its Historic Possibility) in his Shimin Sanka (Citizens' Participation), Tokyo: Toyo Keizai Shinpo Sha,

1971, pp. 175-243, translated into English; "Politics of Citizens' Participation" in The Japan Interpreter: A Journal of Social and Political Ideas, 9, 4, Spring 1975, p. 451.

38. Miyamoto, Chiiki Kaihatsu -, pp. 16-7. In Miyamoto's analysis, the new poverty has four distinct features:

> 1. Unlike classical poverty, new poverty does not have a direct relation to income level or employment. It cannot be solved by income redistribution or full employment policies of the welfare state.
>
> 2. Though new poverty affects the low-income earners the most as people with more means have a greater flexibility to acquire better environment and larger space, it nonetheless encompasses the entire society.
>
> 3. For the above reasons, new poverty cannot be solved in the traditional forum of struggles alone -- i.e. the labor movement.
>
> 4. Social costs of new poverty contain some irreversible elements --such absolute losses as human life or destruction of the nature and cultural heritage. Op. cit., pp. 17-8.

39. Krauss & Simcock, op. cit., p. 187.

40. Hoshino Shigeo, Nishioka Akio & Nakajima Akira, "Numazu-Mishima-Shimizu Sekiyu Kagaku Kombinato Hantai Toso to Fujishi o Meguru Jumin Toso" (Anti-Petrochemical Combinato Struggle of Numazu-Mishima-Shimizu and Residents' Struggle in Fujishi) in Miyamoto Ken'ichi & Endo Hikaru, eds., Gendai Nihon no Toshi Mondai (Contemporary Japan's Urban Problems), vol. 8, Tokyo: Sekibun Sha, 1971. Muramatsu Michio, "Gyosei Katei to Seiji Sanka" (Administrative Process and Political Participation) in Nippon Seiji Gakkai, ed. Nenpo Seijigaku, Tokyo: Iwanami Shoten, 1974, pp. 41-67. Jack G. Lewis, "Civic Protest in Mishima: Citizens' Movement and the Politics of the Environment in Contemporary Japan" in Steiner, Krauss, & Flanagan, op. cit., pp. 274-313.

41. Shoji Hikaru & Miyamoto Ken'ichi, Nihon no Kogai (Japan's Pollution), Tokyo: Iwanami Shoten, 1975, pp. 31-8. "Kogai Saiban" (Pollution Trial), Horitsu Jiho, July 1971, entire edition. Norie Huddle & Michael Reich, Island of Dreams: Environmental Crisis in Japan, N.Y.: Autumn Press, 1975. Frank Upham, "A Sociological Analysis of Four Japanese Pollution suits" in Law and Society Review, 10, 1976. A comprehensive study on PPP: "Tokushu: PPP o Megutte" (Special Edition: On PPP), Kogai Kenkyu, 3, 1, 1974, entire issue.

42. This Mishima-Numazu-Shimizu case has often been treated as a symbol of the environmental protest movement in Japan and as the first major defeat in Japan's postwar growth policy. Krauss & Simcock, op. cit., p. 195. Lewis, op. cit., p. 275, footnote 4.

43. Margret A. McKean, "Political Socialization through Citizens' Movements", in Steiner, Krauss & Flanagan, op. cit., p. 237.

44. In the case of Himeji, the protest group aided by educational materials from the Mishima-Numazu-Shimizu case was successful in halting the construction of Idemitsu petrochemical complex for two years. After a split within the protest group, however, it lost its coherence and power and hence succumbed to the construction. In the cases of Sakai and Takaishi, protests movements were well organized, mobilizing wide segments of communities, and were supported by local chambers of commerce and city councils. They were, nevertheless, powerless in the face of the unilateral prefectural decision to sell reclaimed land to large corporations for the construction of kombinato. Then the governor of Osaka Prefecture was defeated in the next election, but this was too late to alter the Kombinato construction. Shoji & Miyamoto, op. cit., pp. 221-3.

45. Sawai Yutaka, Osaka Kuko Saiban no Tenkai (Unfolding of the Osaka Airport Court Appeal), Tokyo: Minerva Shobo, 1974, vol. 1. A demand to cease any flights from the Osaka airport after 9 p.m was met a few years later.

46. Shibata Tokuei, "Mitsubishi Sekiyu Ryushutsu Jiko" (The Oil-Spill Accident of Mitsubishi Petroleum), Sekai, March 1975.

47. Richard J. Samuels, The Politics of Regional Policy in Japan: Localities Incorporated?, Princeton. Princeton Univ. Press, 1983, p. XVIII in preface.

48. Op. cit., p. 799.

49. Muramatsu, "The Impact -", p. 808.

50. Terry MacDougall, "Political Opposition and Big City Elections in Japan, 1947-1975" in Steiner, Krauss & Flanagan, op. cit., chapter 3, pp. 55-94. Steven R. Reed, "Gubernatorial Elections in Japan" in John Creighton Campbell, ed. Parties, Candidates, and Voters in Japan: Six Quantitative Studies, Michigan Papers in Japanese Studies, no. 2, Ann Arber: University of Michigan, 1981, pp. 139-66.

52. Article 25 of the Constitution: All people shall have the right to maintain minimum standards of wholesome and cultured living. In all spheres of life, the state shall use its endeavors for the promotion and expansion of social welfare and security, and of public health. On civil or civic minimum: Kurt Steiner, "Progressive Local Administration: Local Public Policy and Local-National Relations", in Steiner, Krauss & Flanagan, op. cit., p. 332. Matsushita Keiichi, Shibiru Minimamu no Shiso (Concept of civil Minimum), Tokyo: Tokyo Daigaku Shuppan Kai, 1971. Matsushita, Toshi Seisaku -, pp. 105-73.

