THE RISE

DEVELOPMENT

AND INTERNATIONALIZATION

OF

JAPAN'S MOTOR INDUSTRY

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LUCIUS C. P. VAN MOESEKE

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ABSTRACT

The rise of Japan's motor industry to world prominence has been one of the most spectacular developments of modern times and has come to epitomize Japan's 'economic miracle' in the postwar era. The industry's phenomenal growth was the result of various factors. During its infant and developing phases these included: a legacy in terms of industrial expertise from before the War; a much improved labour relations climate; and the favourable economic conditions that prevailed both at home and abroad that provided the framework for an era of high-speed growth. The most significant factor though, was the support given by the government which considered the industry as economically 'strategic' and 'nurtured' it to growth — along with many of its supporting industries — with a wide range of industrial policies.

Notwithstanding the contribution of these factors, however, the industry showed a remarkable resourcefulness and creativity of its own. Borrowing engineering and management techniques from abroad such as Quality Control, and experimenting with new indigenous concepts such as Just-in-Time, the industry was able to dramatically raise the quality of its products and its levels of productivity. Based on these strengths the Japanese automakers became, during the 1970s, major exporters of motor vehicles and were able to capture ever larger shares of foreign markets. In recent years, however, confronted with increased international trade friction, the erection of trade barriers in its major foreign markets, and the rising value of the yen, the industry has inceasingly sought to move operations abroad. These moves to overseas locations are on such an unprecedented scale that they are contributing to create a new international geography of motor vehicle production.

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CHAPTER ONE

INTRODUCTION

INTRODUCTION

'The automobile industry stands for modern industry all over the globe. It is to the twentieth century what the Lancashire cotton mills were to the early nineteenth century: the industries of industries'

P.F. Drucker, *The Concept of the Corporation*, 1946, p. 149.

Despite the fact it has been almost half a century since Peter Drucker wrote these words and the rise since then of other and arguably more glamorous and sophisticated industries such as consumer electronics and computers, the motor vehicle industry still stands today as the world's largest manufacturing activity and continues to play a pivotal role in the global economy. The significance of the industry lies not only in its sheer scale — producing more than 45 million vehicles per year and sales totalling almost US$1 trillion in 1994 (JMIF 1994; *Fortune* 7 August 1995) — but also in its immense spin-off effects through its linkages with numerous other industries: a motor vehicle is an extremely complex machine requiring between 10,000 and 30,000 individual parts (Altshuler *et al.* 1984; Hayashi 1990), which incorporate into their design and manufacture almost every type of industrial material, process, technology and expertise known to man (Keller 1993).

Though analysts differ as to the size and value of the motor industry's linkages, Pemberton (1988) of the Economist Intelligence Unit believes that a multiplier of at least five is possible. This would take account of

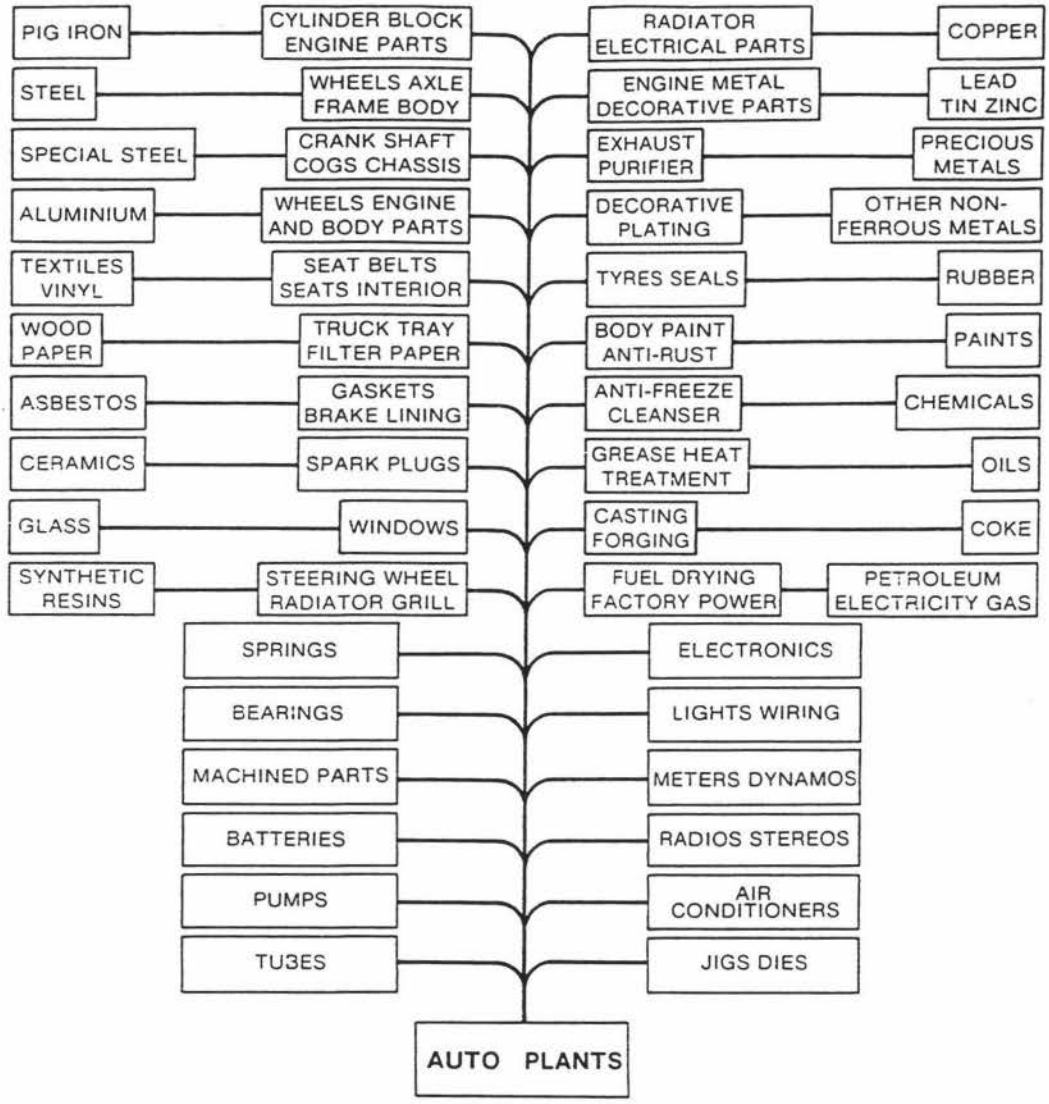

Figure 1.1
Major Materials and Parts Used in Motor Vehicle Production
Source: P. Sheard (1983), p. 26.

successive stages in value added by all the industries and economic activities associated (fairly directly) with the production and operation (consumption) of motor vehicles. Such linked activities include as providers of inputs the steel industry, the components industry, the tyre and rubber industry, and the machine tool industry among others. On the operating side, associated economic operations include the production and

distribution of fuel, road construction, vehicle sales and service, costs of roads and vehicle tax collection, and so on. If the suggested multiplier of five is applied to the aggregate 1994 sales of US$1 trillion of the world's motor vehicle producers, a crude value of US$5 trillion can be attributed to the manufacture and operation of vehicles — an amount equivalent to about 15 percent of the world's GDP.

As the world's largest producer of motor vehicles (see Fig. 1.2), the Japanese automotive industry has become the most powerful and dynamic force within this most influential of industries. This is not only because of its size — producing 11.22 million vehicles in 1993 and sales of nearly US$300 billion in 1994 (JMIT 1994; *Fortune* 7 August 1995) — and its linkages within the Japanese economy — providing direct or indirect employment to 7.22 million workers or 11 percent of all salaried workers in Japan and accounting for 13.4 percent of the manufacturing industry's overall output (Takayoshi 1994) — but also because its exports, which total more than 5 million vehicles annually, or about 45 percent of its output, play a significant role in international trade, constituting a major portion of Japan's massive trade surpluses[1].

Considering that as late as 1950 Japan's annual motor vehicle production stood at less than 32 thousand units — which represented only about 0.3 percent of the world's output — this constitutes a major

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[1] These totalled US$121 billion in 1994 (Bremmer *et al.* 1995: 40).

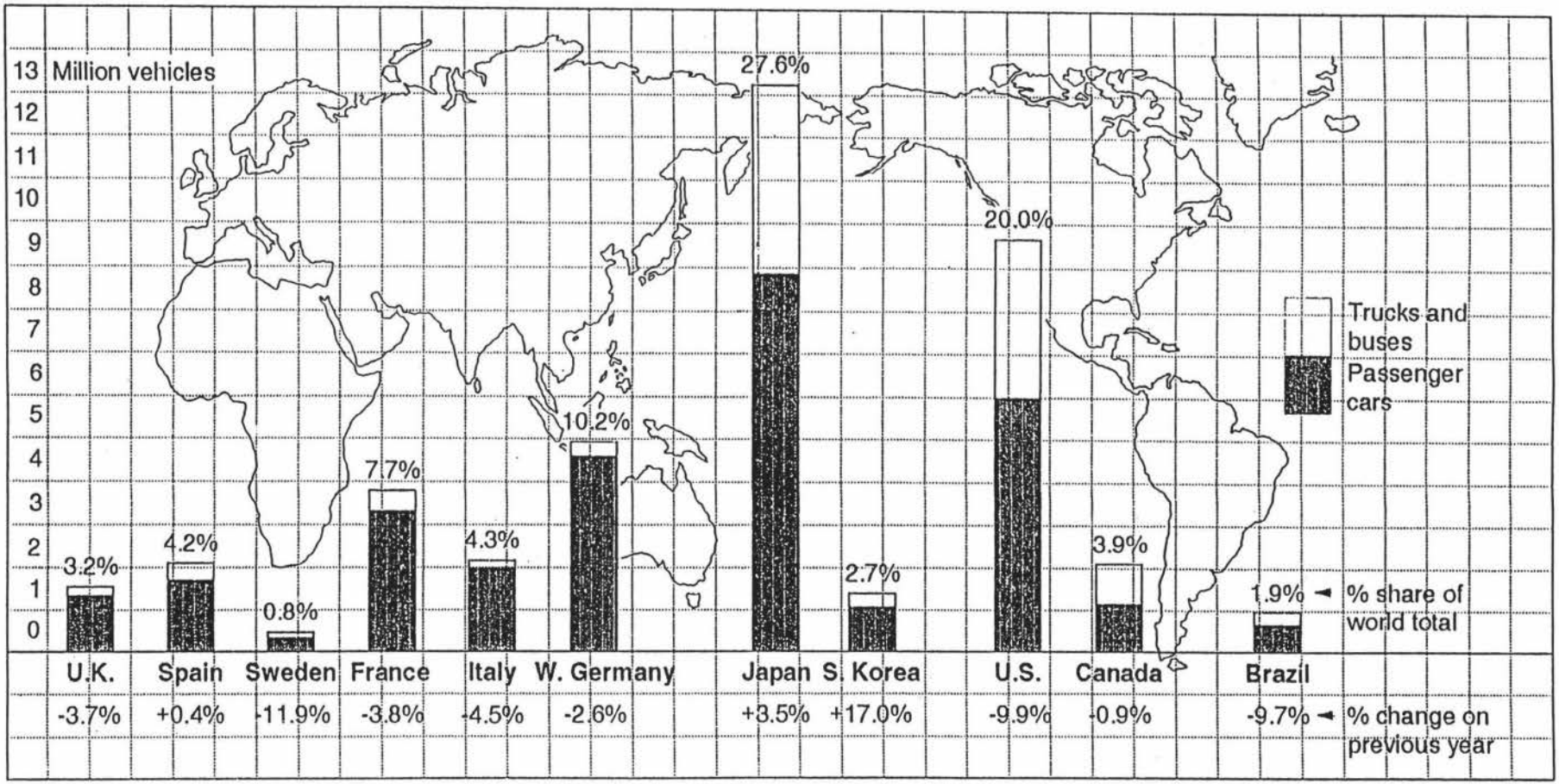

Figure 1.2
World Motor Vehicle Production 1990
Source: K. Done (1991), p. I.

achievement indeed (see Table 1.1 and Fig 1.3). The rise of the Japanese motor vehicle industry to world prominence is, in this sense, one of the most spectacular developments of modern times, and more than any other industry, including consumer electronics, it has come to epitomize the 'economic miracle' that has occurred in Japan since the end of the Second World War.

TABLE 1.1
Japanese Motor Vehicle Production and Exports 1950 -1993

YEAR	TOTAL PRODUCTION	EXPORTS
1950	31,597	—
1955	68,932	1,231
1960	481,551	38,809
1965	1,875,614	194,168
1970	5,289,157	1,086,776
1975	6,941,591	2,667,612
1980	11,042,884	5,966,961
1985	12,271,095	6,730,458
1990	13,486,796	5,831,212
1993	11,227,545	5,017,760

Source: P. Sheard (1983); MVMA (1991); JMIF (1994).

The dynamism and success of the Japanese motor industry have attracted the attention of a considerable number of industry analysts and scholars, and, not surprisingly, that of Western Transnational Corporations (TNCs) and foreign governments. This attention has chiefly centred on

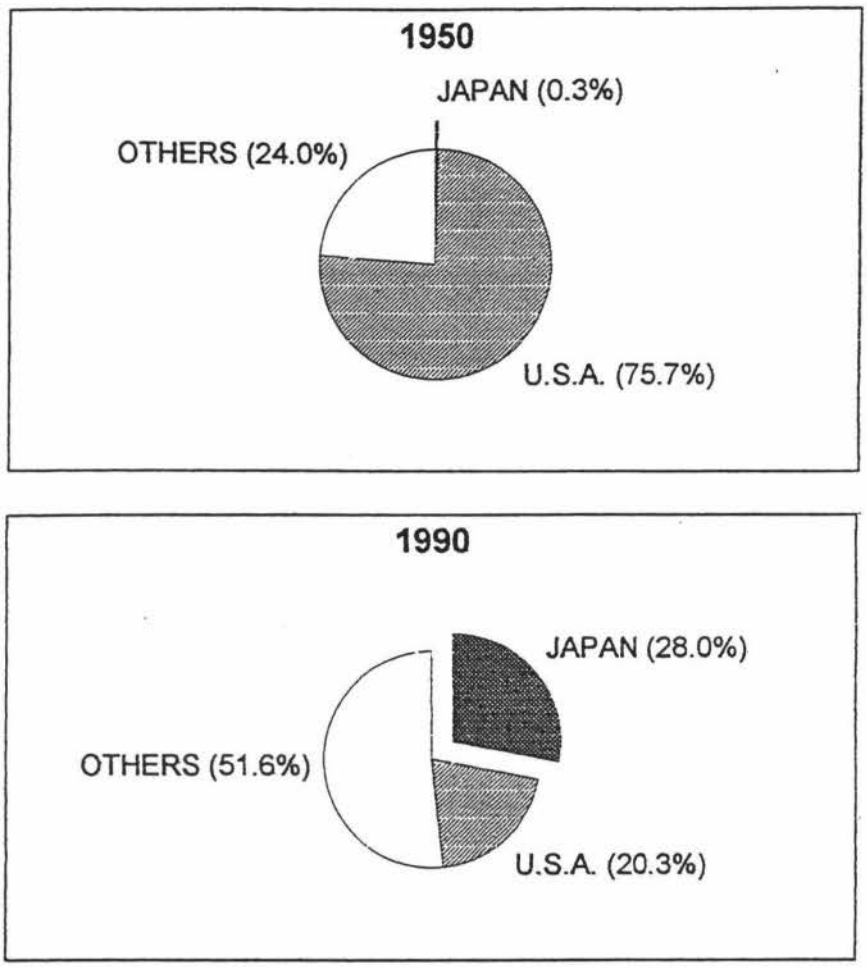

Figure 1.3
Japan's Share of World's Motor Vehicle Production, 1950 & 1990
Source: MVMA (1991).

two main areas. The first of these areas is concerned with the growth and development of the industry which is treated as a sort of 'case study' within the context of the 'economic miracle'. Thus, by focusing on the factors that have influenced the industry's growth, especially the government-business relationship and the extent to which the former was responsible for the latter's progress, analysts have tried to identify and explain the dynamics of Japan's economic success. In this endeavour there have arisen at least two main and opposing interpretations.

There is, on the one hand, a large group of scholars, best exemplified by Eugene Kaplan (1972), Chalmers Johnson (1974, 1982, 1988), William Nester (1990a, 1990b, 1991), and Laura D'Andrea Tyson and John Zysman (1989), who are said to belong to the 'Developmental' or 'Corporatist' school and have tried to explain Japan's impressive economic performance in terms of the corporatist nature of the state where its different component parts have been able to cooperate in the pursuit of commonly agreed policy goals. Thus, according to these scholars, the governing triad of the bureaucracy, the LDP (the main political party), and the *zakai* or big business, have been tied in a formal alliance — solidified by school ties, marriage, the *amakudari* (retiring bureaucrats taking posts in big private corporations), etc. — in the pursuit of common interests in economic growth, wealth and Japanese resurgence. In order to achieve their goals they have followed neo-mercantilist industrial, technology, and trade policies whereby the country's energies and resources have been devoted to the development of economically strategic industries, such as the motor industry, that have in turn brought wealth in the form of trade surpluses which, reinvested domestically, have further contributed to the wealth generating process. Not surprisingly, these scholars have been 'blacklisted', so to speak, in Japan where they are known, together with authors such as Clyde Prestowitz (1988), Karel van Wolferen (1989), James Fallows (1989), Pat Choate (1990a, 1990b, 1990c), and William Holstein (1990) — who have generally been much more critical of Japanese business practices and see them in a kind of 'Conspiracy

Theory' context — as 'the revisionists', or more commonly as 'the Japan-bashers'[1].

There is, on the other hand, a number of Western scholars such as Hugh Patrick (1977), Gary Saxonhouse (1983), David Friedman (1988), Kent Calder (1988), to name a few, who have tried to explain Japan's extraordinary economic performance within the framework of 'Neo-classical Economic Theory', refuting the idea of the existence of a government-business collusion and arguing instead that Japan's success is due to the open nature of its economy and the intense inter-firm competition that prevails within it. Experiences in the motor industry such as the late market entrance of Honda against the government's will, and the failure of the bureaucracy to consolidate the industry into two or three large companies as it had wished to do, are proof, according to these scholars, of the independence of business from government direction and of the relative openness of the system. The government's role is said to have been confined to the implementation of rational economic policies that resulted in an extremely high savings/investment ratio which in turn fuelled economic growth. Thus, while the government has been supportive

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[1] The best known of the so called 'Japan-bashers' are, of course, novelist Michael Crichton and writer Marvin Wolf, authors of *Rising Sun* and *The Japanese Conspiracy* respectively. Both of these books have captured the imagination of millions of Westerners as no other books on the subject have been able to do. Yet, while the former is a fictional account full of stereotypes, the latter deserves careful consideration for, in spite of its bias, it does provide convincing factual evidence on the vast scale of coordination that exists between the Japanese government and business on 'attacking' key world markets.

and indeed has done much to create the environment of growth its role is said to have often been exaggerated.

The second main area that has attracted considerable attention regarding the Japanese motor industry has been that of managerial and manufacturing practices. It is as a result of this attention that the world has learned about concepts such as *kanban*, the Just-in-time system, Total Quality Control, Quality Circles, Japanese subcontracting practices, etc. Just as the American auto industry had through the innovative efforts of Henry Ford and Alfred Sloan (at General Motors) revolutionized the world of manufacturing earlier this century with the first effective implementation of mass production[1], the world has discovered that the Japanese motor companies' manufacturing and management systems constitute a new and revolutionary approach to production that will (as it spreads to other countries and industries), according to the MIT reasearchers James Womack, Daniel Jones, and Daniel Roos (1990), 'have a profound effect on human society — it will truly change the world.'

The number of writers who have advocated the benefits of the Japanese manufacturing practices are legion, the best known and most influential being Yasuhiro Monden (1981, 1983), Richard Schonberger

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[1] Though there had been earlier examples of mass produced items (e.g. guns, rifles, bicycles, etc.) the motor vehicle — in this case Ford's Model T — was the first truly mass produced product that was manufactured using the two basic features that are now commonly associated with this production system: the use of standardized and interchangeable parts, and a moving production or assembly line.

(1982, 1986), Robert Hall (1983), and, of course, Womack *et al.* (1990). Yet, their views have not gone unchallenged, and a growing number of scholars — e.g. Dohse, Jürgens and Malsch (1985), Sayer (1986), Parker and Slaughter (1988), Garrahan and Stewart (1992), Berggren (1993), Elger and Smith (1994) — have argued that the Japanese production methods achieve higher efficiency at an enormous human cost, as they usually involve a greater intensification of work and a new form of subordination of labour to capital.

Yet, if manufacturing trends are anything to go by, the transformation that Womack *et al.* describe is, for better or for worse, already taking place. Japanese production methods are increasingly being adopted overseas, not least because of the globalization efforts of the Japanese companies themselves. Faced with the difficulties derived from increased trade friction, the erection of trade barriers, and the rising value of the Yen, Japanese companies are, in ever larger numbers, establishing operations abroad. In the case of the automotive industry the investments in overseas plants are on such a massive scale that they are contributing to create a new international geography of motor vehicle production.

The objectives of this thesis are threefold. First, to account for the factors that have influenced the Japanese motor industry's growth and development, in particular the role government support and guidance played in its infant and developing phases. Second, to examine in detail

the bases of the industry's manufacturing strengths which, as mentioned above, involve the use of innovative approaches to the production process. And third, to identify the Japanese motor companies' international strategies and examine the economic, social, and political implications these have for the world at large.

CHAPTER TWO

THE RISE OF JAPAN'S MOTOR INDUSTRY 1945 - 1973

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The spectacular growth that the Japanese motor industry experienced for most of the postwar era and up to the 1973 oil crises was the result of a variety of factors which are, in most respects, similar to those that have influenced the growth of Japanese industry in general. Broadly speaking, they fall into one of the following groups or categories: (1) a legacy in terms of experience and expertise in manufacturing that had been acquired before and during World War II; (2) a concerted government effort in the protection and support of the industry during its infant and developing phases; (3) an improvement in labour relations that helped, in turn, create the framework for improvements in quality and productivity; and (4) the favourable domestic and external economic trends that prevailed from the 1950s through the early 1970s, that provided the necessary stimulus for the industry's development and expansion.

THE PRE-1945 LEGACY

Until recently (early 1990s), and for about 40 years years or so, Japan's economic growth had been so impressive that its economic achievements prior to 1945 seem to have been, in most analysts' accounts, all but forgotten. One usually gets the impression from reading such accounts that Japan was then a poor and backward developing nation and that its

economic success is an entirely postwar, and therefore only relatively recent phenomenon. This portrait of Japan is far from accurate. Japan has been a major economic (as well as military) power since at least the beginning of this century, and prior to 1941 had one of the highest rates of economic growth in the world: three times the average for all the other industrialized countries (see Maddison 1989). Its GNP was then the world's sixth largest, and its industry (especially heavy industry such as steel, ship-building, and munitions) was well developed. The country's industrial prowess was shown in its ability to build some of the biggest battleships ever built, Zero fighter planes, and above all, in being able to sustain a war effort for almost four years (1941-1945) against the formidable economic and military might of the United States and the British Empire.

Though much of the country was destroyed during the Second World War, the postwar 'economic miracle' was built on many of the foundations that had been laid down during the war and prewar periods. It should be more than obvious to any observer that the social and cultural ethos, and the skills and expertise of the Japanese labour force, as well as the extensive bureaucratic and business networks that guided Japan's economic recovery, were not created overnight.

The Japanese motor industry's foundations are, similarly, to be found in the prewar era: motor vehicles had been manufactured in Japan since the

early 1900s and mass production facilities had been in operation since the mid-1920s (Odaka *et al.* 1988; Ruiz 1988). Moreover, of the eleven firms that make motor vehicles in Japan today, all except Honda existed prior to World War II. Three of them, Nissan, Toyota and Isuzu, manufactured motor vehicles among other things, while the rest were engaged in the production of cast-iron components, textile machinery, multi-purpose engines, motorcycles, 3-wheel vehicles, ships, tanks, aircraft, and other precision machinery products (Cusumano 1985; Ruiz 1988; Dodwell 1986, 1990). True, the size of the motor vehicle industry was small by Western standards, amounting to the production of only a few thousand vehicles per year — mostly trucks — but the technology and experience acquired during this period in the manufacture of motor vehicles and components proved invaluable in the postwar era (Sheard 1983). Expertise in aircraft technology, for example, proved indispensable in engine development, and know-how acquired through Ford's and General Motors' prewar assembly operations was especially helpful in the early years following the war (Schreffler 1985). By the time Japan had begun to manufacture and export automobiles on a large scale during the late 1960s, the Japanese automobile industry had more than forty years experience of trial and error. 'This may not be common knowledge', says Cusumano (1985: 2), 'but it is common sense: no manufacturing sector requiring such a broad base in precision machinery, specialty steels, thousands of metal, electrical, and other components, is likely to have come so far in merely one or two decades.'

GOVERNMENT PROTECTION AND SUPPORT

Immediately after the war, however, the future of the motor vehicle industry in Japan seemed uncertain. The war had left the industry with ragged, half-wrecked production facilities and almost no market. Except for meeting the limited demand for trucks by the Occupation Army, resumption of operations was extremely difficult as motor vehicle producers suffered from serious deficiencies of just about everything: capital, machines, parts and materials. Moreover, Japan's economic policy-makers were split over whether to support the revival of the motor industry or abandon it altogether. Officials at the Bank of Japan (BOJ) and the Ministry of Transport, for instance, argued that Japan should use its limited resources to develop other industries and leave the motor vehicle field to the Americans and Europeans. This position has been best capsulized in a famous statement made by Mr Naoto Ichimada, the BOJ President, in September 1949:

> 'It is meaningless to develop the motor vehicle industry in Japan. Now is the time of international division of labor. As we can get inexpensive motor vehicles of excellent quality from the United States, why don't we rely upon them?' (in Sobel 1985: 91)

Officials at the Ministry of International Trade and Industry (MITI), on the other hand, were in favour of promoting the industry: they believed that motor vehicle production would help stimulate other sectors of the economy, especially machinery and steel, and would, in addition, help save valuable foreign exchange and enhance Japan's international prestige (BBC 1990b; Genther 1990).

The debate over the industry's future, which lasted roughly from 1949 to 1952, was part of a much broader debate within the Japanese government in general, and the bureaucracy in particular, over the future structure of the Japanese economy. It was the struggle between two ideologies: that of the free-traders who like Ichimada believed in an international division of labour and therefore advocated focusing in areas where Japan had a comparative advantage (e.g. textiles and toys), and those who have been described by some scholars (e.g. Johnson 1982; Nester 1990a, 1991) as 'neo-mercantilists' — best exemplified by the bureaucrats at MITI and the Ministry of Finance (MOF) — who believed that comparative advantage could be created by targeting strategic sectors of the economy. The end result of this struggle, needless to say, was a complete victory by the latter faction, which has dominated policy-making in Japan ever since.

Led by MITI and the MOF, which have been described by Johnson (1982) as Japan's 'economic general staff', the bureaucracy was able to formulate and implement a rational 'industrial policy', that is, 'a government strategy to help important business sectors become more competitive and to adjust to the changing structure of the economy' (Krauss 1992: 49). This usually involved(s) a 'direct or indirect government intervention in the market-place, typically by a range of policy instruments, in order to achieve a different allocation of resources to specifically defined priority industries at any point in time than would occur through the normal operation of the market-place' (Patrick 1988: XIII).

The motor-vehicle industry, designated by MITI as an 'strategic industry' was one of those priority sectors — others included electricity, coal, steel, machinery, shipbuilding, petrochemicals and electronics — that were targeted for promotion through the use of industrial policy tools (Odaka *et al.* 1988; Kosai 1988). On the protective side these included (1) tariffs, (2) a commodity tax system favourable to domestic vehicles, (3) the restriction of imports using the allocation of foreign exchange, and (4) foreign exchange controls on foreign direct investment in Japan. On the developmental (or what the Japanese call the 'nurturing') side, these comprised (1) the supply of low-interest rate loans through government financial institutions, (2) the allocation of subsidies, (3) the provision of special depreciation allowances, (4) the exemption of necessary equipment from import tariffs, and (5) the acquisition and diffusion of essential foreign technology and business practices (Hiromichi 1988).

Protection from foreign competition — and all analysts agree on this point — was the most important form of assistance that the government provided the industry with during this period. This took the form of a comprehensive set of import-barriers, largely devised and implemented during the 1951-54 period, comprising tariffs (30 percent on trucks and 40 percent on passenger cars); commodity (luxury) taxes, ranging from 15 percent on small cars to 30-50 percent on larger vehicles; extreme restrictions on foreign exchange allocations for the importation of foreign vehicles; and a virtual block on foreign investments, effectively preventing

foreign companies like Ford or General Motors, for example, from setting up operations in Japan (Hiromichi 1988; Nester 1991). The significance of these measures can be realized from the fact that in the brief periods when domestic production was minimal and Japan had no major restrictions on vehicle imports, as was the case prior to 1936 and for several years after World War II, foreign manufacturers overwhelmed the local market (Cusumano 1985). This was not surprising since Japanese-made vehicles were uncompetitive in both price and quality with imports. In 1952, for example, a new four-door 8-cylinder American-made Ford sold in Japan for only US$167 more than a little Toyota Toyopet model, and the British-made Austin A40 sold for the same price as Nissan's Datsun (Maxcy 1981: 109). Once import-barriers were adopted, however, imports dropped as a percentage of total sales from 44.6 percent in 1951 to 23.1 percent in 1954 and 8.9 percent in 1955, and continued dropping until reaching a 1 percent token market sliver from 1960 on (Nester 1991). The protectionist policies of the Japanese government therefore 'made it possible for domestic firms to experiment in the automobile industry and to survive despite the existence of far larger and more efficient competitors in the United States and Europe that were anxious to export to Japan' (Cusumano 1985: 7).

In the 1960s, MITI maneuvered to delay as long as possible the liberalization of international trade and capital transactions — unavoidable, given the amount of foreign pressure being put on Japan at the time — and directed its efforts to ensure that whenever a barrier was lifted on the

importation of foreign vehicles, local manufacturers would be sufficiently competitive to maintain their position in the domestic market (Odaka *et al.* 1988). Accordingly, the import of commercial vehicles (1961) and that of passenger cars (1965) were only authorized after the Japanese companies had been deemed to be strong enough to compete in those areas, while foreign capital participation (1971), the most feared form of foreign penetration, was only allowed after years of frantic efforts on the part of the ministry to consolidate the financial strength of the motor companies. In any case, the 'market openings' made during this period were more acts of tokenism than real steps towards true liberalization, for although the most visible trade barriers, such as tariffs, were dropped, a bewildering web of even more powerful non-tariff barriers, affecting the importation, inspection and distribution of foreign vehicles, were bolstered behind the scenes (Nester 1991). Not that the Japanese companies were in need of these any more in order to compete, but MITI always fearful of the effects of liberalization, just to be on the safe side, regarded them as necessary; besides, they did not do any harm to the local industries and, in any case, helped save valuable foreign exchange. The success of these policies in keeping out foreign competition is clear enough for anybody to see, and though it is true that foreign manufacturers, especially the American ones, have made only lukewarm efforts to penetrate into the Japanese market after the so-called 'market openings' of the 1960s took place, the ridiculously low figure of 1 percent or less, in market share these have maintained until recently, have been more the result of the subtle trade

barriers put in place by MITI than a true reflection of the cost and quality advantages, real and perceived, that Japanese vehicles might have over foreign ones.

Government direct financial support in the form of loans, subsidies and fiscal privileges also played an important role in the industry's development. This may not have been as large or pervasive as those that were afforded to basic industries like coal or steel, but was, nonetheless, substantial: during the 1950s, low interest-rate loans and subsidies supplied by the BOJ, the Japan Development Bank (JDB), the Industrial Bank of Japan (IBJ), and other government financial institutions, accounted for nearly 20 percent of the industry's capital needs (Genther 1990); while legislative measures such as the 1951 Special Taxation Measures Law and the 1952 Enterprises Rationalization Promotion Law saved the automotive firms billions of yen by providing them with a reduced tax burden via special depreciation allowances on specified machinery. Moreover, the government granted them special foreign currency allocations for the importation of essential machinery from overseas, while waiving the 15 percent import duty that would have normally been levied on such equipment (Genther 1990).

The government also played a paramount role in the acquisition and diffusion of foreign technology. By MITI's own estimations, Japanese producers were, in the early 1950s, twenty to thirty years behind their

Western counterparts in all major aspects of automobile manufacturing: design, production, technology and performance (Odaka *et al.* 1988). Since most Japanese firms simply could not afford to pay for the kind of research and development that would enable them to catch up with the Americans and Europeans, formal tie-ups with foreign manufacturers were seen as the only way to go in order to introduce new products, modernize manufacturing equipment, and complete the transition from trucks to cars (Cusumano 1985). Accordingly, several technical tie-ups were arranged by MITI between domestic and foreign producers: Nissan formed the first of these joint ventures in 1952 by allying itself with Austin, followed by similar tie-ups in 1953 between Isuzu and Rootes, Hino and Renault, and Shin-Mitsubishi and Willys-Overland. Chang (1981) estimates that, altogether, in the period 1951-1971, 95 licensing agreements were signed between Western and Japanese motor companies, allowing the latter to adopt the latest technology in a variety of industrial processes and the manufacture of automotive components. These agreements were most advantageous to the Japanese firms; for these did not only give them access to Western know-how and experience, but did so at the extremely favourable terms and much reduced costs that MITI was able to extract from the Western companies. Nester (1990b, 1991) observes in this respect that:

> 'MITI had a strong bargaining position over foreign firms since they could neither freely trade nor invest in Japan; technology licensing was their only means of making money in the vast Japanese market. Thus it could easily force foreign firms to make prices and transfer terms in favor of Japanese firms.' (Nester 1990b: 290)

Furthermore,

> 'As in other industries, MITI skilfully played off one foreign firm against the others by promoting the fear that if they did not sell-out now the Japanese would simply buy from another foreign firm' (Nester 1991: 104).

Once a technology became available, MITI then played a key role in ensuring its diffusion, often requiring the initial licensee to in turn license the technology to other companies in the industry (Nester 1990b). In addition (and complementary) to the role it played in the acquisition and diffusion of foreign technology, MITI performed a most valuable service to industry by helping to introduce and disseminate what were then the most advanced and revolutionary Western business methods, an experience that was to have a most profound effect on all aspects of Japanese industrial production. Indeed, it was mainly through the efforts of the Industrial Rationalization Council (a dependency of MITI's Enterprises Bureau) that Japanese managers first got acquainted with Western management theories and business practices. During the Occupation, for instance, the Council's Management Committee would often borrow speakers on industrial management from the Supreme Command for Allied Powers (SCAP) and the US Air Force, and send them around the country to lecture to managers and newspaper reporters (Johnson 1982). Moreover,

> 'Excited by the American concept of "scientific management" the Industrial Rationalization Council churned out publications...leading during the mid-1950's to what was called the 'business administration boom' (*keiei bumu*) and to making bestsellers of

> books such as Peter F. Drucker's The Practice of Management (published in 1954 and translated into Japanese in 1956).' (Johnson 1982: 216)

All these protectionist and promotional measures, extensive and far-reaching as they were, constituted, nonetheless, only one side of the government's assistance policy to the automotive industry: the obvious or most 'visible' side. As significant were the less conspicuous forms of support the government devised to help the industry. Johnson (1982, 1988) and Nester (1990a, 1990b, 1991) have, in this regard, shown at length the many subtle ways which the Japanese government bureaucracy has employed throughout the years to implement industrial policies and assist in the development of economically 'strategic' industries. Of these, the most important were those used in the area of finance, which included the control of interest rates and the use of indirect financing by the BOJ (under the MOF's direction). Nester (1990a) writes in this respect that:

> 'The BOJ tightly regulates interest rates, which have traditionally been determined by government borrowing costs rather than in response to demand and supply conditions for credit in the entire economy. The BOJ supplies loans to strategic industries targeted by MITI via the city banks at interest rates among the world's lowest.... This subsidization of strategic industries was paid for by savers who received low interest rates and non-priority borrowers who paid extremely high interest rates.' (Nester 1990a: 150)

Government financial institutions were, in addition, able to channel funds from the private sector to strategic industries by means of what is known as 'window guidance' (*madoguchi shido*), that is by influencing the lending policies of private banks (Ueno 1980). During the 1950s and

1960s when capital was scarce and the banks were ultimately dependent for capital on their ability to borrow from the BOJ, it was relatively easy for the government to influence the banks' lending criteria (Johnson 1982). Government agencies thus usually needed only to make a 'token' loan to a certain industry or company to indicate that this had their (and ultimately MITI's or the MOF's) 'seal of approval', a subtle 'hint' to the commercial banks to provide the rest of the capital that that particular industrial sector or enterprise required. A bank that would not have complied with the bureaucrats' wishes, or lend at rates higher than those advocated by the BOJ, would have risked losing its borrowing privileges from the latter, or faced bureaucratic 'difficulties' in conducting its business operations in the future (Nester 1990b). It was in these ways that most strategic industries, including the automotive industry, were financed in the years of high-speed growth, and thus, though government loans only comprised a fraction of the capital that these industries needed, it was through government 'manipulation' of the financial system that most of the funds they required were obtained (D'Andrea Tyson and Zysman 1989).