53. Matsushita, Shibiru Minimamu, passim.

54. Steiner, op. cit., p. 339. On the Ninagawa administration, Ellis S. Krauss, "Opposition in Power: The Development and Maintenance of Leftist Government in Kyoto Prefecture" in Steiner, Krauss & Flanagan, op. cit., chapter 11, pp. 383-424.

55. Shoji & Miyamoto, op. cit., p. 202 & Appendix p. 6.

56. Ibid.

57. Since 1961, every Japanese citizen in principle has been covered under one or another health insurance plan. But most older people still have to pay 30% of their medical and hospital bills. The Tokyo program (and most others which followed) was to let those over 70 (later over 65) go to whatever doctor they choose and to pay their bills -- including the 30% portion not covered by health insurance. John Creighton Campbell, "Problems, Solutions, Non-Solutions and Free Medical Care for the Elderly in Japan", Pacific Affairs, 57, 1, Spring 1984, pp. 53-55.

58. Campbell, "Problems -", pp. 55-56.

59. Steiner, "Progressive Local -", p. 332.

60. Kogai Taisaku Kihon Ho (The Basic Law for Environmental Pollution Control), Article 1, 1967. Miyamoto Ken'ichi, Kogai to Jumin Undo (Pollution and Citizens' Movement), Tokyo: Jichitai Kenkyu Sha, 1970, pp. 48-77.

61. Shoji & Miyamoto, op. cit., pp. 149-53.

62. "Tokushu: PPP -", passim.

63. OECD, Environmental Policies -, p. 83. Shoji & Miyamoto, op. cit., p. 153.

64. Koshiro Kazutoshi, "Japan's Labor Unions: The Meeting of White and Blue Collar" in Politics and Economics in Contemporary Japan, Tokyo: Japan Cultural Institute, 1979, pp 144-9. Okochi Kazuo, Reimeiki no Nihon Rodo Undo (The Dawn of Japanese Labor Movement), Tokyo: Iwanami Shoten, 1958.

65. Okochi Kazuo, ed. Rodo Kumiai no Seisei to Soshiki (Formation and System of Labor Unions), Tokyo: Tokyo Daigaku Shuppan Kai, 1956. Okochi Kazuo, Sengo Nihon no Rodo Undo (Postwar Japan's Labor Movement), Tokyo: Iwanami Shoten, 1969. G. Maruyerne, Nanatsu no Kuni no Rodo Undo (Labor Movement in Seven Nations) translated by Kumata Ryo, Tokyo: Iwanami Shoten, 1980, vol.2, pp. 106-9.

66. The official policy goal of the Japanese Socialist Party -- and that of Sohyo (the two being almost identical because of interpenetration of the leaderships) -- was set in 1955 as to establish a self-supporting economy by severing Japan's links to the United States and to abolish the Self-Defense Forces as a precondition of a class-struggle. "Seisaku Taiko" (Outline of Policies) announced on October 1955 in Nihon Shakaito: Nijunen no Koroku (Twenty Years Record of the Japan Socialist Party), Tokyo: Nihon Shakaito, 1965, pp. 166-70.

67. Yoshino M.Y., Japan's Managerial System: Tradition and Innovation, Cambridge, Mass.: MIT Press, 1968, pp. 72-4. Hazama Hiroshi, Nihon Teki Keiei no Keifu (Trendsin Japanese Management), Tokyo: Nihon Noritsu Kyokai, 1963, pp. 102-3. Yasuzu Horie, "The Role of the Ie in the Economic Modernization of Japan", Kyoto University Economic Review, 36, 1, April 1966, pp. 1-16. Andrew Gordon, The Evaluation of Labor Relations in Japan, Harvard East Asian Monographs 117, Cambridge: Harvard University, 1985. Solomon B. Levine, "Labor Markets and Collective Bargaining in Japan" in Lockwood, ed. The State -, pp. 642-48.

68. Gordon, ibid.

69. Halliday, op. cit., op. 207. Kuriki Yasunobu, "Keizai Kiki to Rodo Undo" in Iwanami Koza: Nihon Rekishi, vol. 22, Tokyo: Iwanami Shoten, 1977, pp. 221-64.

70. The metaphor of ie (family) relationship, with the vertical nature of Japanese society and the homogeneity of the people, still serves as a point of controversy. Because the enterprise union is not totally unique to Japan and the fact that many enterprise unions were born out of the intense difficulties of the early postwar era, Japanese culture should not be viewed as an overriding reason for the resilience of enterprise unionism. It should be seen rather as an ideology used by management when it serves its purpose.

71. Yoshino, Japan's Managerial -, chapter 4. Hanami Tadashi, "The Characteristics of Labor Disputes and Their Settlements in Japan" in Social and Cultural Background of Labor-Management Relations in Asian Countries, Tokyo: Japan Institute of Labor, 1971, p. 213. A classic on Japan's labor: Ronald Dore, British Factory-Japanese Factory, Berkeley: Univ. of Calif. Press, 1973. Okochi Kazuo, Bernard Karsh & Solomon B. Levine, eds. Workers and Employers in Japan: The Japanese Employment Relations System, Princeton, N.J. & Tokyo: Princeton Univ. & Univ. of Tokyo Press, 1974. Robert E. Cole, Work, Mobility, and Participation, Berkeley: Univ. of Calif. Press, 1979. Robert E. Cole, Japanese Blue Collar, Berkeley: Univ. of Calif. Press, 1971.

72. Okochi, Sengo Nihon no Rodo -, chapter 3.

73. Ibid

74. Pempel, Policy and Politics -, p. 97. Koshiro, op. cit., pp. 147-8. Maruccine, op. cit., p. 109. Halliday, op. cit., p. 217-223.