Government support was also implemented in other subtle ways. MITI played an important role in the direction, planning and coordination of the motor companies' policies, and its guidelines and 'suggestions' were, more often than not, faithfully followed by the automotive firms. During the 1950s, this was more or less an straightforward and 'visible' affair 'because most [of MITI's] orders, permissions, and licences were then firmly based

on explicit control laws' (Johnson 1982: 266). Once these were lost as a result of the process of economic liberalization in the early 1960s, however, MITI had to increasingly rely, for enforcing its will, on what is known as 'administrative guidance' (*gyosei shido*), which has been succintly defined by C. Higashi (1983: 23) as 'government influence over private business exerted through regulations, recommendations, encouragement, discouragement, or prohibitions irrespective of statuatory authority'.

MITI had no explicit legal authority to enforce its recommendations, but it had a substantial amount of indirect power at its disposal through a variety of administrative rewards and punishments (Yamamura 1982), and through its *amakudari* ('old boy' network) in the motor industry (Johnson 1974). The effects of MITI's policies and directives, therefore, were widely felt in all areas of production, from the distribution and allocation of raw materials to the type and number of vehicles that were to be produced by each individual company.

True, MITI's relationship with the automotive industry has not always been as smooth as MITI would have liked, and there have been a few instances, for example, when the motor companies were able to successfully 'rebel' against MITI's guidance — such as when MITI tried to force the auto companies to manufacture a 'people's car' in the mid-1950s, or when it tried to rationalize the industry in the mid-1960s by the mergers

of the then 12 auto makers into only three manufacturing groups[1]. These instances, however, cannot be taken as examples, as some scholars do (e.g. Patrick 1976, 1977; Tresize 1976, 1983), of the companies' power and independence *vis-à-vis* MITI for, in the words of Chalmers Johnson (1982: 10), 'they did not, and do not, happen often enough to be a routine'.

Complementary to these policies, the government provided the motor industry with other, less direct, but by no means less significant forms of assistance. After all, developments in the automobile industry cannot be seen in isolation for the aid and incentives given by the government to steel, machine tools, and, especially, the automotive parts industry (just to mention three of the most important among the many related industries), contributed significantly to the growth and progress made by the motor industry during this period.

As mentioned earlier, it was largely as a result of government policy that Japan transformed its postwar economic base from light to heavy industries during the 1950s, and fundamental to that shift in economic emphasis was the development of the steel industry — the so called 'backbone' of heavy industry — which, naturally, received even greater

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[1] In both instances the opposition of the auto firms was prompted by the impracticality of MITI's plans. In the first case because the technical specifications MITI suggested for the so called 'people's car' were almost impossible to achieve (see Chang 1981), and in the second case, because the companies felt that given the rapid pace of growth of the Japanese domestic market there was enough room for all of them to coexist and prosper; and that given their different company unions, life-time employment systems and *keiretsu* affiliations, a merger would have been not only undesirable, but also an unworkable proposition.

government protection and financial support than other 'strategic' industries (Yamawaki 1988). The implications this had for the motor industry are obvious: It would have been extremely difficult for it to develop, let alone grow as quickly as it did, had there been no domestic production of steel, for to import the material from overseas would have been an impractical proposition and would have, in any case, proved counter-productive in the long run.

Similarly, the machine tool industry, which consists of metal cutting and metal forming power tools, was another key area that grew mostly as a result of government 'nurturing'. Described as 'the bedrock of a nation's industrial base' its importance lies in the fact that almost all manufacturing processes use machine tools and in that advances in this area precede new developments in end-user industries such as motor vehicles — the motor industry was, and is, in fact, the main user of machine tools, accounting for nearly half of all machine tools bought in Japan (Sarathy 1989).

The importance of the connection between the automotive parts industry and the motor industry is evident and needs no further explanation. Indeed, given the close ties between these two industries, the support given by the government to the former can be regarded as an extension of that afforded to the latter. Not surprisingly, government policies designed to assist the companies in the parts industry were very

similar to those that had been implemented to help the assembly firms, though because of their smaller size, more limited financial resources and lower levels of technological expertise, their requirements for protection and support were proportionally greater.

The parts industry became the object of government assistance as early as 1952 (Cusumano 1985), though it was not until the enacment of the Machine Industries Law, in June 1956, that a comprehensive set of aid measures was first implemented: the industry was selected as one of 17 machinery industries targeted for promotion (Hiromichi 1988) and the law allowed companies to acquire technology patents, to receive priority in foreign exchange allocation to buy new equipment, and to obtain special fiscal privileges. In addition, there were special rules for the depreciation of new equipment and the promotion of rationalization technology (Genther 1990). As in the case of the motor industry and other 'strategic' industries, the government became also responsible for financial assistance, either by the provision of loans through official financial institutions such as the Japan Development Bank and the Small Business Finance Corporation, or by 'arranging' loans from the private banking system through the use of 'window guidance' (Hiromichi 1988; Nester 1991). As a result of these measures, the industry grew at an impressive pace, accomplishing in the process remarkable improvements in terms of productivity and cost efficiency, which in turn contributed significantly to the achievement of similar results at the assembly firms' operations (Odaka *et al.* 1988; Smitka 1991).

Last, but not least, among the government's contributions to the development of the motor industry, one must mention those policies, mainly at the macro-economic level, which, though not aimed at helping the industry itself (at least, not directly), contributed, nonetheless, to greatly foster its growth and expansion. The most important among these were, of course, those related to infrastructure and taxation, for these held the key to the reduction in production costs and the increase in consumer demand that the motor companies needed in order to grow.

One of the main difficulties that Japanese industry had experienced in the prewar era was the lack of adequate infrastructure. The country's ports, roads, railways, etc., did not meet industry's needs: they were insufficient in number and extent, poorly planned and located, and more often than not, substandard in construction (Maddison 1969). During the war, even these became useless, as allied bombing destroyed most of Japan's existing communications and power-conducting networks. It should come as no surprise, therefore, that after the war, the building up of infrastructure became a priority for the Japanese government for this was essential if the country was to recover quickly. Unlike prewar times, however, industry's requirements became paramount, even to the extent of having precedence over those of the general population. Indeed, the Enterprises Rationalization Promotion Law of 1952 (the brainchild of MITI's Enterprises Bureau) committed the central and local governments to building ports, highways, railroads, electric power grids, gas mains, and

industrial parks at public expense and made them available to approved industries[1] (Johnson 1982: 218). Moreover, the building of these was to be done in a rationalized fashion, so that roads, factories and port facilities, for instance, were completely integrated. Over the next twenty years, MITI and the Ministry of Construction devoted extensive efforts to this task, and although the results were not always ideal, they did manage to provide industry with the facilities it required to operate efficiently, thus contributing significantly to the lowering of production costs. In the case of the motor industry, the construction and upgrading of roads had the added benefit of increasing the potential for automobile transportation and thus, it would not be an exaggeration to say that the rapid diffusion of motor vehicles experienced during this period can, to a considerable extent, be attributed to the improvements made by the government to the road network (Nakamura 1981; Koshi 1983).

The government policies that contributed most effectively to the growth of consumer demand, however, were seen in the area of taxation. The most important milestone in this regard was the 'positive finance' tax policy programme launched by Prime Minister Ishihara and MOF Minister Ikeda in December 1956, which, under the slogan 'a hundred billion tax cut is a hundred billion yen of aid' as the basis for the 1957 budget, opened domestic demand as it had never been opened before (Johnson 1982: 16).

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[1] During the period 1955-1973, for instance, construction of infrastructure expressly designated for the use of industry swallowed up over half of all public works expenditures in Japan (see Ogura and Yoshino 1988).

Thus began the positive stimulation of a domestic market fully half the size of the United States, bringing about what in fact became, during the 1960s, a 'consumer revolution' (*Kasumigaseki*), maintained and fuelled, as it was, by the concession of additional income tax rebates, averaging in most years, and up to FY 1974, between two and five per cent (Nester 1990b: 257). This 'consumer revolution' was further boosted by the elimination of excises on targeted products, which, as Johnson (1982: 236) points out, 'led to the Japanese phenomenon of all households buying the same goods during a particular period — for example, the "three sacred treasures" (television, washing machine, and refrigerator) of the early sixties, and the "three c's" (car, cooler and color TV) of the late sixties.'

IMPROVEMENTS IN LABOUR RELATIONS

Japanese labour relations were not always the envy of the world, and as Chalmers Johnson (1982: 197) observes, 'It is astonishing how easily foreign admirers of the tranquility of Japanese society...forget the strikes, riots, and sabotage that marked the period 1949-61'. Indeed, the early postwar period was marked by constant strife as new industry-wide unions battled with managers over wages and working conditions. In the case of the motor industry, the unions at Nissan, Toyota and Isuzu tried to coordinate their efforts, in one of the few attempts in Japan to form an American-style industrial union. The near-bankruptcy of Toyota in 1949-1950 helped quell the union there, but it was only in 1953, after a 100-day

strike at Nissan, that the industry finally rid itself of militant unions (Cusumano 1985; BBC 1990b). In this sense, the break-throughs made in labour relations during this period were of the utmost importance as these enabled management to curb the power of the labour movement, obtain greater commitment from the workforce and acquire the necessary freedoms to introduce the working and manufacturing practices that, as we shall see in a subsequent chapter, were later to revolutionize the industry.

The improvement in labour relations was brought about by the adoption by the assembly firms of three key employment practices — what the Japanese employers habitually call their 'three sacred treasures' — the 'lifetime employment' system, the seniority wage system, and enterprise unionism (Nester 1990b). Of these, enterprise unionism was perhaps the most important as this involved the transformation of the unions from industry-wide syndicates into company based organizations. This transformation did not come easily, but once management was able to break the control that radical groups had on organized labour during the early 1950s, the enterprise unions, more docile and cooperative by their very nature, became the norm thoughout the industry. Complemented by guarantees of employment until retirement, and advancement and remuneration based primarily on seniority, the new labour environment encouraged Japanese workers to support rather than to confront management, and to tolerate working conditions that would have been otherwise unacceptable (Cusumano 1985).

FAVOURABLE DOMESTIC AND EXTERNAL ECONOMIC TRENDS

The above mentioned factors — the pre-1945 legacy, government support and the improvement in labour relations — were extremely important for the development of the Japanese motor industry, but no amount of experience, government support or labour cooperation could have assured its success if other conditions had not been present. After all, the industry did not grow in a vacuum. Its development was affected by market forces, the availability and cost of raw materials, and the overall state of the domestic and world economies. In this sense the industry was very fortunate to have gone through its infant and developing phases at a time when conditions at home and abroad were extremely favourable.

Prior to 1973, the relatively low prices commanded by energy resources and other key raw materials, acted as stimulants to the Japanese manufacturing industry and made possible the high rates of growth it was able to achieve during this period. In this sense, Alfred Chandler's (1980: 50) statement that 'the German and Japanese miracles were based on improved institutional arrangements and cheap oil', is no exaggeration. In addition to their low prices, there was also the factor — previously unknown in Japan's history — of ready access to dependable sources of supply of these resources. If one remembers that it was precisely to secure access to oil and other key raw materials necessary for industrial expansion that Japan had gone to war in 1941, the importance of this last factor can hardly be overestimated.

The significant expansion of the world economy registered during this period and the immense benefits Japan derived from the new world economic order and its open trading system, provided the framework for the spectacular growth rates the Japanese economy achieved from the mid-1950s through the early 1970s. The corresponding increase in personal disposable income among the Japanese people led to surges in demand for cosumer durables such as motor-vehicles enabling producers to take advantage of economies of scale. In a competitive setting, cost reduction led to falling prices, which in turn, brought another surge of demand and so on. The relative price of automobiles *vis-à-vis* the consumer price index, for example, declined by as much as 8 percent per annum in the period 1960 to 1970 (Odaka *et al.* 1988: 48).

In addition to these favourable macroeconomic factors, the Japanese motor industry greatly benefitted from events of a more fortuitous nature which provided it with what might best be described as 'lucky breaks'. The Japanese call these 'lucky breaks', *kamikazes*[1] or lucky winds (Keller 1993), and the history of the postwar automotive industry is full of such occurrances, though four of those were of such magnitude as to have profoundly influenced its subsequent development. The first of such 'lucky breaks' resulted from the fact that motor-vehicle manufacturing facilities had come out of the war virtually unscathed. Though they were far from being in 'pristine' condition, they had nevertheless escaped the

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[1] This was also the name given to the Japanese suicide pilots during the Second World War.

worst of allied bombing and were able to resume production almost immediately after the conflict had ended, managing to survive the crucial period 1945-1950 (Schreffler 1985).

The second 'lucky break' came as a result of the Korean War. Allied procurements, which were described at the time by Japanese business as 'the benevolent rain after the draught' (in BBC 1990b), led to an unprecedented boom in the industry and set the pace for its future growth and development (Sobel 1985). Not least among the benefits was the fact that it demonstrated the viability and importance of the industry, especially in some government quarters that until then had been sceptical about its usefulness and potential (see BBC 1990b; Genther 1990).

The third and fourth — and probably most publicized — of the 'lucky breaks' was the result of the oil crises of 1973 and 1979. The oil shocks affected the motor industry, at least initially, just as much as other industries, but worldwide demand for fuel-efficient vehicles led to its prompt recovery and success in world markets. Their most important and enduring legacy, however, was perhaps the fact that it served to change consumer perceptions about Japanese vehicles, for while prior to the rise in energy prices these had been perceived mostly as 'cheap' means of transport, after 1973 attention increasingly focused on their efficiency and quality rather than price.

CHAPTER THREE

JAPAN'S MOTOR INDUSTRY COMES OF AGE

JAPAN'S MOTOR INDUSTRY COMES OF AGE

'Scratch the bodies of their cars and you could still see the Budweiser labels.'

So went the standing Detroit joke about Japanese made automobiles during the 1960s (Halberstam 1986: 43). Japanese goods, after all, had a long standing reputation for shoddiness, and cars were no exception. The first export trials to the US by Nissan and Toyota in the late 1950s had proved such a fiasco[1] that the Japanese had been tagged, in the minds of the American producers, with an image of fumbling incompetence and their cars regarded, as the above quotation illustrates, as something of a joke (Sobel 1985; BBC 1990b). When Japanese cars started to make inroads into international markets from the mid-1960s onwards their success was attributed to their low price and fuel economy which made them ideal as a second ('housewife') car in many Western households. Thus, despite the extraordinary economic and technological progress made by Japan during this period and the major export successes being achieved by its steel,

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[1] Toyota was the first Japanese auto company to make an attempt to export automobiles to the US in August 1957. At US$2,300, however, the Toyopet Crown (as the Toyota export model was known) did not come cheap — it cost US$ 600 more than a VW and almost as much as a Chevy. Moreover, it offered neither quality nor performance for although it ran well enough in city traffic, the car fell apart on the open road, where Americans generally cruised at around twice the speeds for which the Japanese car had been designed (see Sobel 1985, BBC 1990b). Nissan, which made its debut in the US in 1958, was a bit more successful in selling its cars but these too experienced the same problems as the Toyopet. It was only as the Japanese companies were able to reduce the prices and improve the quality of their automobiles towards the mid-1960s that they were able to gain a respectable presence in the US market.

shipbuilding, camera, watch-making and consumer electronics industries, the challenge posed by Japanese automakers to Western manufacturers was slow to be recognized, and it took the oil crisis of 1973, and especially, that of 1979 — when demand for fuel-efficient Japanese automobiles skyrocketed around the world — for them to be taken seriously.

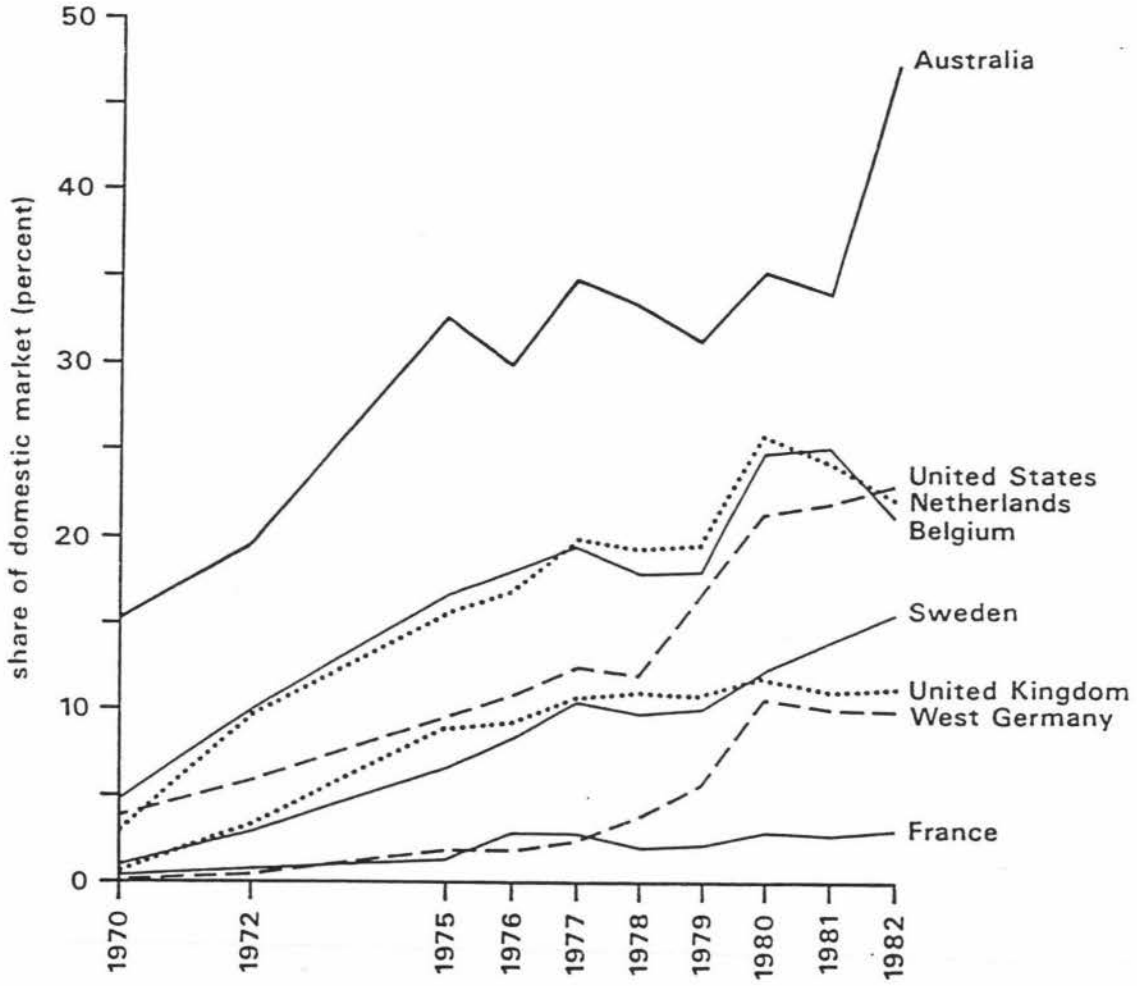

Figure 3.1
Japanese Import Penetration of Selected Industrialized Countries, 1970-1982
Source: P. Dicken (1986), p. 286.

As Japan's trade surplus in motor vehicles and parts with Europe and North America soared from US$2.9 billion in 1973 to US$17.6 billion in

1981 (Altshuler *et al.* 1984: 8), many governments were prompted to protect their domestic industries by putting caps on Japanese market share. Britain, which possessed the least competitive motor industry among the major industrialized countries, was the first[1] to negotiate an agreement with Japan that effectively limited Japanese imports to 11 percent of the British market. France was next in 1977, with a 3 percent cap on market share. Other European countries followed in 1980-81 in the midst of the world economic slump, and even Germany and Sweden, whose own domestic motor industries had remained strong throughout, urged export moderation on the Japanese. This led eventually to the European Economic Community (EEC), in its multinational capacity, reaching an agreement with the Japanese government in mid-1983 whereby Japanese auto exports would be effectively limited to a 9 percent share of the Community's market as a whole (Altshuler *et al.* 1984: 33, 232-233).

The biggest export success for the Japanese automakers, however, was accomplished in the United States. The American market, the largest and most profitable in the world, had long been dominated by the 'Big Three' firms from Detroit — General Motors (GM), Ford, and Chrysler — but had experienced as a result of the energy crises the most dramatic

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[1] Strictly speaking, Italy was the first Western nation to officially restrict Japanese auto imports. This, however, was not in response to the Japanese car export success phenomenon of the 1970s, but dated back to the early 1960s when the Italian government, arguing lack of reciprocal access to the Japanese market, imposed a formal ban on all Japanese car imports. Subsequent negotiations led to a 1969 agreement whereby Italy and Japan agreed to accept up to 1,000 (raised to 2,200 in 1976) of each other's cars per year.

shifts in consumer preferences, from the traditionally large or very large 'petrol-guzzling' automobiles manufactured by the Big Three to the lighter and smaller fuel-efficient models offered by European and Japanese automakers (see Fig 3.2) (see also IEA 1984). The effects of these shifts in consumer demand were devastating for the US companies. In the

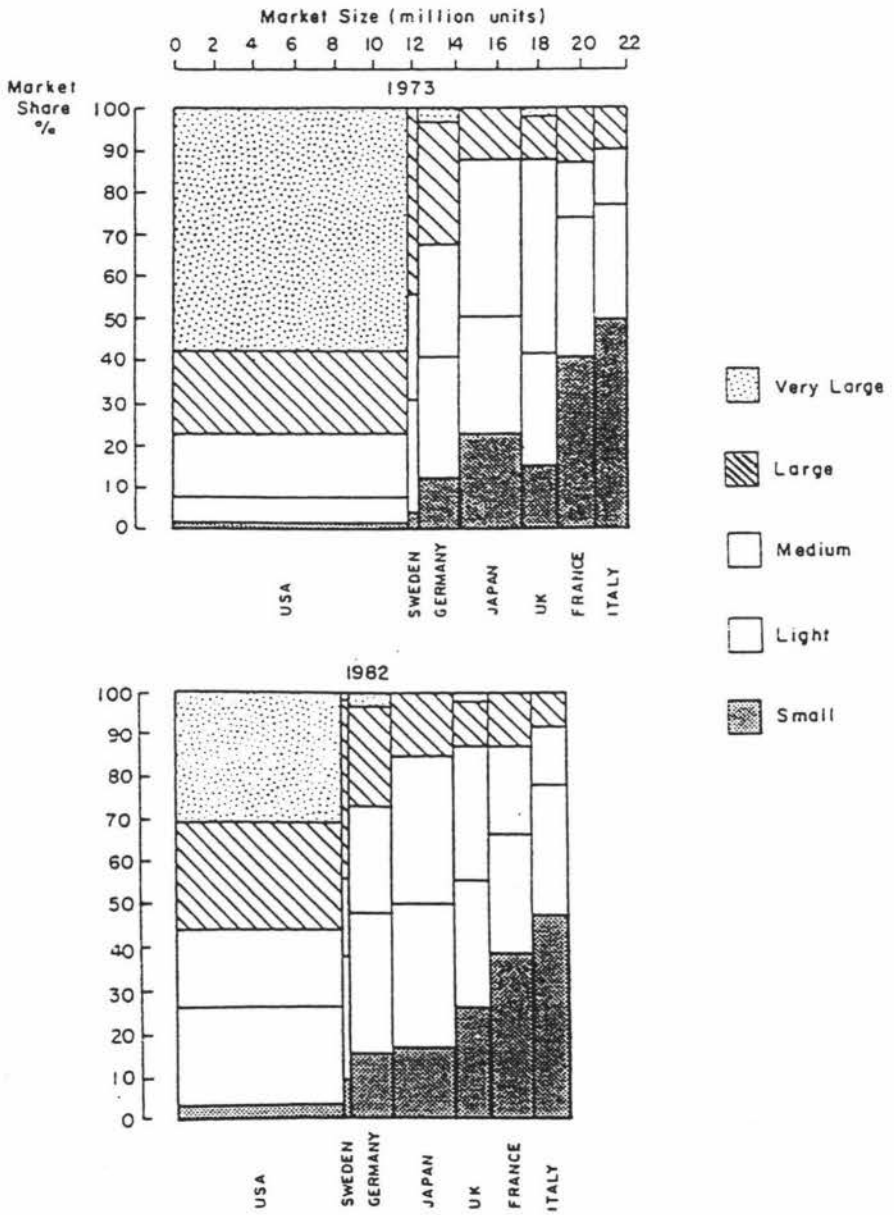

Figure 3.2
Structure of Car Demand in MajorVehicle Producing Countries, 1973 & 1982
Source: A. Altshuler *et al.* (1984), p.132.

smaller and depressed market that had resulted from the dramatic rise in petrol prices, foreign companies were capturing an ever increasing share, with Japanese-made automobiles accounting for almost all the imports' growth (see Fig. 3.3). Thus, by 1980 the US auto industry experienced the

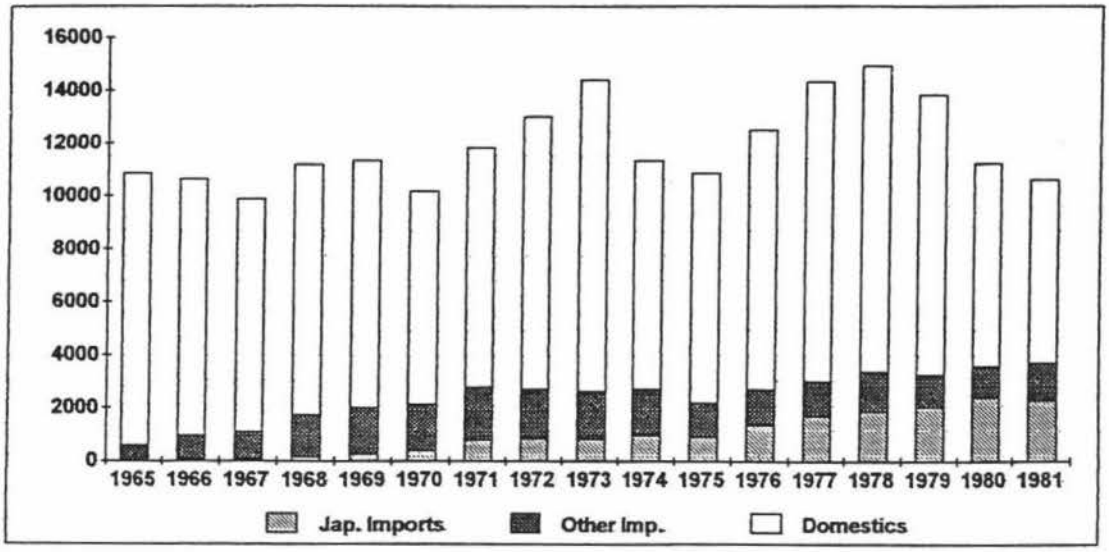

Figure 3.3
US Motor Vehicle Sales (in thousands of units), 1965-1981
Source: MVMA (1991).

worst economic downturn in its history. Some idea of the magnitude of the devastation in the industry can be gleaned from the following figures. The American auto giants lost almost a combined US$4 billion; Chrysler, the least competitive among them and with accumulated losses of over US$2.7 billion for the two year period of 1979-1980, almost went under and had to be bailed out by the US government; 250,000 workers went on indefinite layoff; and an additional 450,000 became unemployed in the industries that supply the Big Three (Ward's Communications 1982: 99; Hill 1984: 142; Denzau 1988: 11). By 1981 demands for protection were so strong on Capitol Hill that the Reagan Administration was forced to

negotiate a Voluntary Restraint Agreement (VRA) — also known as Voluntary Export Restraint (VER) — with the Japanese government whereby the latter accepted responsibility for limiting passenger car exports to the US to 1.68 million units (1.76 m. including vans and station-wagons) (Kenen 1994: 240). America, long the bastion and most ardent advocate of free trade, had been forced to turn protectionist in the face of a Japanese vehicle export onslaught.

The dramatic success of the Japanese automakers in the US market caused a lot of 'soul searching' within the industry as well as government and academic circles. Most of the studies conducted up through the early 1970s had shown the US auto industry as the most productive and competitive in the world. In 1973, for example, the British Central Policy Staff (in Abernathy *et al.* 1983: 59-60) had estimated that the Americans were almost twice as productive (as measured by the number of vehicles per employee per year) as the French and Germans, and at least 40 percent more efficient than the Japanese. The imports' success, therefore, was initially attributed to Japan's cost advantages, which, according to most studies done after 1979, were estimated to be between US$1,200 and US$2,000 per vehicle[1]. Most of this price differential, it was

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[1] Most studies done prior to 1979 put the Japanese cost advantage at a much lower figure. Ford, for example, published a report in 1978 that placed the Japanese cost advantage per car at US$500 and ascribed it to lower wage rates (in Abernathy *et al.* 1983). Reports by various academics (e.g. Toder *et al.* 1978) and industry experts pegged the cost differential at an even lower figure than Ford's. After 1979, however, the figures run much higher, a reflection of both, more accuracy (the result of greater interest and access to specialized information on the part of researchers) and a widening price gap (due to ever higher productivity on the part

(continued...)

alleged (by industry White Papers and government officials), was due to differences in labour costs (Clark 1988). Additionally, it was believed that Japanese factories had the advantage of being more 'modern' and used higher levels of automation, including robots (Falkenberg 1982). Stories in the popular press, for instance, often depicted Japanese factory operations as beffiting images of science fiction books with robots doing most of the work in the assembly lines. So strong was in fact this belief, even at corporate level, that, GM went on to undertake, in the words of its then (1979) chairman, Thomas Murphy, 'the most ambitious product and facility improvement program ever undertaken by any corporation in the world at any time in history' (quoted in Sobel 1985: 279). Eventually, this meant an expenditure of US$90 billion during the period 1981-1991, US$40 billion of which was spent on robotics alone — the payback could not have been more disastrous: GM reported losses of US$4.5 billion in 1991 and a staggering US$23.5 billion in 1992. What is worse is that despite this massive expenditure it still took GM twice as many man-hours than Toyota to produce an automobile (Lorriman and Takashi 1994: 5).

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[1] (...continued)
of the Japanese automakers and lower capacity utilization and, therefore, higher costs on the part of the US companies). Abernathy, Harbour, and Henn (1981), for instance, reported a US$1,600 difference in the price of small US and Japanese made automobiles in 1979. By extrapolating numbers from the 1979 study Abernathy *et al.* (1983) estimated the difference to be about US$1,200-US$1,500 in 1981. J.E. Harbour, in the much publicized 'Harbour report', also found the difference to be about US$1,600 for 1979 (Harbour 1980). Altshuler *et al.* (1984) put the difference at over US$1,500, while the US Federal Trade Commission (1984) estimated the Japanese cost advantage to be between US$1,500 and US$ 2,000 in 1983 (in Fuss and Waverman 1992). Cusumano (1985), in turn, gave an average productivity-cost advantage (excluding shipping costs) of US$1,800 per car for Nissan and US$3,000 for Toyota in 1983.

The key to Japan's 'advantage', however, was not to be found in the differences in labour costs, or as GM painfully discovered, in automation and robots. To be sure, Japanese workers in the automotive industry had substantially lower wages than their American or German counterparts[1], and some of their factories, especially those belonging to Nissan, were indeed very modern, equipped with the latest in state-of-the-art technology, including robots (McElroy 1984) — though these were not used to the extent or the scale that had been reported in the press[2]. But, as the increasing number of studies done on the subject after 1979 were able to show, the success of the Japanese automakers was more the result of the quality of their products and the productivity levels attained at their manufacturing operations than any advantages they may have derived from cheaper labour or high tech automation. Industry reports in 1981

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[1] Though most estimates are in agreement as to the existence of vast differences in wages between the US and Japanese automotive industries, they do differ as to the actual figures. Thus, while Fuss and Waverman (1992), for example, put Japanese labour costs for 1981 at C$9.62/ hour or about 38% of the US level, Abernathy *et al.* (1983) place it at a much higher US$11.28/hour or about 56% of US wages. Altshuler *et al.*'s (1984) and Ward's Communications' (1992) estimates, at US$7.74 and US$7.61 per hour respectively, are closer to Fuss and Waverman's, though they consider these figures to represent about 45% of the US average.

[2] Much of the confusion surrounding the extent of use of robotics in Japan arose from the fact that most of what the press called 'robots' were actually inflexible pick-and-place devices or what the Japanese called 'manual manipulators', that required human operation. According to the Japanese Industrial Robot Association, 61,000 out of the reportedly 75,000 'robots' in use in Japan in 1980, were machines of this kind (see Schonberger 1982: 122-123). True robots, that is fully automatic and programmable mechanical devices capable of changing their motion patterns according to the software being fed to them, constituted only about 14,000, most of them in use in the automotive industry. The comparable figure for the US was 4,000 (see Linge 1991:321). Even then, however, as *Automotive Industries* editor John McElroy (1984) points out, the highly automated and 'robotized' image of Japanese factories that had been portrayed in the press was an exaggeration. If anything, the US automakers' plants actually had newer and more sophisticated technology than the Japanese (see McElroy 1984: 20).

indicated, for example, that while the Big Three had, on average, 670 to 810 defects per 100 vehicles, the Japanese automakers only had 205, or

TABLE 3.1

Quality Scores for Selected US and Japanese Small Automobiles, 1968-1979

	Chevy Nova	Vega Monza	Ford Falcon Mavrick	Ford Pinto	Plymouth Valiant Volare	Toyota Corolla	Toyota Corona	Datsun 510/710	Honda Civic	Honda Accord	Subaru Sedan
1968	1.67	N/A	3.67	N/A	3.67	3.00	4.33	3.00	N/A	N/A	N/A
1969	3.00	N/A	3.67	N/A	3.67	3.00	4.00	4.00	N/A	N/A	N/A
1970	2.67	1.00	3.67	N/A	3.00	4.00	4.00	4.00	N/A	N/A	N/A
1971	3.33	1.50	4.00	3.50	3.00	4.33	5.00	5.00	N/A	N/A	5.00
1972	1.00	1.00	4.00	3.00	3.67	4.00	4.33	4.67	N/A	N/A	4.33
1973	1.00	2.67	3.67	3.33	3.67	4.67	3.67	4.00	3.00	N/A	5.00
1974	1.67	3.00	3.00	3.00	3.00	5.00	4.67	4.33	4.00	N/A	5.00
1975	2.00	2.33	2.67	4.00	1.67	5.00	5.00	4.00	5.00	N/A	4.00
1976	3.00	3.00	3.00	3.00	1.33	5.00	5.00	4.67	4.33	4.00	4.33
1977	2.67	3.00	2.33	3.00	1.00	5.00	5.00	3.33	4.33	5.00	4.33
1978	3.00	1.33	Discont.	3.00	1.00	5.00	5.00	4.00	4.33	5.00	5.00
1979	3.00	1.50	Discont.	2.00	2.00	5.00	5.00	5.00	5.00	5.00	5.00

Note: Scale of 1 to 5; 1 = much worse than average, 5 = much better than average.
Source: A. Falkenberg (1982), p.180. Based on data from *Consumer Reports*.

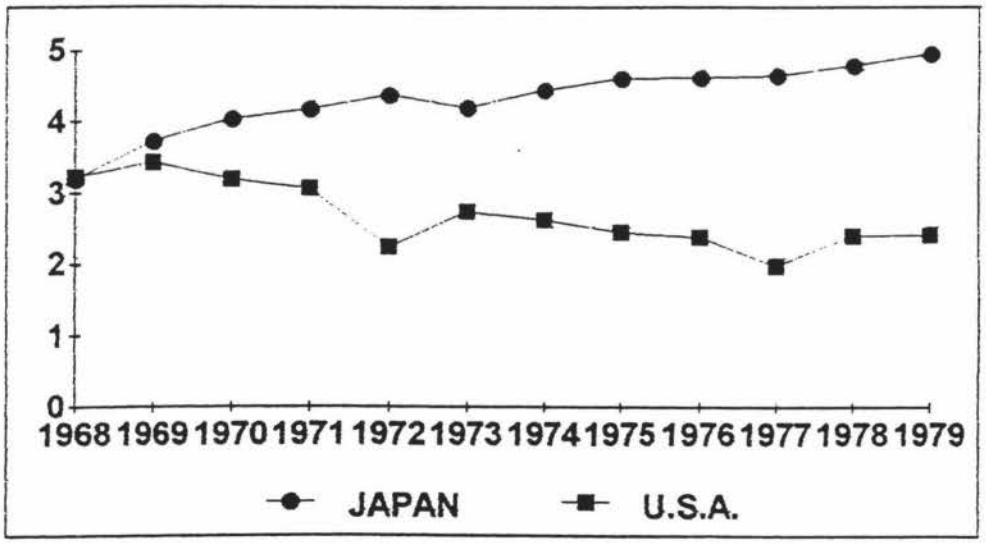

Figure 3.4

Overall Quality Scores for American and Japanese Small Cars, 1968-1979.
Note: Scale of 1 to 5; 1 = much worse than average, 5 = much better than average.
Source: A. Falkenberg (1982).

almost 75 percent less than their American counterparts (Harbour 1990). US consumer ratings of American and Japanese automobiles had, in fact, reflected these differences for years (Table 3.1 and Fig. 3.4).