Pempel described this division as "- the very different institutional levels of conflict and conflict resolution -- between national and company level and between public and private sector union activities -." Pempel, Policy and Politics -, p. 91.

75. Stockwin, Japan: Divided -, p. 170.

76. Okochi Kazuo, "Rodo Mondai Yogono Kaisetsu" (Commentary on Labor Terminology) in Gendai Yogono -, 1982 edition, pp. 396-7. Takagi Tadao, Keizai Kiki to Rodo Kumiai Undo (Economic Crisis and Labor Union Movement), Tokyo: Gakushu No Tomo Sha, pp.126-7. Maruccine, op. cit., p. 112.

77. Galeson & Odaka, op. cit., pp. 642-5. Takagi, Keizai Kiki -, pp. 126-30. Shimada Haruo, "Japanese Labor's Spring Wage Offensive and Wage Spillover", 7, 2, 1970, pp. 34-41. Yamazaki Kohei, "Seme no Shunto" (Shunto Attack), Ekonomisuto, March 27, 1984, pp. 50-5. Robert Evans, "Shunto: Japanese Labor's Spring Offensive", Monthly Labor Review, 90, 10, Oct. 1967, pp. 23-28.

78. Galeson & Odaka, op. cit., p. 645.

79. Maruccine, Nanatsu no -, p. 112. Okochi, "Rodo Mondai -", p. 397.

80. Calculated from Asahi Nenkan (Asahi Yearbook), 1986, p. 191. Galeson & Odaka, op. cit., p. 645.

81. Fujita Shiko, "Kigyo Fukushi no Atarashii Rinen to Doko" (New Doctrine and Trends in Enterprise Welfare) in Maruo Naomi, et. at., Nihon Gata Kigyo Fukushi (Japanese Style Enterprise Welfare), Tokyo: Mitsumine Shobo, 1984, pp. 18-23.

82. Sakamoto Mamoru, Shakaito-Sohyo Burroku (The JSP-Sohyo Block), Tokyo: Nihon Hyoron Sha, 1981. Kozuma Yoshiaki, "Rodo Undo no Teitai to Shakai no Saiken" (The Stagnation of Labor Movement and the Reconstruction of the JSP), Gekkan Shakaito, 328, Sept. 1983, pp. 20-9.

83. Muramatsu Michio noted that the LDP introduced the Income Doubling Plan in 1960 partly to mitigate political polarization of the Japanese society over the renewal of the Japan-U.S. Security Treaty in 1960. Muramatsu Michio, "The Impact of Economic Growth Policies on Local Politics in Japan", Asian Survey, 15, 9, Sept. 1975, p. 808.

84. Stockwin, Japan: Divided -, pp. 274-5. Stockwin, "Shifting Alignment -", p. 887.

85. The Kozo school believed that the Restoration was not a real revolution because the Japanese society in the 1920s was still dominated by feudal remnants, thereby requiring a bourgeois-democratic revolution before a proletarian-socialist one. On the other hand, the Rono school regarded feudal remnants as less important than the forces thrown up by capitalist development of the economy, so that it should be possible for the working class to take over the reins of power without the intervening stage of revolution. Stockwin, Japan: Divided -, pp. 172-3. Halliday, op. cit., p. 80, p. 134, p. 338. John Dower, op. cit., pp. 35-6. Ouchi Riki, Nihon Kaizai Ron (Theories of Japanese Economy), Tokyo: Tokyo Daigaku Shuppan Kai, 1962, vol. 1, Introduction and chapter II. Toyama Shigeru & Sato Shin'ichi, eds., Nohonshi Kenkyu Nyumon (Guide to the Study of Japanese History), Tokyo: Tokyo Daigaku Shuppan Kai, vol. 1, 1954, & vol. II, 1962. George M. Beckmann & Okubo Genji, The Japanese Communist Party: 1922-1945, Stanford: Stanford Univ. Press, 1969. Roger Swearingen & Paul Langer, Red Flag in Japan: International Communism in Action: 1919-1951, Cambridge, Mass.: Harvard Univ. Press, 1952. Paul F. Langer, Communism in Japan: A Case of Political Naturalization, Stanford: Hoover Institution Press, 1972.

86. Stockwin, Japan: Divided -, chapter 9. J.A.A. Stockwin, The Japanese Socialist Party and Neutralism: A Study of a Political Party and Its Foreign Policy, Melbourne: Melbourne Univ. Press, 1968. Hatakeyama Takeshi, Habatsu no Uchi Maku: Nihon no Seiji Kozo (Behind the Factionalism: Japan's Political Structure), Tokyo: Tachikaze Shobo, 1975, pp. 131-94. Taguchi Fukuji, ed., Nihon Shakaito Ron (Theory of Japan Socialist Party), Tokyo: Shin Nihon Shin Sha, 1969. A.B. Cole, G.O. Totten & C.H. Uyehara, Socialist Parties in Postwar Japan, New Haven: Yale Univ. Press, 1966.

87. Stockwin, Japan: Divided -, p. 108.

88. Sakagami Nobuo, Senkyo Seido, Seiji Shikin no Jittai to Kaku To no Seisaku (Election System, Political Fund and Policies of Political Parties), Tokyo: Kyoiku Sha, 1979. Ronald J. Herebenar, "The Politics of Electoral Reform in Japan", Asian Survey, 17, 10, Oct. 1977, pp. 978-96.

89. Most studies in the ethnocentric pluralist political development school as well as ethnocentric power-elite school adopted this assumption: Tsuji, op. cit. Robert E. Ward, Japan's Political System, N.Y.: Prentice-Hall, 1967; Frank Langdon, Politics in Japan, Boston: Little, Brown, 1967; Pempel, "Japanese Foreign -". T.J. Pempel, "The Dilemma of Parliamentary Opposition in Japan", Polity, 8, 1975, pp. 63-79. Pempel & Tsunekawa, op. cit. It is precisely this ethnocentric approach to Japanese politics that a group of Japanese scholars has challenged and led to their attempt to establish a less ethnocentric pluralist interpretation of Japanese politics as seen in chapter I. Otake Hideo, Gendai Nihon no -. Muramatsu Michio, Sengo Nihon no -.

90. Stockwin, Japan: Divided -, chapter 7 & 9. It should be noted that the LDP's loss always shrinks after each election as some independents join the LDP after victories.

91. Op. cit., p. 95. Michael Blaker, "Japan in 1977: An EmergingConsensus", Asian Survey, XVIII, 1, Jan. 1978, p. 92.

92. Steiner, "Progressive Local -", pp. 326-329.

93. A summary of the opposition parties' policies: Asahi Nenkan (Asahi Yearbook), 1974, p. 224.

94. Shiratori, op. cit., especially, chapters III & V. Shiratori Rei, Nihon ni Okeru Hoshu to Kakushin (Conservations and Progressives in Japan), Tokyo: Nihon Keizai Shimbun, 1973. Shiratori Rei, Nihon Seiji no Kozo: Sengo Taisei no Shuen (Structure of Japanese Politics: Dying Days ofPostwar Order), Tokyo: Toyo Keizai Shimpo Sha, 1975. Sato Seizaburo, Kumon Shumpei & Murakami Yasusuke, "Datsu Hokaku Jidai no Torai" (The Arrival of the Post-Conservative-Progressive Era), Chuo Koron, Feb. 1977. Nihon Seiji Gakkai (Japan Political Science Association), ed., Gojunen Taisei no Keisei to Hokai (The Formation and Collapse of the 1955 System), Tokyo: Iwanami Shoten, 1979. Iizaka Yoshiaki, Okazawa Norio, & Fukuoka Masayuki, eds., Rengo Seiji eno Choryu (Trend Toward Coalition Politics), Tokyo: Toyo Keizai Shimpo, 1979.

95. NIRA, Nihon no Kadai -, chapter 10.

96. See footnote 104.

97. Muramatsu, Sengo Nihon no -, p. 331. Richard Brynildsen, "A Decade of Japanese Diet Elections, 1967-1976: Conservatism and Radicalism Reevaluated", Asian Survey, 17, 10, Oct. 1977, pp. 967-77.

98. Kishida, op. cit., pp. 56-107.

99. Soda Toshio, "Sengo Nihon no Sangyo Seisaku to Dokkin Seisaku" (Postwar Japan's Industrial and Anti-Monopoly Policies) in Kitada Yoshiji & Soda Toshio, eds., op. cit., vol. II, p. 80. Watanabe Koichi, "Keizai Seisaku to Seisaku Shutai" (Economic Policies and Policy Objectives) in Kitada & Soda, op. cit., vol. I, p. 66.

100. Ozawa Terutomo, "Japan's Multinational Enterprise: The Political Economy of Outward Dependency", World Politics, vol. XXX, no. 4, July 1978, p. 523.

Chapter IV

1. Hachijunen no -, p. 8 & p. 117.

2. Tekunoporisu '90 Kensetsu Koso Iinkai, Tekunoporisu Kihon Koso Chosa Sogo Hokokusho (Comprehensive Report on Technopolis Concept), Tokyo: MITI, March 1982. Tamura Masaaki, "Tekunoporisu Koso no Tenkai" (A Development of Technopolis Concept), Refarensu, April 1983, pp. 142-146.

3. Kumamoto Kazuki, "Hatan Shita Daikibo Chiiki Kaihatsu" (Failed Large-Scale Regional Development), Keizai Hyoron, April 1985, pp. 60-61.

4. This is the reason why officials stress rhetoric of the "era of local autonomies" when discussing technopolis: for example Sugihara Kazuo, "Sangyo Kozo no Kodoka to Tekunoporisu" (Advancement of the Industrial Structure and Technopolis), Manejimento Bessatsu (Special Edition on Technopolis), Oct. 1982, p. 16.

5. Tsuruta Toshimasa, "Chiiki Sangyoka to Tekunoporisu Keikaku" (Regional Industrialization and Technopolis Plan), Keizai Hyoron, April 1985, pp. 18-19. Fukuhara Motoichi, "Tekunoporisu no Seisaku Tenkai" (Development of Technopolis Policy), Manejimento -, pp. 26-28.

6. Nohara Hikaku, "Chiiki Kaihatsu Seisaku" (Regional Development Policy) in Kitada & Soda, op. cit., vol. 1, chapter 7, pp. 226-254.

7. Uehara Nobuhiro, Chiiki Kaihatsu to Sangyo Kozo (Regional Development and Industrial Structure), Tokyo: Ochanomizu Shobo, 1977, passim.

8. Asahi Shimbun, July 14, 1980.

9. Hachijunen no -, pp. 328-3. Ishikawa Hisao, "Tekunoporisu Koso to Toshi Keizai" (The Technopolis Concept and Urban Economy), Toshi Mondai, March 1983, pp. 54-56. Kobayashi Akira, "Chiho Kara Mita Tekunoporisu" (Looking at the Technopolis from Local Perspectives), Manejimento -, pp. 92-94. The Industrial Policy for the 1980s anticipated that there would be a continuing articulation of public demand for qualitative improvement in working and living conditions in urban centers and a growing desire among younger people from provincial areas to opt for working near their hometowns where more

leisurely lifestyles both in terms of time and space can be attained and the cost of housing is lower. Hachijunen no -, p. 111.