These figures reveal that Japanese automobiles had been consistently rated by consumers as better, or far better than average, and quality-wise, superior to American automobiles, since at least the late 1960s. Since, as Falkenberg (1982) points out, most research indicates that quality is far more strongly correlated with market share than price is — especially in high priced items such as automobiles — one can safely infer from these data that it was the high quality that Japanese automobiles offered, not their low price, that was most attractive with consumers. Of course, competitive pricing did not hurt, and the combination of high quality and low price — plus fuel efficiency, which became very important after 1973 — proved unbeatable in the marketplace. It must be stressed, however, that Japanese success in international markets in general, and the American market in particular, had preceded the oil crises; Japan was exporting 2 million vehicles per year prior to the 1973 oil shock (40 percent of them to the US); not exactly a trifle, especially if one thinks that this number was actually larger than the entire production of the Italian or British motor industries, at that time the fifth and sixth largest in the world respectively (see MVMA 1991). True, international demand for fuel efficiency in cars became the driving force in the marketplace after the oil shocks, but here again, quality proved to be the decisive factor, for it was

the Japanese automakers that mostly benefitted from this shift in demand, often at the expense of equally fuel-efficient, and in some cases equally inexpensive (e.g. Fiat, Renault), European cars (see Falkenberg 1982; Sobel 1985).

As revealing as the reports on the quality of Japanese automobiles were, they were not nearly as surprising, however, as the findings and conclusions of many a study done on manufacturing productivity (e.g. Harbour 1980, known as 'the Harbour report'; Abernathy *et al.* 1981, 1983; the Automotive Panel of the National Research Council 1982, etc.). These in fact showed most conclusively that Japanese cost advantages were the direct result of the much higher levels of efficiency attained by the Japanese automakers at their factories (see Table 3.2 and Fig. 3.5), but not because of the number of machines or the level of technology they used, but because of the management and production systems they had developed and put in place at their manufacturing facilities.

TABLE 3.2
US-Japanese Differences in Labour Hours per Small Car in Selected Plants (1980)

	United States	Japan
Assembly	28	17
Engine	7	4
Stamping	10	4
Transmission	8	6

Source: Abernathy *et al.* (1984), p. 62.

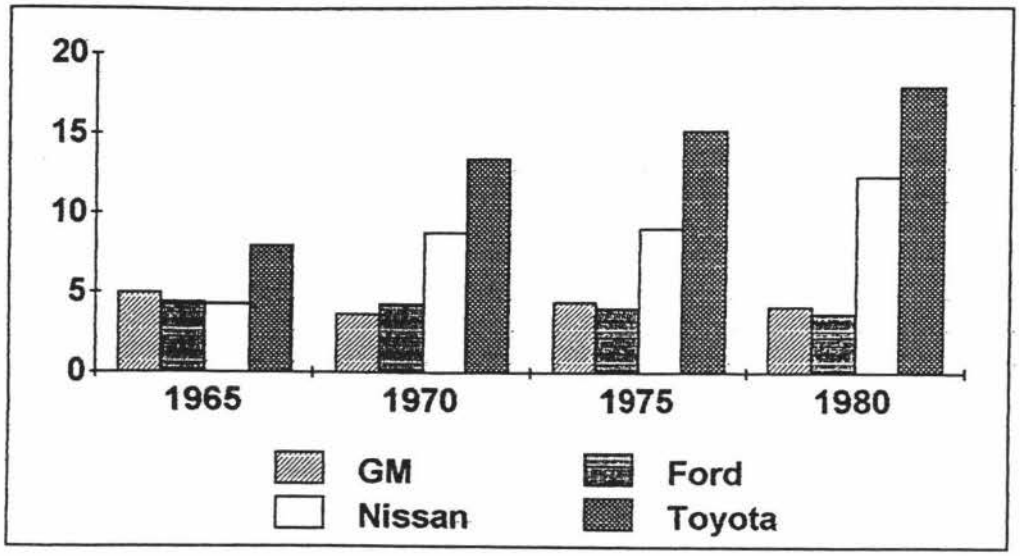

Figure 3.5
Vehicle Productivity (vehicles per worker/year) in Selected Automakers
Note: Adjusted for vertical integration.
Source: M. Cusumano (1985) p. 197.

These were facts that were, of course, hard to accept in a country with the pride and manufacturing reputation of the US. As Abernaty *et al.* wrote in 1983:

> 'That Toyota or Nissan might have an advantage in lower wage rates was understood early on; that they might also have an edge in product quality or productivity was a realization that began to dawn only in 1979. Even then, however, many American observers were inclined to attribute that edge to cultural traits, government policy, domestic savings rates, or levels of capital investment. That it might have something to do with the guts, the nuts-and-bolts of running a manufacturing operation, was a realization that has not fully sunk even yet.' (Abernathy *et al.* 1983: 58)

Yet this productivity gap, as Abernathy *et al.* reported in the same study,

> '...is not the result of clever manipulation of statistics, disparate reporting conventions, or incomplete accounting. (There are not enough Japanese workers hidden away on the rolls of captive

> suppliers or subcontractors to explain the consistently more productive operation of Japanese plants and factories.) The productivity gap is every bit as real, every bit as tangible, as differences in material costs or rates of compensation.' (Abernathy *et al.* 1983: 62)

Moreover, Abernathy *et al.* concluded,

> 'The differences between Japanese and American automakers in productivity, cost, and quality are important less in themselves than as reflections of an achieved excellence in manufacturing. They are not causes, but results; not motive agents, but symptoms. It is the hard-won ability to devise and maintain a world-class manufacturing system that comes first.' (Abernathy *et al.* 1983: 67)

In the light of what has been stated so far, the 'dumb luck' theory, namely that Japan's export success occured only because it just happened to have available what the world needed at the time (i.e. small fuel efficient cars) — a view held by many people, including quite a few executives in the auto industry (Keller 1993) — is too simplistic, and in many ways misleading. While it is true that fuel efficiency did contribute to increase the Japanese cars' appeal with buyers, it was, as noted earlier, the superior quality and better performance that these offered, at the right price, that proved to be their most attractive features with consumers. Because these features were ultimately linked to the fact that Japanese manufacturers like Toyota, Nissan or Honda could produce a much better quality product in more efficient and economic ways than their Western counterparts, their success in international markets was, therefore, assured, regardless of whether an energy crisis had occurred or not. In this sense, the effect of the oil shocks was more that of accelerating the

process rather than creating it. It could in fact be argued, that while the Japanese companies did receive some immediate benefits from the oil shocks — in the form of increased exports — the political and economic effects these had on the international scene, proved detrimental to their growth in the long run. By attracting public attention to their export success, for instance, the Japanese automakers became the objects of political attack in many parts of the world where many governments made them the scapegoats for their countries' economic woes. In this sense, the quotas and other artificial import-limitations imposed by many countries in the midst of this political climate, effectively blocked the Japanese companies' possibilities for future expansion in markets where, had their growth been more gradual — and therefore the chances of a political backlash less likeky — their penetration, long-term, could have been greater.

Similarly, the deep sense of crisis that both the oil shocks and the large increase in Japanese imports brought about, engendered a much more resolute response from the Western automakers than would have otherwise been the case. Indeed, having been on the brink of collapse, the Western companies — particularly the American ones — became very determined in their efforts to upgrade their manufacturing base and improve the quality and fuel-efficiency of their vehicles. Though they continued to lag behind the Japanese in terms of both quality and performance, these efforts paid off in that they did make the Western

companies more competitive and thus, able to contain somehow the Japanese 'advance', averting in this way a repeat of what had occurred in other industries like shipbuilding and consumer electronics which were practically abandoned to the Japanese. The automotive industry was just too important to follow that path.

CHAPTER FOUR

THE JAPANESE MANUFACTURING REVOLUTION

THE JAPANESE MANUFACTURING REVOLUTION

What had occurred in Japanese factories between 1950 and the 1970s was nothing short of a revolution in manufacturing. At the heart of this revolution was a production philosophy that stressed not volume, as does the Fordist 'mass production' system, but quality — quality in product output through the implementation of a process of Total Quality Control (TQC), and quality in manufacturing procedures through the establishment of a Just-in-Time (JIT) production system. The overall aim of these processes was to attain perfection through the elimation of all types of waste and the achievement of zero defects. Though perfection is, of course, a target that can never be actually accomplished, the goal of achieving it produced a dynamic process of ever continuous improvement or *kaizen* that was responsible for pushing the Japanese automotive industry to ever higher quality levels and thus become the standard by which all others had to be measured.

TOTAL QUALITY CONTROL

Ironically, most of the methods and techniques that revolutionized the industry during the 1950s and 1960s were first created or devised in the United States (Hutchins 1985). After the war the Japanese, aware of the low levels of quality of their products, sought the help of American

statistical and management consultants to remedy some of their worst quality problems. Sponsored first by SCAP (Supreme Command for Allied Powers) — during the 1946-52 Occupation — and then by official organizations such as the National Productivity Council and the Japanese Union of Scientists and Engineers (JUSE), experts of the calibre of W. Edwards Deming[1] and Joseph M. Juran introduced to Japan the idea of quality control (QC) (Cole 1980; Shores and Thompson 1986).

At that time quality control meant statistical quality control (SQC). First developed by Dr. Walter A. Shewhart of Bell Laboratories during the 1920s and early 1930s, SQC (also known as statistical process control or SPC) consisted of a statistical system which by means of statistical sampling, control charts and related methods of lot inspection and adjustment of manufacturing processes and equipment, helped reduce defect levels (Abbott and Leaman 1982). With SQC the variation of individual production was analyzed, and the production process was then engineered so that a failure to meet final tolerances was unlikely. Given the observed

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[1] Dr. William Edwards Deming (1900-1993) was first recruited by SCAP in 1946 to teach quality control methods in Japan. A statistician, with a PhD in physics, Deming had worked in the US Department of Agriculture, the US Census Bureau, and the US Army as an expert in statistical sampling. As such, he was familiar with the work of W.A. Shewhart and other leading American experts of that era. Moreover, he had studied in England under Sir Ronald Fisher, the leading statistical theorist of his day. Deming is much revered in Japan where his contribution is regarded as having played a pivotal role in the major improvements made in quality by Japanese industry during this period. 'I was the only man in Japan in 1950,' Deming later told an interviewer, 'to believe my prediction that within five years manufacturers around the world would be screaming for protection; it took four'(in BBC 1990a). Fittingly enough, the JUSE, named its most prestigious prize, for excellence and quality in industry, the Deming Prize in 1951. Curiously though, Deming remained largely unknown in the US outside government circles, and only received public recognition after his appearance in an NBC TV documentary in 1980.

variation of a process, for example, it would be controlled in such a fashion so that good parts would be produced with a 99.99 percent probability. Machines still had to be checked and adjusted at regular intervals, but inspection *per se* was rendered redundant (Monden 1983: 139-140).

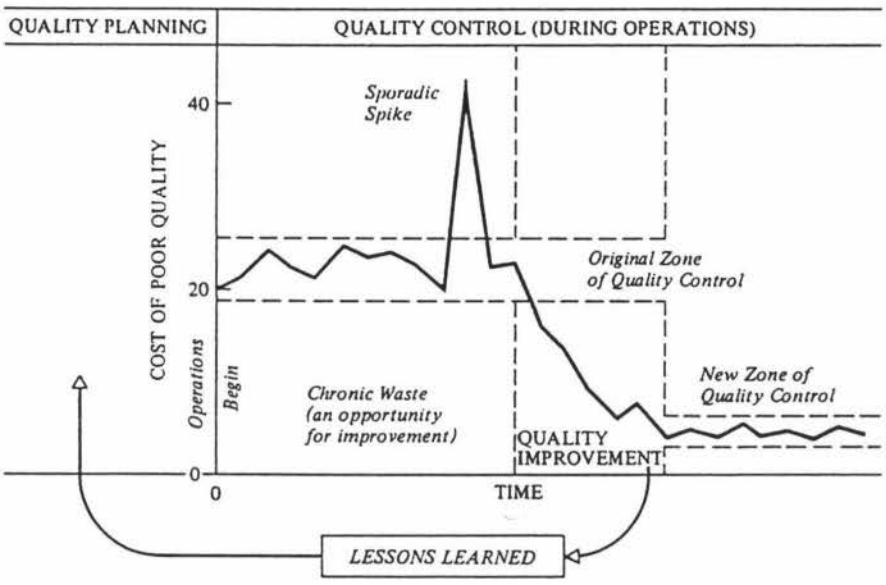

Figure 4.1
Improvement Effects of Quality Control on The Manufacturing Process
Source: J.M. Juran (1989), p. 29.

SQC had been successfully applied by the US Army in the production of weapons and ammunition during World War II (Ishikawa 1985) and Japanese motor-vehicle manufacturers such as Nissan, Toyota and Isuzu got first-hand experience in it during the Korean War when as a result of Allied procurement orders for military vehicles US Army personnel, expert in SQC, were dispatched by SCAP to assist the various Japanese motor vehicle factories in meeting the US Army's strict quality standards (Cusumano 1985: 321; Smitka 1991: 60).

What Deming and Juran did, however, was more than simply transmit the statistical value of QC techniques. What they were really doing was telling the Japanese that quality had to be central to the purpose of a company (Halberstam 1986; Dobyns 1994). Quality, in their view, could not be some minor function that could be accomplished by having some of the workers at the lowest levels attend a lecture or two or by appointing a certain number of inspectors to keep an eye on things — as American companies usually did. 'True quality demanded a totality of commitment that began at the very top; if top management was committed to the idea of quality and if executive promotions were tied to quality, then the priority would seep down into the middle and lower levels of management, and thus inevitably to the workers' (Halberstam 1986: 313).

These ideas were given a practical framework by another American management theorist, Armand V. Feigenbaum, who in 1951 first emphasized the concept of quality as a movement involving company-wide participation, which he called (from 1956 on) Total Quality Control (TQC), as opposed to SQC which could only be applied by specialists. As defined by Feigenbaum,

> Total Quality Control is an effective system for integrating the quality-development, quality-maintenance, and quality-improvement efforts of the various groups in an organization so as to enable production and service at the most economical levels which allow for full customer satisfaction (Feigenbaum 1961: 12)

In Feigenbaum's view, therefore,

> Quality control refers to the broad administrative area of developing, maintaining and improving product quality. It does not mean simply any single technical method (i.e. SQC} for accomplishing these purposes. Such a definition would be too restrictive. (Feigenbaum 1961: 21)

Feigenbaum (1956, 1961) also argued that QC programmes should focus on defect prevention rather than inspection and that managers should make quality the responsibility of the worker. He also encouraged American firms to set up TQC systems that involved all departments in the company (market research, design, product development, etc.) and aimed at satisfying not the quality standards arbitrarily set up by some manager or office within the organization, but the consumers' definition of quality.

As was the case with Deming and Juran, Feigenbaum found his most receptive audience not in America but in Japan. There the annual or biennial visits of these and other experts, the translation and publication of their books and articles and the tours undertaken by Japanese study groups to the US helped diffuse QC methods throughout the automotive sector and other industries (Hutchins 1985). The Japanese, however, found American QC methods still difficult to implement. In Kaoru Ishikawa's view (1985) Feigenbaum, for instance, still relied too much on specialized statistical techniques which were not easy to teach beyond the engineering ranks. Feigenbaum also spoke of worker participation in the QC process but did not suggest 'realistic' ways of how to involve all employees in this task. Ishikawa — regarded in Japan as the most influential authority on TQC — and other Japanese experts (e.g. Genichi

Taguchi) adapted and modified the TQC system to suit the Japanese companies' needs. Their emphasis was placed on the simplification of QC methods so that it could be accessible to all the ranks in the company. This in turn made it possible to shift inspection functions and QC responsibilities from staff departments to the shop floor, allowing for true worker participation. Also, because of the severe quality problems that afflicted the Japanese motor industry during this period (1950s), there was a need for manufacturers to find and correct quality problems at their source. Japanese managers often found, for example, that better manufacturing quality did not solve problems when these stemmed from faulty designs or materials (Cusumano 1985: 326). Ishikawa suggested, therefore, to extend QC programmes from the manufacturing stage to the whole industrial process, that is, from the early phases of market research and product development right through production and final sales. For this purpose, he advocated, as Feigenbaum had suggested earlier, the involvement of all company units, including top management and all divisions, in the planning and coordination of QC activities (Hsu 1994).

In time, a distinctive Japanese approach to QC emerged, so much so that by 1968 Ishikawa felt the need to coin a new term: Company-Wide Quality Control (CWQC) to describe TQC as was uniquely practised in Japan (Ishikawa 1985; Hutchins 1985). Indeed, while most Western corporations had not even began to adopt Feigenbaum's TQC principles and continued to rely on rather large and specialized staff departments for QC

activities, Japanese companies had, by this stage, gone even beyond what Feigenbaum had advocated and had made QC a true 'production line' function (Hutchins 1985). To be sure, the Japanese firms still possessed QC departments but these were, proportionally, much smaller than those found in the West and the staff's funtions would have been more concerned with the coordination, training and monitoring of QC activities within the factory than with inspection itself (Cusumano 1985). The study done by Harbour (1980), for instance, shows in this respect that the average American auto assembly plant's QC staff was, in 1980, 2.5 times as large as that from a Japanese factory with identical capacity. Moreover, while the emphasis of QC in the West continued to be based on inspection and the application of post-production corrective measures to achieve quality, the emphasis in Japan was placed on the implementation of preventative measures, the so called 'quality at the source' approach, so that quality became ingrained, so to speak, into the manufacturing process.

Perhaps the most important difference, however, was in what was understood and aimed at by the two manufacturing cultures in reference to quality. While in the West quality was most commonly understood in the narrow context of the product and its conformity to design specifications, the Japanese understood quality in the broadest possible sense; Ishikawa (1985) explains in this respect that,

> 'Narrowly interpreted, quality means quality of product. Broadly interpreted, quality means quality of work, quality of service, quality of information, quality of process, quality of division, quality of

> people, including workers, engineers, managers, and executives, quality of system, quality of company, quality of objectives, etc. To control quality in its every manifestation is our basic approach.' (Ishikawa 1985: 45)

Ishikawa was also instrumental in popularizing another key QC concept: the QC circles. These had originated as an idea from W.E. Deming after World War II (Lorriman and Takashi 1994: 85), but it was mainly thanks to the efforts of Ishikawa that these were first implemented in Japan in the early 1960s (Ishikawa 1985; Shores and Thompson 1986). A QC circle consists of a small group of workers in the same workshop, organized to perform quality control activities, including the improvement of the workplace. It is based on one work unit, such as a section, and is made up of a leader and several (an average of seven) workers. Members of the group make suggestions for improvement and they often have the discretion to implement the suggestion themselves. It also serves to promote communication between workers and management (Hsu 1994: 292). Participation in such groups takes place in the employees' own time and as such is regarded as a 'voluntary' activity, though it is the general understanding that everyone is expected to participate (Lorriman and Takashi 1994: 85).