10. Chikusai Makoto, "Nashonaru Tekunoporisu: Tsukuba" (National Technopolis: Tsukuba), Kensetsu Geppo, Jan. 1985, p. 82.

11. In the case of Kyushu NEC, the IC plant located in Kumamoto city in Kyushu was shipping (in 1982) 1.5 ton of ICs and LSIs daily on the last flight to Tokyo. Each shipment cost 250,000 yen carrying a product valued at 400 million yen. Thus the cost of this transportation was a mere 0.06% of the value. Ota Masaki, "Ea Kago Jidai no Butsuryu" (Flow of Products in the Era of Air Cargo), in Manejimento -, p. 84.

12. Op. cit., pp. 83-88. Ito Zen'ichi, "Chiiki Kaihatsuron to Shite no Tekunoporisu" (Technopolis as Regional Development Theory), Manejimento -, pp. 53-54.

13. Sasaki Masasachi, "Shirikon Airando, Kyushu Tekunoporisu o Yuku" (Silicon Island: Going around Kyushu Technopolis) Jumin to Jichi, October 1983, pp. 27-31. Mitsukawa Hiroshi, "Chiiki Kigyo no 'Seiko no Kagi' wa 'Inobeta' to 'Gijutsu'" (Local Firms' "Keys to Sucess" are "Innovation" and "Technology"), Manejimento -, p. 109.

14. Makino Noboru, "Arayuru Chijo Sangyo o 'Toronikusu-ka' Suru" ("Electronization" of All Local Industries), Manejimento -, pp. 32-33.

15. For example, the prime minister's annual beginning-of-the-year administrative policy speech to the Diet: Asahi Shimbun, Jan. 25, 1982. Science and Technology Agency, White Paper on Science and Technology, Tokyo: Foreign Press Center, August 1983, p. 1. Ishizaka Seiichi, "Nihon no Kagaku Gijutsu no Ne o Sodateru Tekunoporisu" (Technopolis to Nurture Japan's Science and Technology), Manejimento -, p. 24.

16. Ito, op. cit., p. 54. Kamiya Kazuo, "Chiiki Sangyo Kassei-ka eno Michi" (The Road to Revitalizing Local Industries) Manejimento -, p. 22.

17. Tsuruta, op. cit., pp. 12-13.

18. Kobayashi Atsushi, "Ugoki Dasu Tekunoporisu" (Beginning to Move Technopolis) Tsusan Janaru, April 1984, pp. 36-37. Kobayashi, a MITI official, pointed out that the income differential between the top ten prefectures with major cities and the remaining 43 was narrowing until 1977 but it has widened since the late 1970s. p. 36.

19. Karatsu Hajime, "Chijo ni Aru Shiizu no Me o Do Ikasuka" (How to Exploit Buds of Local Seeds), Manejimento -, pp. 47-50. Roundtable Discussion, "Nijuichi Seiki e Tsunagu Joso" (Assisting the Run to the Twenty-First Century), Manejimento -, p. 7. Fukuhara, op. cit., p. 25.

20. Hachijunen no -, chapter 10, pp. 147-154. Chusho Kigyo Sho, Chusho Kigyo no Saihakken (Rediscovery of the Small and Medium-Sized Enterprises), Tokyo: Tsusho Sangyo Chosakai, 1980. MITI, Vision of Small and Medium-Sized Enterprises and Their Policy Direction in the 1980s, Tokyo: MITI, Nov. 1980, pp. 42-43.

21. Imai, "Japan's Industrial -- ", op. cit., pp. 44-46.

22. The former assumption was what justified Japan's industrial policies of the high growth era in which larger firms were given easier access to low-cost capital to build mass-production facilities based on economies of scale over smaller ones.

23. Kiyonari Tadao, "The Unsung Mainstays (1): Small Business" in Murakami Hyoe & Johannes Hirschmeier, Politics and Economics in Contemporary Japan, Tokyo: Japan Culture Institute, 1979, pp. 173-178. Nakamura Hideichiro, Nihon Sangyo: Guzen no Han'ei (Japanese Industries: Coincidental Prosperity), Tokyo: Toyo Keizai Shimpo Sha, 1982, pp. 219-240. Yonekawa Seihin, "Takumashii Kusanone Gijutsu Kakushin no Ninaite" (Brave Practioners of Grass-Roots Technological Innovation) Ekonomisuto, 1984, pp. 60-61. Yoshikawa Akihiko & Brian Woodall, "The 'Venture Boom' and Japanese Industrial Policy: Promoting the Neglected Winners" Asian Survey, June 1985, pp. 699-700. Maotani Tsutomu, "Waga Kuni Chusho Kigyo no Chii to Sono Henka" (The Position and Changes of Our Nation's Small and Medium-Sized Enterprises) in Kiyotani Tadao, et. al., Chusho Kigyo Ron (Theories of Small and Medium-Sized Enterprises), Tokyo: Yuhikaku Shinsho, 1978, pp. 53-54.

24. Imai, "Japan's Industrial -- ", op. cit., pp. 46-47.

25. Op. cit., p. 44.

26. The term "economies of scope" rarely appears, but often is described as tahinshu shoryo seisan (multiple variety of products in smaller-volume production). This notion is fundamental to what is coined as "softnization" or "softnomics" to describe current industrial and economic changes in Japan -- i.e. knowledge-intensification and higher value-added economy with the consequence of the growth of the information and service sector -- sometimes with the macro policy proposal to "revitalize the private sector initiatives" by limiting Keynesian demand management policy and welfare state policy. The terms "softnomics" and "softnization" are widely used since the study group for the Minister of Finance popularized them in its final report of 1983. Asahi Shimbun, June 8, 1983. Nagatomi Yuichiro, ed.

Sofutonomikkusu no Teisho (A Proposal of Softnomics) Tokyo: Kin'yu Zaisei Jijo Kenkyu Kai, 1983 Tate Ryuichiro, Sofutonomikkusu (Softnomics) Tokyo: Nihon Keizai Shimbun (Japan Economic Daily), 1983.

On Japan's venture business: Yonekawa, op. cit., pp. 58-59. Nikkan Kogyo Shimbun Tokubetsu Shuzaihan, Gyoshu Hakai: Kigyo Ikinokori Sakusen (Industrial Destruction: Firms' Survival Strategies), Tokyo: Nikkan Shobo, pp. 226-237. Charles Smith, "Industrial Japan '84", Far Eastern Economic Review, Dec. 20, 1984, pp. 69-80. Nakamura, op. cit., pp. 237-238. Karatsu, op. cit., p. 47.

27. Hachijunendai no -, p. 118.

28. Hirata Keiichiro, et. al., Kokudo Kaihatsu (National Land Development), Tokyo: Sanraizu, 1972, p. 16. On the background of how Tokyo University of Education was Transplanted as Tsukuba University, see Tahara Soichiro, Gyosai no Jidai (The Era of Business Interchange) Tokyo: Purejidento, 1983, chapter 4. Tsukuba is closer to the Research Triangle of North Carolina, Sophia Antipolis of Southern France and Academgorodok of Novosivirsk in the Soviet Union than to the Silicon Valley of California, Route 128 of Boston or Northern Silicon Valley near Ottawa in that it was a planned agglomeration of R&D rather than a natural evolution. But unlike the Research Triangle, Sophia Antipolis and other technopolis projects around the world, the industry component was more or less an afterthought to the consolidation of public R&D institutes and universities at Tsukuba.

29. Yamamoto Tomo, "Ibaragi: Tayo na Sentan Sangyo de Kennai Tekunoporisu Ka" (Ibaragi: Toward the Technopolis with Various High-Technology Industries) Sekai Shuho, Oct. 9, 1984, p. 45.

30. "Chishiki Joho no Minato Machi" (A Harbor of Knowledge and Information) Jiyu Minshu, August 1985, pp. 105-106.

31. Ibid.

32. Lewis Simons, "A High-Tech Expo Opens in Japan's 'City for Science'" Smithsonian, April 1985, p. 162.

33. The Japan Economic Journal, April 30, 1988.

34. Ibaragi Prefecture, Nijuissei-ki e Mukete no Ibaragi (Looking Toward the 21st Century), June 1988, p. 7.

35. Quoted in Simons, op. cit., p. 160.

36. For example, Tahara, op. cit., p. 132.

37 Taketoshi, op. cit., p. 56.

38. Nathaniel E. Roper-Dennis, "MITI's Technopolis Plan: A New Brand of Regional Development", The Oriental Economist, August/Sept. 1984, p. 57.

39. Taketoshi Makoto, "Mietekita Tsukuba Tekunoporisu" (Surfacing Tsukuba Technopolis) Ekonomisuto, May 7, 1985, pp. 50-52.

40. Prior to 1985, Tsukuba was little known. One survey showed only 30% of Japanese people knew of Tsukuba Science City. Yamamoto, op. cit., p. 46.

41. Asahi Nenkan (Asahi Yearbook), 1986, p. 272 & p. 403.

42. Op. cit., p. 272.

43. Tahara, op. cit., p. 135.

44. Op. cit., p. 142. Nagagutsu to Hoshizora: Tsukuba Kenkyu Gakuen Toshi no Junen (Boots and Star-Filled Sky: Ten Years of Tsukuba Research Academic City), Tsukuba: Tsukuba Kenkyu Gakuen Toshi no Seikatsu o Kirokusurukai, 1981.

45. Gene Gregory, "Science City: The Future Starts Here", Far Eastern Economic Review, March 28, 1985, pp. 45-50. Arai Tadao, "Tsukuba Kenkyu Gakuen Toshi" (Tsukuba Scientific and Academic City), Ekonomisuto, Feb. 4, 1985, pp. 4-6.

46. These guidelines were stipulated by the Technopolis Committee. Fukuhara, op. cit., p. 26. Tamura, op. cit., p. 144.

47. Kotoku Hideo, "Tsusansho mo Tomadou Chiho no Nekki" (Local Enthusiasm that Bewildered MITI), Asahi Janaru, Feb. 3, 1984, pp. 106-109.

48. Hirata Ikuo, "Shinshitsu Kigyo eno Kashi Zashiki ni Narikanenu" (Risk of Becoming a Rented Room), Nikkei Business, April 30, 1984, p. 148. Initially, the plan was to create a few technopolises but MITI chose 19 out of 38 localities which announced candidacies in the end as they apparently judged that the level of local enthusiasm was sufficiently intense to warrant such a change. 19 locations involve 20 prefectures with 2 neighboring communities docked into a single project. Tahara, op. cit., p. 144.

49. There is even a joke going around that one local administration misunderstood the scheme as "technology-intensive police-force". Kotoku, op. cit., p. 107

50. Op. cit., p. 146.

51. Tamura, op. cit., p. 146.

52. MITI, Aratana Hatten-Dankai o Mukaeru Tekunoporisu no Kenchiku Jokyo (New Development Stage: Construction Status of the Technopolis), July 1989. Nihon Keizai Shimbun, Feb. 10, 1984. Asahi Shimbun, April 28, 1983.