The value derived from these groups has been the subject of much debate. As one of the most conspicuous differences between Japanese and Western companies they were one of the first features to attract the attention of Western analysts and observers during the 1970s and were

even acclaimed, in some quarters as the 'wonder solution' for Western industry[1]. Juran himself was among the first to express enthusiasm for them after a 1966 visit to Japan:

> 'The QC Circle movement, standing by itself, must be characterized as a brilliant achievement — a *tour de force* in management leadership. Nowhere else have I seen industrial companies succeed in so constructively harnessing the interest, the time, and the ingenuity of the work force to the myriads of intradepartamental problems — not only problems of control, but problems of breakthrough as well.' (Juran 1967: 17)

It is undeniable that QC circles did and do play a fundamental role in reinforcing the training Japanese employees receive in QC methods, as well as boosting their morale and cooperation (Robson 1982; Hutchins 1985; Onglatco 1988). Yet, it has been suggested (*e.g.* Cole 1979) that these have a 'negligible influence' on improving operations and productivity and Ishikawa himself, admitted (in Cusumano 1985: 334) that they did little to improve quality without the support of a comprehensive 'quality assurance' programme throughout a firm and its supply network.

The major source of disagreement seems to stem from the fact that

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[1] Though Juran is usually credited with being the first 'big name' to have endorsed QC Circles and arouse Western interest in them, Wayne Rieker in America, and David Hutchins in Europe, were the individuals most responsible for the widespread application of QC Circles in the West. Rieker, as a member of the Lockheed company team that established the first QC Circle in the US in 1974, and later, as president of the American Society for Quality Control, championed the idea of QC Circles as the solution for the American companies' quality problems. Hutchins, as a consultant for a large number of UK and Continental firms, did the same in Europe. Hutchins, in fact, described QC Circles as 'the most exciting and profound approach to management to have become established in the world since the advent of 'scientific management' at the turn of the last century'(see Hutchins 1985).

improvement suggestions made by QC circles cannot be measured quantitatively, and therefore it is difficult to gauge their value. Consider this, however; Nissan, for example, claimed that QC circle activities saved the company US$160 million between 1978 and 1984 (in Cusumano 1985: 334). Even more impressive is the data for Toyota; in 1986, for instance, Toyota reported having received 2.6 million suggestions — an average of 43 per employee — and 96% of these were adopted (in Hutchins 1988: 10). That is almost 2.5 million new practices put into effect during one year(!). Even if most of the suggestions were small, one-step tasks, that is still a lot of improvement.

THE JUST-IN-TIME PRODUCTION SYSTEM

More than any other QC procedure or technique, it was the Just-in Time (JIT) Production System that was responsible for boosting the quality of Japanese motor-vehicles to the standards of excellence for which they became known. It achieved this by *building quality into the process* rather than simply controlling or assigning 'quality targets' for production runs. Moreover, as has been shown by Schonberger (1982, 1986), Hall (1983), and the more recent MIT's International Motor Vehicle Program (IMVP) report published by Womack *et al.* (1990), it was JIT that produced through the rationalization of production practices and processes the most remarkable improvements in productivity achieved in industrial activity since the advent of the Industrial Revolution.

Also known as the *Kanban* or Toyota Production System (TPS) JIT is described by Monden (1981) as 'a production system to produce the kinds of units needed, at the time needed and in the quantities needed'. This stands in stark contrast to the traditional Western mass production approach that seeks to manufacture massive amounts (based on forecasts) and stockpiles parts and supplies 'just in case' they are needed.

JIT was devised by Taiichi Ohno, a Toyota engineer who with the approval and encouragement of top Toyota management and the help of Shigeo Shingo[1] and other Toyota engineers perfected the system through a process of endless experimentation and gradual improvement from the late 1940s through the early 1970s (Cusumano 1985; Ohno 1982, 1988; BBC 1990b; Womack *et al.* 1990). On the surface JIT functions as a production and inventory control system. That, indeed, was its genesis. When Toyota faced possible bankruptcy in 1949-1950, one of its problems was excessive inventory. This not only tied up much of the struggling company's badly needed capital but in overcrowded Japan it occupied much valuable space. Contemporary descriptions of Japanese factories, for example, all noted that piles of in-process parts made it difficult to even manoeuvre across the floor (Itami *et al.* in Smitka 1991: 143). To solve this

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[1] Shigeo Shingo, a Japanese industrial engineer and management consultant, was, after Ohno, the person most responsible for the development of JIT. Shingo worked as a consultant for Toyota from 1955 onwards, and made important contributions to the system in many technical areas, especially in the areas of set-up time reductions and the introduction of *poka-yoke* (fail-proof) devices. More importantly, Shingo worked as a consultant to many Japanese companies (including Honda, Mitsubishi, and Daihatsu), and thus greatly contributed to the dissemination of JIT methods and techniques throughout Japanese industry.

problem Ohno looked for inspiration to the US supermarkets inventory control system. As he himself describes it,

> '...by the late 1940s, at Toyota's machine shop that I managed, we were already studying the US supermarket and applying its methods to our work. A supermarket is where a customer can get (1) what is needed, (2) at the time needed, (3) in the amount needed.' (Ohno 1988: 25)

Moreover, in a supermarket the shelves were restocked only when they needed to be, as goods were sold to customers. The stock on the shelves was not controlled by the producer of goods, but by the shelf stocker and the end user. Goods, were not simply piled on the floor because there was no more room on the shelves(!). The system of ordering was dictated by the demand for products at the store level, rather than decisions made by the supplier of the merchandise. A supermarket that ordered more goods than it could turn over during the week not only had a storage and control problem, but it also risked piling up inventory it would never be able to sell. In effect, final demand pulled goods through the system rather than the manufacturer pushing them through (Fig. 4.2).

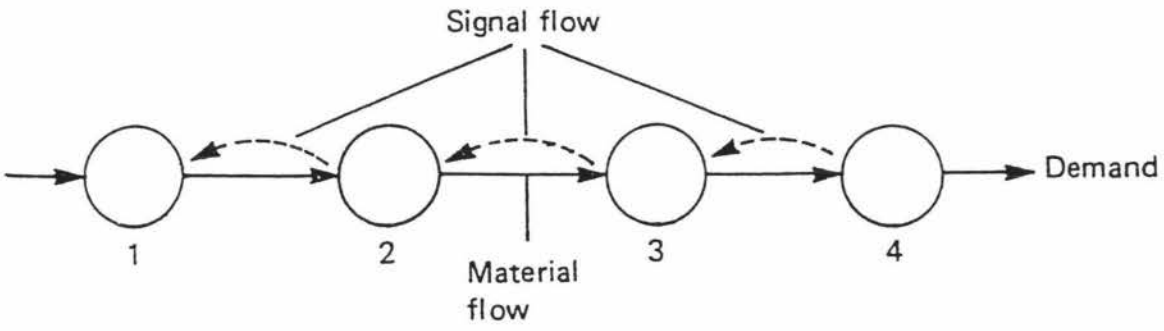

Figure 4.2
Example of the Operation of a Pull System
Source: P.J. O'Grady (1988), p. 93.

Following this model Ohno therefore sought to balance production lines so that parts were turned out from one machine or operation only as fast as they were used in the next. Moreover, nothing was pushed forward, because the workers moved back to previous stations to take only what they needed. This was a major departure from that most fundamental of manufacturing techniques of the American automobile industry: the decision not to 'push' materials and components, but, as in the case of the supermarket, to have final assembly lines 'pull' them through the system (Cusumano 1985: 265).

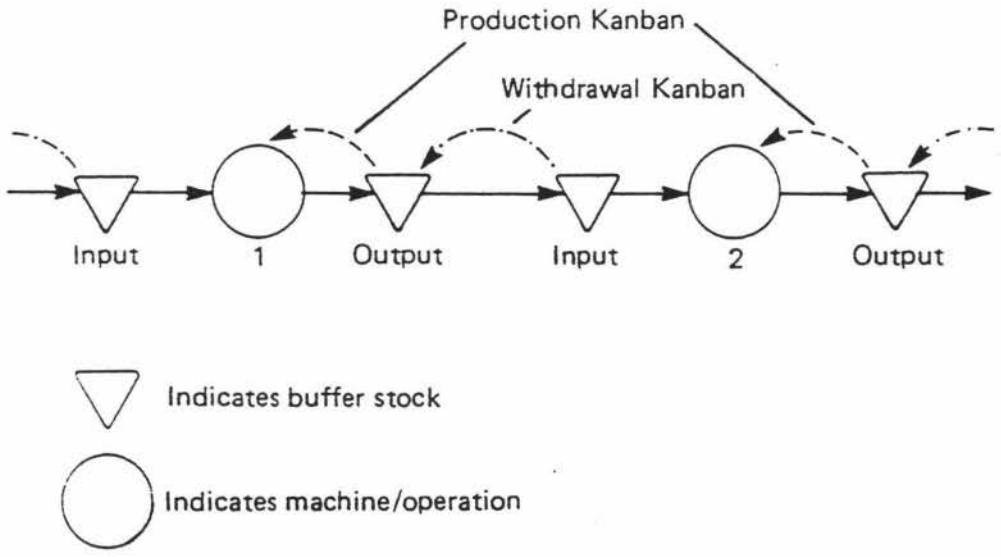

Figure 4.3
Toyota's Dual *Kanban* System
Source: P.J. O'Grady (1988), p. 96.

To make this process even more efficient Ohno introduced small production-ordering cards, called *kanbans*. Singh *et al.* (1990: 29) explain how these devices work:

> There are different types of Kanban cards. The most common are the 'production kanban' and the 'withdrawal kanban'. The production Kanban accompanies the containers as they are being produced. When the production of a container is completed and demand for the next stage occurs (the demand is indicated by another card, the withdrawal Kanban from that stage), the production Kanban is removed from the container and is returned to the production-ordering Kanban post at the same stage. The withdrawal Kanban from the next stage actually replaces the production Kanban on the container, and accompanies the container. In other words, the Kanban pulls the containers through the production system just-in-time to meet the demand at each production stage, thus minimising in-process inventory.

Complementary to these changes made to the production flow process was the reorganization of the factory layout which to an outside observer would in effect have constituted the most visible feature of JIT (Graham 1988). Under the system devised by Ohno, machines were placed in close physical proximity to each other so as to save space and prevent the accumulation of inventory between work stations. Moreover, the machines were positioned in a 'line' or 'U-shaped cell' in the order they were needed to complete consecutive stages of the manufacturing process. By deploying the machinery in this way the pace of work was effectively coupled with all other processes, generating a more continuous rate of demand and a more consistent flow of output along the production line. This not only had the effect of speeding up production quite considerably, but it also allowed the flow of production to be controlled and monitored more precisely[1] (Shingo 1981; Ohno 1988).

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[1] The benefits of these changes were especially significant in areas outside the traditional assembly line. Though automotive factories are usually associated with this type of layout, assembly lines normally constitute only a fraction of the manufacturing facilities in use. Most

(continued...)

The success Toyota had in reducing inventories and smoothing production in these ways can be best visualized from a description made by Hutchins (1988) of one of its factories:

> 'In the factory, with the exception of the vehicles actually being worked on the track, there was a total absence of inventory. In the normal way one would expect to find huge stillages of door panels, bumpers, seats, tyres, winscreens, engines, gearboxes, transmission systems, and so on. In the Toyota factory, apart of some low value items, there was none. In their place lorries — or transporters — continually back up to the track and the parts are off-loaded piece by piece into the vehicles being assembled. As one transporter is emptied, another takes its place, the former returning to the supplier for further loads.' (Hutchins 1988: 10)

Though no specific data is available regarding how much Toyota did actually save from reducing inventories, the figure must have been quite considerable. It has been estimated, for example, that in a typical manufacturing plant, materials and parts are worked on for only 5 percent of the time they spend in the factory — up to 95 percent of 'in-process-time' is spent moving the product between opera-tions and queueing — and that 30 percent of production costs in many plants go on warehousing, inventory carrying, and monitoring[1] (Ballance and Sinclair 1983: 148).

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[1] (...continued)
of the work input is in effect made in off-line areas where work is batched or labour-paced (e.g. the assembling of axles and engines, preparing trim). By redesigning these areas to resemble the flow and pace of assembly lines, efficiency was, therefore, greatly increased under JIT, as this took advantage of the benefits usually associated with this type of production layout — namely the high proportions of available time utilized during which value is being added to materials and resources.

[1] Western production control systems are based on the two interrelated principles of economic order quantities (EOQ) and 'buffer stocks'. EOQ may be defined as the quantity of production per time unit that achieves the best trade off or balance between set-up costs and the costs of holding stocks (thus as set-up costs increase batch size increases, and as handling,
(continued...)

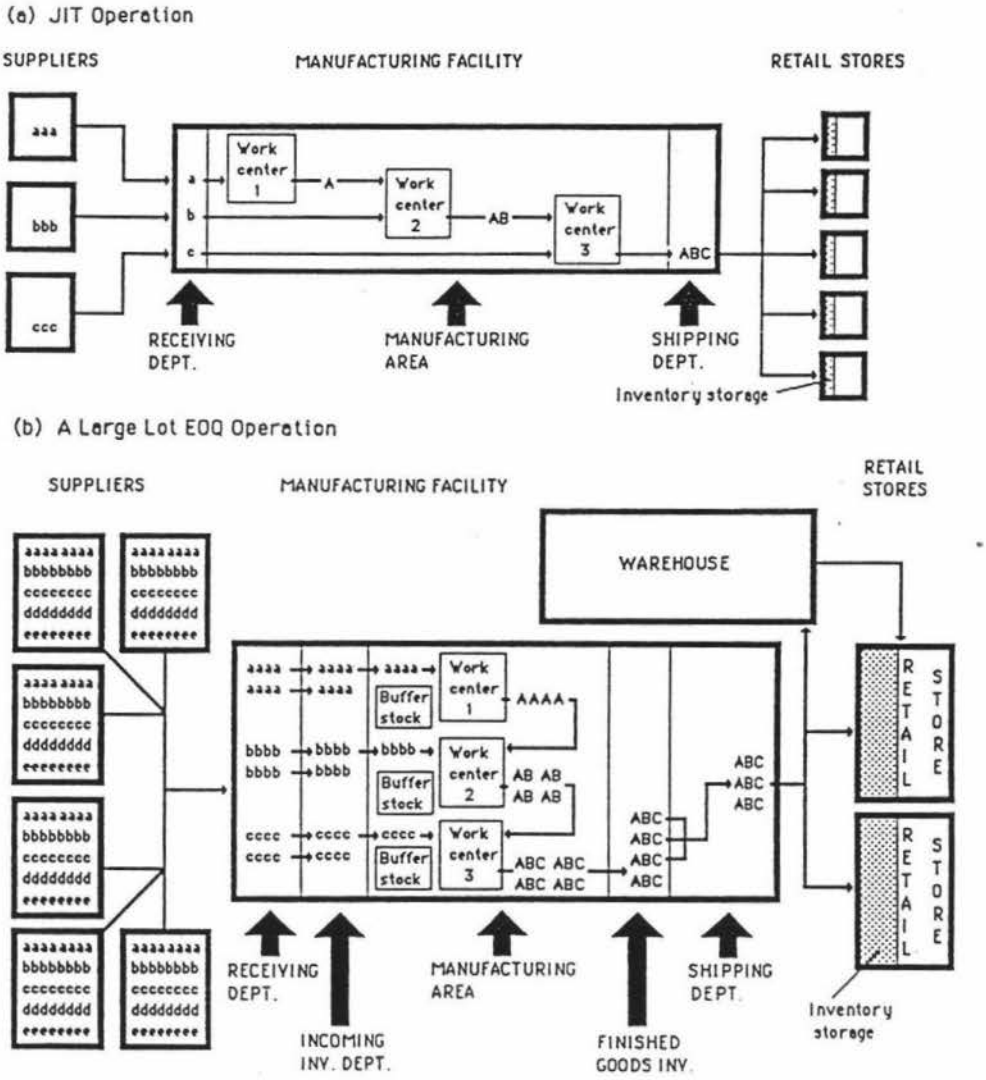

Figure 4.4
Comparison of JIT and Large-Lot EOQ (Mass Production) Operations
Source: M.J. Schniederjans (1993), p. 30.

Moreover, space savings, extremely important in a country like Japan, were also significant. A Ford Motor Co. study has shown that Japanese automotive companies need only one-third the floor space to achieve specified production rates of American equivalents (in Wantuck 1981).

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[1] (...continued)
storage and carrying costs increase batch sizes are reduced). This principle is combined with the practice of staging buffer stocks between successive work stations to keep production going in the event of downtime at any individual work station, in which case each work station simply works into its buffer stocks until the production flow is restarted (see Fig. 4.6).

In addition to saving space and capital Ohno also found that one of the greatest benefits of reducing inventories[1] was the fact that it exposed problems which otherwise may remain hidden. Linge (1991: 317) tells of an analogy used in Japan to explain this phenomenon. This compares inventory to the water in a pond; when the inventory level is high it covers up the problems of a company which are like 'rocks' at the bottom of the pond (Fig. 4.5). As the company lowers its inventory it exposes these 'rocks' and can remove them.

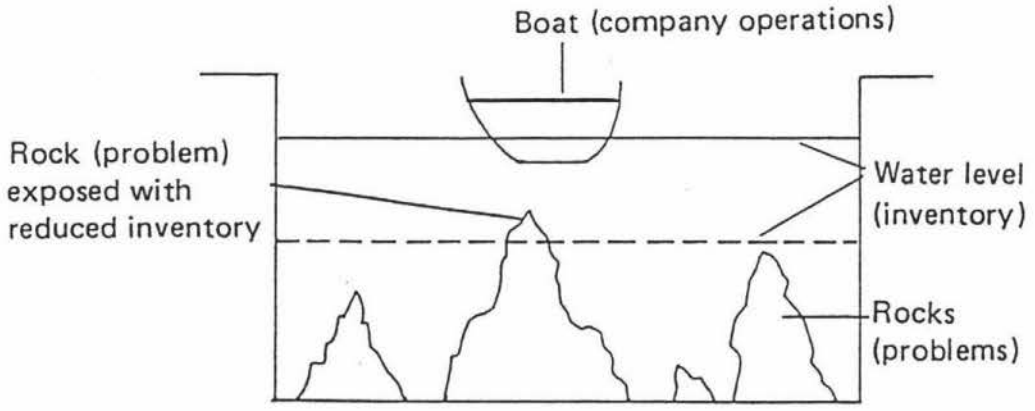

Figure 4.5
Pond of Inventory
Source: P.J. O'Grady (1988), p.36.