53. The increased fiscal spending for domestic demand expansion after theyen'srevaluation recession a few years ago did not specify any fund for technopolis projects.

54. Tsuruta, op. cit., pp. 17-18.

55. Nihon Keizai Shimbun, November 29, 1988.

56. Interviews with Kumamoto officials in May, 1989.

57. Kumamoto Prefecture, Kigyo Yuchi no Genkyo (Status of Newly Attracted Industries), March 31, 1989.

58. Oita Prefecture, Toyono-Kuni Tekunoporisu (Oita Technopolis), 1988. Interviews with Oita officials in June 1989.

59. Oita Prefecture, Shuyou Gijutsu Kigyou no Richi Jyokyo (Present Status of High Technology Industries), March 1989.

60. Nihon Keizai Shimbun, March 1, 1989.

61. Nihon Keizai Shimbun, October 18, 1988.

62. Nihon Keizai Shimbun, Sept. 29, 1988.

63. Nihon Keizai Shimbun, August 11, 1988.

64. "Aso no Yuho Sarani Takaku: Kumamoto wa Ima Moesakaru" (The Peak of Aso Stands Taller: Burning Passion of Kumamoto), Gekkan Jiyu Minshu, March 1985, p. 66. Yokota Toshiya, "Tekunoporisu ni Yume Futatabi" (Once More Dream for the Technopolis) Ekonomisuto, March 20, 1984, p. 66.

65. Ube Technopolis: Kawasaki Ikuo, "Gendoryoku wa Minkan" (The Locomotive is in the Private Sector) Tsusho Janaru, July 1985, p. 23. Kurume Tosu Technopolis: Sasaki, op. cit., p. 30.

66. Nihon Keizai Shimbun, Sept. 17, 1988.

67. The NEC official was quoted in: Hirata, op. cit., p. 151.

68. "Aso no Yuho -- ", p. 78.

69. Kawasaki, op. cit., 23.

70. Karatsu, op. cit., p. 50.

71. Nihon Keizai Shimbun, October 6, 1988.

72. Aratana Hatten -, p. 3.

73. Jinno Takeyoshi, "Kuni no Sangyo Seisaku o Chiho de Okonau Mujun" (Contradictions of National Industrial Policy Carried out by Local Initiatives).Asahi Janaru, Feb. 3, 1984, p. 105.

74. Tsukaya Tsuneo, "Kumamoto ni Tekunoporisu o Tazunete" (Visiting Technopolis in Kumamoto) Jumin to Jichi, May 1984, pp. 63-67.

75. Nihon Keizai Shimbun, Feb. 6, 1989.

76. "Aso no Yuho -- ", p. 79. Kumamoto Prefecture, Kumamoto Technopolis, March 31, 1989, p. 8.

77. Nihon Keizai Shimbun, Jan 31, 1989.

78 Nihon Keizai Shimbun, March 14, 1989.

79. Nikkei Sangyo Shimbun (Nikkei Industry Daily), Jan. 18, 1989.

80. Nihon Keizai Shimbun, Feb. 10, 1989.

81. Nikkei Sangyo Shimbun, Jan. 28, 1989.

82. Nihon Keizai Shimbun, April 20, 1989.

83. Nikkei Sangyo Shimbun, March 17, 1989.

84. Nikkei Sangyo Shimbun, December 21, 1988.

85. Sasaki, op. cit., pp. 28-29.

86. Sasaki, op. cit., p. 29.

87. Inoue Yoshio & Ito Koretoshi, Sentan Sangyo to Chiiki Keizai (High-Technology Industries and Regional Development), Tokyo: Minerva Shobo, 1988.

88. "Aso no Yuho -- ", p. 74.

89. Jinno, op. cit., pp. 102-103.

90. Tahara Soichiro, "Tekunoporisu no Kisha" (A Standard-Bearer the of Technopolis), Uzushio, Nov. 1983, pp. 100-113. Kumamoto Technopolis: Asahi Nenkan, 1985, p. 438. "Chiteki Kohun no Bazukuri" (Creating an Intellectually Exciting Place), Jiyu Minshuto, March 1985, pp. 80-81. Oita Technopolis. Asahi Nenkan, 1985, p. 439. Tahara, "Tekunoporisu no -- ", pp. 100-113. Stimulated by the governor's "one product for each village" campaign, one association of small and medium-sized firms has launched a "one technology for each plant" movement. Karatsu, op. cit., p. 49.

91. "Chiteki Kohun no Bazukuri" (Creating an Intellectually Exciting Place), Gekkan Jiyu Minshu, March 1985, pp. 80-81.

92. Personal interviews with Kumamoto and Oita prefectural officials inJuly 1989.

93. Aratana -, pp. 9-10.

94. Jinno, op. cit., p. 104.

95. Hirata, op. cit., p. 150.

96. Sasago Katsuya, "Nagaoka Tekunoporisu" (Nagaoka Technopolis), Bungei Shunju, Nov. 1983, pp. 138-139.

97. Hirata, op. cit., p. 146. Kotoku, op. cit., p. 108.

98. Jinno, op. cit., p. 103.

99. Sasaki, op. cit., pp. 28-29.

100. Ibid.

101. Nihon Keizai Shimbun, May 18, 1989.

102. Nihon Keizai Shimbun, Dec. 9, 1988.

103. Nihon Keizai Shimbun, Sept. 27, 1988.

104. Aratana -, p. 12.

105. Jinno, op. cit., p. 105.

106. Tahara, op. cit., pp. 135-166. Sasago, op. cit., pp. 134-149.

107. Oka Namiki, "Tekunoporisu to Kennai Kotsu" (Technopolis andTransportation) Manejimento -, p. 42.

108. Sasago, op. cit., p. 140.

109. "Chiteki Kohun no -- ", p. 80.