The treatment of machine breakdown is a classic example of this 'pond of inventory' analogy. As the inventory and work-in-progress levels (the level of the pond) are reduced, problems caused by unreliable machines

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[1] It should be noted that JIT as developed by Ohno seeks the *reduction*, not the *total elimination* of inventories as is advocated by such well known Western exponents of JIT as Richard Schonberger and Robert Hall. Ohno and Mito (1988) express reservations about such an approach: 'To be sure, if we completely eliminate inventories, we will have shortages of goods and other problems. In fact, reducing inventories to zero is nonsense.'

are encountered (rocks are exposed). The typical response of Western management is to keep large buffer stocks at each work station so that 'good' machines are not affected by the breakdown of unreliable machines, in other words, the 'solution' is to cover the rocks and hide the problem. This is not only costly in terms of inventory but problems, in this case unreliable machinery, do not receive proper and timely attention. By contrast, the JIT philosophy indicates that when problems are uncovered they must be confronted and solved (the rocks must be removed). The

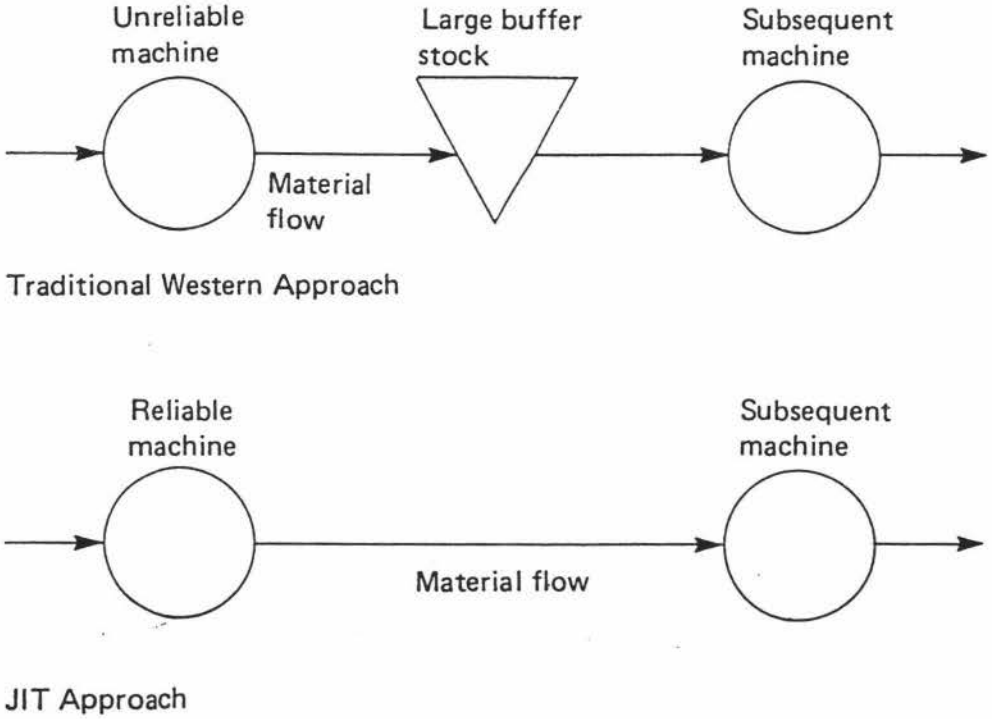

Figure 4.6
Approaches to Unreliable Machines
Source: P.J. O'Grady (1988) p. 37.

inventory level can then be gradually reduced until another problem is uncovered; this problem can then be tackled, and so on. In the case of unreliable machines, the JIT philosophy would require that the problem be

solved either by a preventive maintenance programme — which is often referred to in JIT as total preventive maintenance (TPM) — that would improve the reliability of the machines, or if all else fails, by the purchase of new, more reliable equipment. This difference between the traditional Western approach and that of JIT is illustrated in Fig. 4.6.

Other 'revolutionary' practices introduced by Ohno came about in response to the conditions that prevailed in Japan during the early 1950s. The number of vehicles sold in Japan at that time was relatively small, amounting to less than 100,000 units per year. Yet, the Japanese market was growing rapidly and called for an increasing variety of motor-vehicle models to satisfy local needs. The problem thus faced by Toyota and the other Japanese automakers was that of how to produce more models in small volumes at reduced cost. This seemed a contradiction in terms for according to traditional mass production principles the most effective route to securing lowest unit costs was high volume production of standardized items. In the case of the automobile industry it was believed that a minimum production run of 200,000 units per basic model (1 million in the case of engine casts and body panels) was necessary to achieve economies of scale (White 1971; see also Dicken 1986). Yet, given the small size of the Japanese market in those days, this was more than an impossibility. Moreover, the Japanese companies lacked the resources to invest in the specialized presses that each model required and therefore had to produce a variety of products with the few machines they

possessed. All managers at Japanese automotive factories dealt with this problem by reducing setup and lead times[1] to accomodate smaller lots (Cusumano 1985: 266). Ohno was by far the most successful. Shingo (1981), and Ohno (1988) relate how they and their team of engineers carefully studied the way each manufacturing operation was performed and devised ways in which to improve it. They found, for instance, that by making small modifications to the machinery and dies (e.g. using clamps and fasteners instead of bolts and screws; standardizing the size of dies; using rollers to move dies in and out of position, etc.), and doing some preparations in advance, they could significantly reduce the time needed to change dies or cutting tools. By continually practicing with these techniques and adding further refinements to the process Ohno and his team were able to reduce the time required to change stamping dies, for instance, from the several hours it would have normally taken in the late 1940s to 15 minutes by 1962, and to an astonishing three minutes by 1971[2] (Shingo 1981: 256-257). Nissan, by contrast, had only managed to reduce the time needed for die changes to between 30 minutes and 1 hour by 1960, and to about 10 minutes by the early 1980s — Western

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[1] Setup time in manufacturing is understood as the time required for a specific machine, assembly line or work centre to convert from production of one specific item to another. Lead time is the actual span of time required to perform a manufacturing activity; it includes time for order preparation, queuing, receiving, inspection, transport and so forth; this is not to be confused with throughput time which comprises only the actual time taken by the material to go through the production process.

[2] Toyota today manages to do single setups (meaning setup times of less than 10 minutes) in most of its operations and has even achieved one-touch setups (one minute or less) in some of them. Toyota's goal, of course, is to achieve, in true JIT fashion, one-touch setups for all operations.

manufacturers, meanwhile, still required several hours to accomplish the same task during the 1980s (Cusumano 1985: 285).

In the process of perfecting his quick die changes techniques, Ohno also made a most remarkable discovery: he found that it actually cost less per part to make small batches of stampings than to run off enormous lots. There were two main reasons for this phenomenon. First, by manufacturing in small lots, the carrying cost of the huge inventories of finished parts that traditional methods of mass production required was eliminated, and second, and more importantly, the making of only a few parts before their assembly into a vehicle caused stamping mistakes to show up almost instantly during production. The consequences of this latter discovery were enormous. It made those in the stamping shop much more concerned about quality and it eliminated the waste of large numbers of defective parts — which had to be repaired at great expense, or even discarded — that would have otherwise been discovered long after manufacture (Womack *et al.* 1990: 53). Moreover, with no buffer stocks to fall back on the production system could not tolerate the manufacture of defective parts since this could quickly affect operations downstream and, worse, bring the system to a halt. Quality, therefore, had to be *built into* if not *thought into* the system (see Hayes and Wheelwright 1984; Cheng and Podolsky 1993). In this sense, JIT became the ultimate embodiment of TQC. Quality was now truly every worker's responsibility and thus 100 percent inspection rate was achieved. In the most automated areas, *poka-*

yoke or fail-proof devices were attached to machines to automatically check for abnormals in a process[1] (Shingo 1981). When defects occurred or were detected, the worker was empowered to stop the production line, or in the case of automated operations, the machines would be automatically stopped by the *poka-yoke.* This is what Ohno calls 'Autonomation' which he likens to the automatic nervous system of the human body:

> 'At Toyota, we began to think about how to install an automatic nervous system in our rapidly growing business organization. In our production plant an automatic nerve means making judgements autonomously at the lowest possible level; for example, when to stop production, what sequence to follow in making parts, or when overtime is necessary to produce the required amount.' (Ohno 1988: 45)

More importantly, however, when a defect occurred, every effort was made in tracing it back to its ultimate cause. To this end, Ohno instituted a system of problem-solving called 'the 5Ws' or 'the five whys', that is, he asked his managers and workers to ask themselves 'why' (i.e. why is this happening?), at least five times, every time they encountered a problem. By probing every problem in this way one could uncover its various layers and almost always invariably arrive at its source (Shingo 1981; Ohno

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[1] Where it was not possible to check every component, either because it was too expensive and time consuming to do it manually or not technologically feasible to perform automatically, then a 'representative' sampling, called *N=2*, would be used. As Schonberger (1982) points out, however, a 'representative' sample in Japanese QC means the first and the last piece, not a random selection. The first and last pieces constitute a sample size of two, hence the name *N=2*. This is because, in a stable process the first and last pieces encompass the entire production run, but a random sample in a typical Western sample size of N=5 does not. In the *N=2* approach, if the first and last pieces are good then it is assumed that the whole process has remained stable and, therefore, that all parts are good.

1988). To facilitate this task, cause-and-effect charts and diagrams were used; the most popular one, the Ishikawa diagram, better known as the 'fishbone' chart because of its shape, became an invaluable tool that graphically illustrated interrelationships among processes. An effect, i.e. a quality characteristic or problem, could in this way be carefully evaluated during production; efforts to improve that characteristic or to cope with a quality decrease could then be focused on the factors and sub-factors displayed on the 'fishbone chart' (Fig. 4.7).

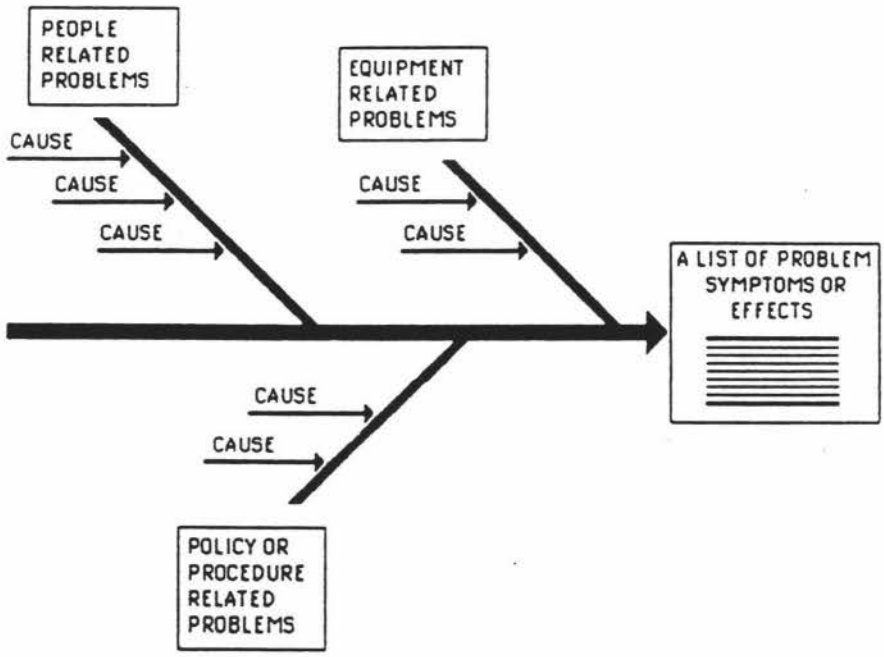

Figure 4.7
Cause and Effect Ishikawa 'Fishbone' Diagram
Source: M.J. Schniederjans (1993), p. 263.

To some this might have seemed like a costly, time-consuming and even futile process for, according to traditional Western management principles, defects, no matter what, would always be present and therefore

as long as these are maintained at an 'acceptable', manageable level no drastic action is warranted. With JIT, however, there is no acceptable level of defects; the system strives for perfection and, thus, for their complete and total elimination. When a defect is found or a problem occurs, therefore, the philosophy dictates that every effort is made to avoid this from ocurring again. In the early years (1950s) when the quality problems at Toyota were rather severe the production lines, as might be expected, used to be stopped frequently (Womack *et al.* 1990); but as each problem got solved in this methodical and thorough way, efficiency was increased (see Fig. 4.8) and thus the line would run, after every stop, a little bit better and more smoothly than before (O'Grady 1988) — a true example of *kaizen* in action. 'Today, in Toyota plants', Womack *et al.* (1990) state, 'yields approach 100 percent. That is, the line practically never stops!'. In

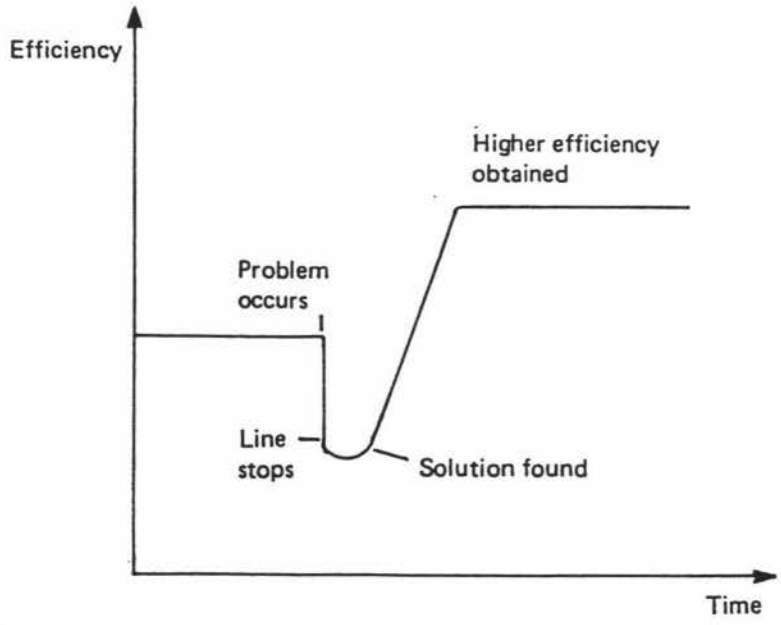

Figure 4.8
Incremental Efficiency Increase.
Source: P.J. O'Grady (1988) p. 48

mass production facilities, by contrast, the lines stop very often. This is not to correct defects — which are fixed at the end — but to deal with material supply and coordination problems. In such conditions a 90 percent yield is often regarded as a sign of good management (Womack *et al.* 1990: 57).

Even more striking are the differences that are found at the end of the production line. To illustrate this point Halberstam (1986) tells the story of Harold Sperlich, an American auto executive who toured a Japanese automotive factory in the early seventies. Having noticed that there were no areas devoted to fixing defective vehicles, Sperclich became puzzled,

> '"Where do you repair your cars?" Sperlich asked the [Japanese] engineer with him.
> "We don't have to repair our cars," the engineer answered.
> "Well then," Sperlich asked, "where are your inspectors?"
> "The workers are the inspectors," his guide answered.
> Sperlich left that factory somewhat shaken: In America, he thought, we have repair bins the size of football fields.' (quoted in Halberstam 1986: 716)

Womack *et al.* (1990) corroborate these facts. They point out that Toyota's assembly plants, for example, have practically no rework areas and perform almost no rework. By contrast, mass production facilities devote up to 20 percent of plant area and 25 percent of their total hours of effort just to fixing mistakes. This is what Sperlich, the auto executive, calls 'nonconformance'. That is the difference between what it costs to do a car right the first time and what it cost to do it wrong and then have to compensate: the money spent on the scrap metal, the manpower wasted on

repair, the problem on the warranties, and the insidious costs spread throughout the company associated with paying attention to something one should not have to pay attention to (in Halberstam 1986: 716). The price of 'nonconformance' is therefore, by any possible estimate, a very expensive one[1] and the notion maintained by some management theorists (e.g. Crosby 1979) that 'quality is free' begins to make sense. Schonberger (1982) points out in this respect that the Japanese experience in fact shows that 'quality is better than free'; 'quality is productivity', not only because so many costs — scrap, rework, inspection, customer dissatisfaction, etc. — are avoided but also because, as mentioned earlier, in this sort of environment quality improvements are being implemented all the time and efficiency is therefore being increased almost continuously.

The emphasis that JIT placed on tracing problems to their root cause was in most respects similar to the 'quality at the source' approach advocated by TQC. In both cases the main focus was on defect prevention and doing things right the first time. It should be noted, however, that for most of the 1950s Toyota relied mostly on its production system for attaining and improving quality; in other words, production, not quality control, had the primary responsibility for quality. It was only in the

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[1] By Sperlich's own estimates the cost of 'nonconformance' for an American auto company in the mid-1980s, for example, was some 20 to 40 percent of revenues. That in turn meant that if things had been 'done right' the first time, not only would the quality of the cars have been better, and hence the company's reputation, but costs could have been reduced by, say, 25 percent or about US$2,500 a car, which was close to what the Japanese cost advantage was at that time (in Halberstam 1986: 716).

early 1960s — after Nissan had won the Deming Prize (1960) — that Toyota, in an effort to equal its rival's quality achievements, embraced TQC in earnest (Cusumano 1985), and the blending of the two systems, JIT and TQC, produced even more remarkable results making Toyota the undisputed leader in the industry in both productivity as well as quality — a fact that was formally recognized by the JUSE when it awarded Toyota the Deming Prize for outstanding quality in 1965. Meanwhile, most of the other Japanese automakers — which had adopted TQC early on and had experimented with their own versions of inventory control and setup time reduction systems — became aware at this time of the advantages of the Toyota production system and began to gradually incorporate many of Ohno's innovations into their own manufacturing operations. This borrowing process reached a momentum and even a sense of urgency after the Arab oil embargo of 1973, when it became clear that the flexible nature of JIT offered superior protection against sudden declines in market demand (Miller *et al.* 1992:113; Keller 1993: 160). Toyota itself did much to facilitate this diffusion process as the company saw it as a national duty to instruct other companies in the system so as to improve the capability of Japanese industry to retain a competitive position in the world markets during this tough and difficult period[1] (Hall 1983: 23). By the late 1970s

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[1] Toyota considered the JIT system so powerful that in the early days the company had deliberately coined difficult and even misleading words to describe it. Toyota feared that if other Japanese corporations or worse, the big American companies, learnt the JIT techniques the company would lose its competitive advantage. As Ono puts it, 'If in the beginning the US had understood what Toyota was doing, it would have been no good for us' (see Myers 1990: 98).