110. These figures are drawn from Asahi Nenkan, 1986, p. 833.

111. Asahi Nenkan, 1990 p. 425.

112. This point is emphasized in Kihara Keikichi, "Amenitii no Shiso ni Motozuku Kankyo Keikaku no Sakusei O" (For the Formulation of an Environmental Management Plan Based on the Idea of Amenity), Manejimento -, p. 56.

113. Kumamoto, op. cit., pp. 61-62.

114. Hashimoto Ryoichi, "Kagawa ni Tekuno Suishin no Joken wa Aruka?" (Does Kagawa Have Needed Conditions to Promote a Technopolis?), Jumin to Jichi, Feb. 2, 1984, p. 76.

115. Yuhihama Shogo, "Ishoku no Tekunoporisu Koso" (Unusual Technopolis Concept), Jumin to Jichi, Feb. 1983, pp. 70-71.

116. Sheridan Tatsuno, Tekunoporisu Senryaku (The Technopolis Strategy), Tokyo, Damamikku Serazu, 1988, pp. 401-408.

117. Nikkei Sangyo Shimbun, Nov. 18, 1988.

118. Nihon Keizai Shimbun, August 11, 1988.

119. Inoue & Ito, op. cit.

120. For example: Hiratsuka Hiroshi, "Saikaihatsu to Tekunoporisu" (Redevelopment and Technopolis), Gekkan Shakaito, April 1984, pp. 146-147. Terada Setsuji, "Tekunoporisu Ho no Nerau Mono" (What the Law for Technopolis Aims to Gain), Zen'ei, July 1983, pp. 207-225.

121. Personal interviews with the JSP and JCP policy staff on technopolis in July 1989.

Chapter V

1. Hachijunendai no -, p. 125, p. 128 & pp. 169-170.

2. Sen'i Kogyo Shingikai & Sangyo Kozo Shingikai, Atarashii Jidai no Sen'i Sangyo no Arikata: Senshinkoku Gata Sangyo o Mezashite (The Textile Industry as It Should Be in The New Era), Tokyo: MITI, Oct. 1983.

3. Takase Kazuo, "Sen'i Sangyo no Atarashii Tenkai" (A New Developments in the Textile Industry), Tsusan Janaru, Jan. 1984. Kono Shuichi, "Sen'i Sangyo no Atarashii Sugata" (New Form of the Textile Industry), Tsusan Janaru, Feb. 1983, pp. 94-96. Nihon Keizai Shimbun (Japan Economic Daily), Nov. 1, 1983.

4. Ibid.

5. Gyokai Bunseki (Analysis of Industries) 1989, Tokyo: Nikko Research Center, p. 111. The imposition of voluntary export restraints on South Korean sweaters: Asahi Nenkan, 1990, p. 42 & p. 128.

6. Sen'i Nenkan (Textile Yearbook), Tokyo: Nihon Sen'i Shimbunsha, 1989, p. 40. Bruce Roscoe, "Japan to the Barricades: Tokyo Exerts Subtle Pressure to Slow Textile Inflows", Far Eastern Economic Review, Sept. 12, 1986, pp. 87-88. "Men Seihin" (Cotton Products), Shukan Toyo Keizai, Spring Special Edition, 1985, p. 38. Ike, op. cit., p. 550.

7. Takase, op. sit., p. 68. Nihon Keizai Shimbun, Oct. 14, 1983.

8. Kaigai Shinshutsu Kigyo Soran (Comprehensive List of Companies' Overseas Expansion), Tokyo: Toyo Keizai, March 1989, 131 & 868.

9. Brian Ike, "The Japanese Textile Industry: Structural Adjustment and Government Policy", Asian Survey, vol. 20, no. 5, May 1980, p. 539.

10. Ibid.

11. Tanaka Ken, "Japan", Asian Textile Survey, Hong Kong: Far Eastern Economic Review, 1970, pp. 127-145.

12. The Textile Old Act is formally called the Temporary Law Governing Textile Industry Equipment and the Textile New Act is the Temporary Law Governing Textile Equipment and Others, while the Special Textile Act is the Temporary Law for the Structural Reorganization of Specified Textile Industries. Ike, op. cit., p. 539. U.S General Accounting Office, Industrial Policy: Case Studies in The Japanese Experience, Oct 20, 1982, pp. 46-47.

13. Yoshioka Masayuki, Sen'i (Textiles). Tokyo: Nihon Keizai Shimbun 1986, p. 87.

14. Op. cit., Yoshioka, p. 114.

15. Sakaino Mitsuko, Seni Gyokai (The Textile Industry), Tokyo: Kyoikusha, 1987, p. 29.

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and fabrics, the U.S. producers are in the dominant position, with Japanese producers trailing in second place. For example, in 1982, U.S. producers had a 31% share of the global market vis-a-vis Japanese producers' 13% in synthetic fibers. U.S. firms produced 900,000 tons of synthetic yarns while Japanese firms produced 650,000 tons, and U.S. firms produced 6 billion square meters of synthetic fibers while Japanese firms produced 4 billion. Hirai & Iwasaki, op. cit., p. 1.9.

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Chapter VI

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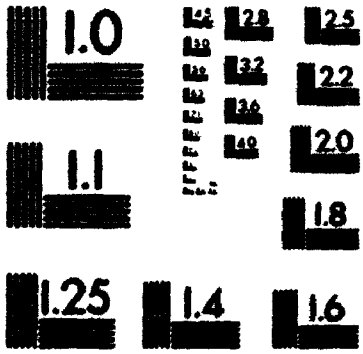

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