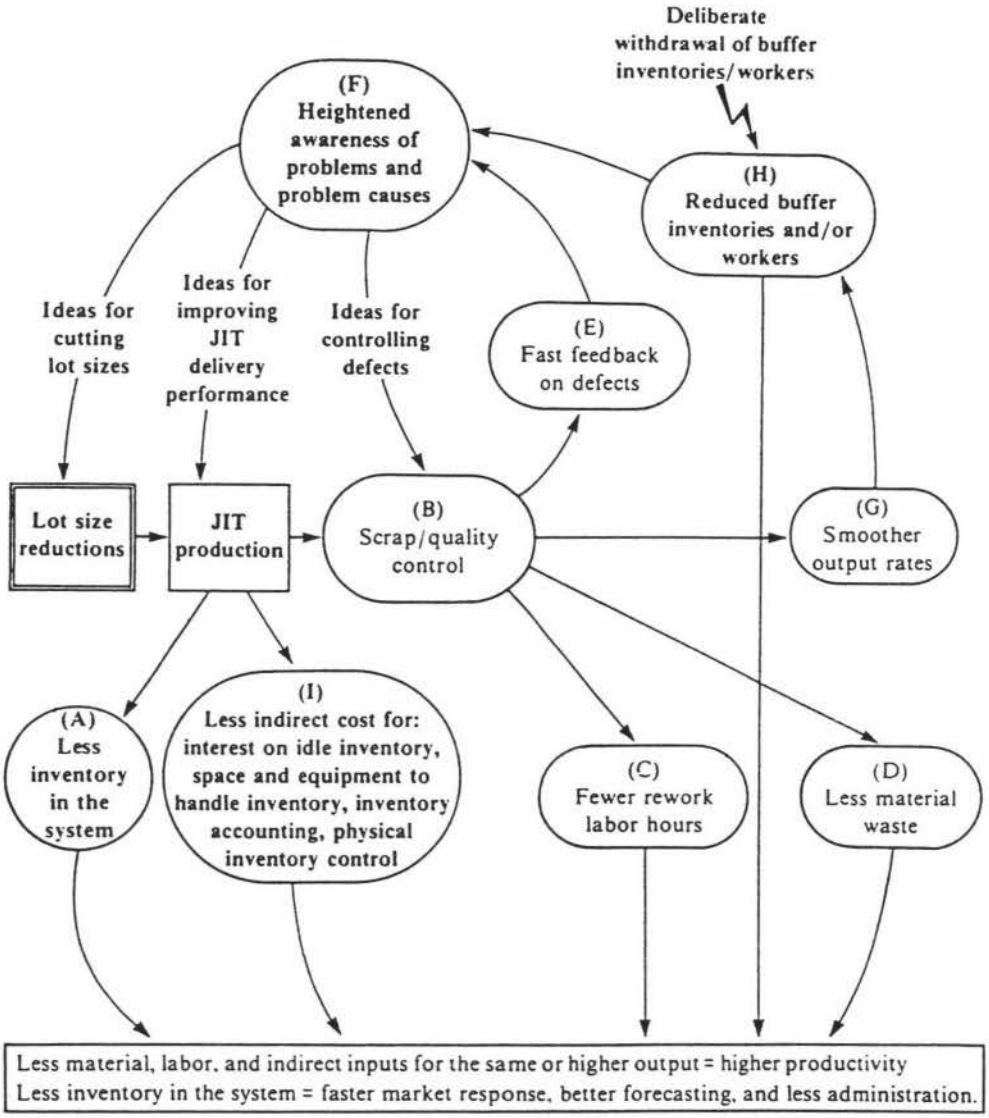

Figure 4.9
Effects of Total Quality Control blended with Just-in-Time Production
Source: R.J. Schonberger (1982), p. 26.

JIT/TQC had become a unified complementary system (Fig. 4.9) — or as Sandras (1988) appropriately puts it, 'the two sides of the same coin' — which had become standard not only among the Japanese automotive companies but had also spread across many of their suppliers and other industries as well (Hall 1983, Cusumano 1985, Womack *et al.* 1990).

CHAPTER FIVE

JUST IN TIME OR JUST TOO MUCH?: THE EFFECTS OF JIT/TQC ON LABOUR

JUST IN TIME OR JUST TOO MUCH?: THE EFFECTS OF JIT/TQC ON LABOUR

The remarkable improvements in quality and productivity that the Japanese firms were able to achieve under TQC and JIT did not come without costs. In their relentless drive for higher quality and efficiency they exacted an enormous toll from their workforce. This was particularly true at Toyota where, beginning in 1948, Ohno and his assistants subjected every process, machine, and worker to the most rigorous scrutiny so as to eliminate 'waste' — which they defined as anything or anyone that adds cost but not value to the finished product (Shingo 1981: 212). Moreover, given the fact that the labour force had become as a result of the labour settlements of the early 1950s and the institutionalization of 'lifetime employment', much of a fixed cost — even more so than machinery, which could, after all, be depreciated in the long run — Ohno set out to get the most out of the company's human resources (Womack *et al.* 1990: 54-55).

Ohno achieved maximum labour utilization at Toyota by extending the principle of 'no buffer stocks' to the workforce. There were no 'buffer personnel' (e.g. maintenance crews, quality inspectors, etc.) consequently job descriptions were drawn more widely through. Workers were now expected to be more 'flexible', which meant that they were required to perform a number of additional tasks on line such as doubling as mechanics and quality inspectors of sorts, and thus being held individually

responsible for routine maintenance tasks, minor breakdown on their machines, and the quality of the parts they produced. They were also required to work in groups and assist fellow team-mates when these were 'overloaded'. Moreover, with the reorganization of the factory layout and the logical, stage by stage, synchronization of processes into group technologies, the workers' ability to control the pace of work was practically eliminated (Graham 1988). Gone were the days when they could build up banks of work, or employ other devices that allow them rest periods at their own discretion; now, with no work-in-progress stocks, the workers were effectively tied together in a line and paced within the very narrow limits set by the production process. To add to the pressure, lines were constantly speeded up so as to test the limits of human capability; one Toyota worker described this process, rather vividly, in the following way:

> '...they keep speeding up the line. The faster the line gets, the harder we work to catch up...but when we finally get used to the speed, then they make it even faster. Right now it's a minute and fourteen seconds per unit, but I bet they'll speed it up[1]. The new guys can't handle it any more. You read in the newspapers that Toyota workers are quick and active. We're not quick. We are forced to work quickly.' (in Kamata 1982: 144).

Additionally, processes were rationalized in such a fashion so as to eliminate every 'wasted motion' on the part of the operators. Studies on worker motions and cycle times had been done in the West by Frederick

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[1] Time would prove this worker right. When he made these statements to Kamata, it was early 1973; when Kamata went back to Toyota seven years later, in 1980, he found that the line at the transmission plant where he and this employee worked had been speeded up from 74 to 45 seconds (see Kamata 1982: 206).

Taylor, H.L. Gantt, Frank and Lillian Gilbreth, and other engineers who in the early part of this century had pioneered methods of 'work factor analysis'[1] that had as their objective to find an economic work pace that was highly productive yet not too tiring for the employees (Miller *et al.* 1992). This was the approach adopted by Nissan for example (Cusumano 1985). At Toyota, however, the methods used were much less scientific and more pragmatic in nature. Ohno described his approach in an interview:

> 'If I'd just called the foreman and said "stop the waste" people wouldn't understand what I meant. They'd say "but we've always done things that way" or "this man is a hard worker", but I would say "you can't see straight; that's not real work" ... Machines actually work by themselves; so someone standing over it, watching it intently might think he is working, but the machine is doing fine on its own, so I say that is a waste of manpower. If I found a job that was being done "efficiently", I would say "try doing it with half the number of men". And after a time, when they'd come back and said that they had done that, I'd say: "OK, half the number again".' (in BBC 1990b)

The objective then became to try to execute tasks with as fewer workers as possible. In practice, it was not always feasible to halve the number of employees doing a job, but if enough 'wasted motion' could be eliminated from three workers, for example, then one worker could be made redundant — not to be fired, but to be transferred to another task where he could be more 'productive'. It did not even matter if the process in question took now, with two people, a little longer than it did before with

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[1] It is interesting to note the interest that this subject awakened in Japan. As early as 1911, for instance, the translation of F.W. Taylor's book *The Secret of Saving Lost Motion* sold over 1.5 million copies (!) (see Sobel 1985).

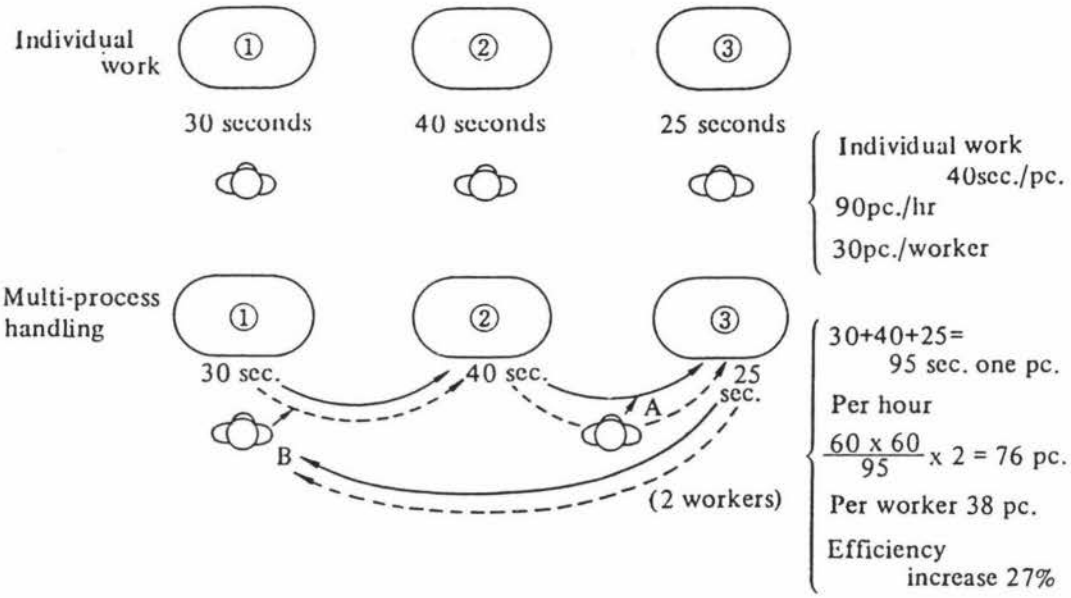

Figure 5.1
Efficiency Improvements by Multi-process Handling Operation
Source: S. Shingo (1981), p. 240.

three (Fig. 5.1); the issue here was not maximum utilization of time or machinery, but of manpower — hence the use of a team production quota system to ensure that this was achived[1]. The rationale behind these practices is explained by Shingo:

> 'Machineries after "depreciation" has the possibility to be free of charge, but in case of comparing idle time of machines and delay of man; generally, from the standpoint of cost reduction, it is permissible to let the machines rest. ... [Thus] it is not so necessary to attain high operation ratio of machines; but the most important object is "cost reduction".' (Shingo 1981: 82)

'The history of Toyota rationalization', writes Kamata (1982: 199), 'is the history of the reduction of workers, and that's the secret of how Toyota

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[1] Kamata (1982) and Schonberger (1982) point out in this respect that it is not the output rate that is important but the daily quota, and if this is not met within the 8-hour working day, then the team (as a unit) has to stay late until this is actually accomplished.

shows no increase in employees, while achieving its startling increases in production'.

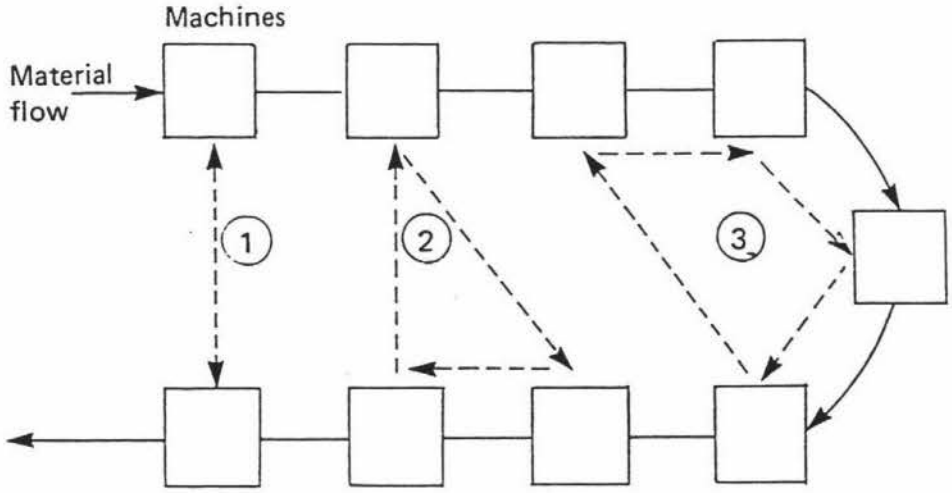

Figure 5.2
Example of the Flexibility of Workers in U-shaped lines
Source: P.J. O'Grady (1988), p. 87.

This rationalization also meant that operators were required to handle several machines at once instead of only one as had been customary before (and still is in most cases in Western industry). This 'multi-machine' or 'multi-process' handling is regarded, in effect, as one of the more salient features of the Toyota Production System (Shingo 1981: 82). To make this even more efficient, a U-shaped flow line was used whenever possible (Fig. 5.2) so that the operators could be physically close to as many machines as they could possibly handle and thus reduce or eliminate their need to even walk between machines (a 'wasted motion') (see Hall 1983: 120-127; O'Grady 1988: 86-87; BBC 1990b).

In spite of the evidence pointing to a much more intensified pace of work and the existence of much stronger pressures to which the work force was subjected to at Toyota, the number of analysts that praise Toyota's labour practices are legion, with the MIT study *The Machine That Changed the World* by Womack, Jones and Roos (1990) being, without doubt, the most influential. According to these authorities the 'lean production' system (as the JIT/TQC system is dubbed by the MIT researchers, and is henceforth thus called) with its emphasis on flexibility (multiple skills), continuous learning, teamworking, problem-solving, and suggestions schemes (QC circles), gives the employees much greater opportunities to use and develop their talents and become involved in the running and management of an enterprise, providing them therefore with a far more rewarding and gratifying environment than the traditional mass production system. The latter, based on the principles of 'scientific management formulated by Frederick Taylor, Frank Gilbreth and other theorists, and epitomized by the production methods devised by Henry Ford and Alfred Sloan at Ford's and GM's factories, respectively, is blamed for the chronic inefficiencies and dissatisfaction that prevails in Western manufacturing environments. With its strict separation of management and production activities, and its extreme horizontal subdivision of labour and fragmentation of work tasks, the Taylorist-Fordist mass production system is thought to be responsible for the lack of communication and often antagonistic relationship that exist between management and labour in Western companies, and for the de-skilling effects these practices have

had on the workforce, where high levels of job dissatisfaction, absenteeism and low morale are frequently observed.

Although criticisms of Taylorist-Fordist production methods are now the norm, praise for lean production's working practices, though widespread, is far from universal. The German scholars Dohse, Jürgens and Malsch (1985) have, in this sense, provided one the most compelling alternative interpretations to date on lean production's labour practices. They contend that although these appear, at first sight, to be the very antithesis of traditional forms of work organization under the mass production paradigm, closer scrutinity indicates that lean production should not be regarded as an alternative to Taylorism 'but rather a solution to its classic problem of the resistance of workers to placing their knowledge of production in the service of rationalization' (Dohse *et al.* 1985: 128). Thus, since there are no buffer stocks to fall back on, no demarcation between jobs, and flexibility across a wider range of work tasks, workers are exposed to continual, controlled pressure and are left with little option other than to cooperate and use their initiative to keep production going. Japanese workers, are in this sense, according to Dohse *et al.* (1990: 124-25), 'not merely manual workers but are integrated into the production system as intellectual workers'. What is most remarkable about this, however, is that teamworking actually appeals to workers because of the idea that through teamwork — everyone pulling together — one can increase productivity, improve quality, enhance job satisfaction and save jobs.

'Even allowing for some hype', write Parker and Slaughter (1988: 4), 'it seems too good not to try' . This process is what Dohse *et al.* (1985) call the 'internalization of Taylorism'. The most dramatic example of this process is provided by the fact that although 'management prerogatives [under lean production] are largely unlimited' (Dohse *et al.* 1985: 141), it is peer group pressure that exerts the greatest control over labour. With individual earnings ultimately dependent on the team's productivity and attainment of production quotas, 'workmates put each other under a massive moral pressure to turn in a good performance' (Schonberger 1982). In this sense, 'the group organization instead of constituting a defense against the technical/economic system's insatiable demands, plays a role in enforcing these demands' (Berggren 1993: 36).

The views expressed by Dohse *et al.* are shared by other scholars such as Sayer (1986), Parker and Slaughter (1988), Berggren (1993), who see lean production's emphasis on teamworking, employee motivation and high performance levels not born out of some predilection for the welfare or job satisfaction of the labour force, but by the need to break down the rigidity of traditional production systems and push the firm to levels of high productivity, growth, and profitability. Lean production systems are therefore innately 'Janus faced': while they may stress the importance of behavioural skills that promote cooperativeness, conscientiousness and self-discipline, they are also highly oppressive, often securing high levels of productivity by overtly coercive means (Berggren 1993).

The most powerful indictment of lean production's labour practices (as employed by Toyota), however, is not provided by academics, but by people who have actually worked on the production line. After all, as Dore (1982) points out, it is one thing to write about events or conditions from the outside, and another to live and experience what these feel like from the inside. One of these eyewitnesses' accounts is by Satoshi Kamata (1982), a Japanese journalist who in his now famous book *Japan in the Passing Lane* (more appropriately titled 'The Automobile Factory of Despair' in the original 1973 Japanese version) described his experiences while working undercover in a Toyota factory for six months in the early 1970s. Kamata's account reads like a Dickensian novel describing in detail the very harsh and oppressive conditions in which Toyota employees had to work. He tells of how workers, for instance, would spend their whole working days of eight to ten hours (including overtime) in the space of one square yard just trying, and barely managing, to keep up with the speed of the production line. With only a short break for lunch (35 minutes), and then all their movements precisely prescribed, they had no rest, all their free time during working hours having been effectively taken away from them as 'wasteful' and therefore having to devote every minute of their shift, 'to the last second', to production (Kamata 1982: 199). It is no wonder that in such an environment many workers would feel despair, with the pressure so intense that some would even try to commit suicide — as many in fact tried to do, according to Kamata. These allegations are corroborated by a Toyota production worker, Tokushi Akamatsu, who in a

book published in Japanese in 1982 ('The Cruel Story of Toyota') claimed that the pace of work at Toyota's factories led to an unusually high number of accidents and suicides among the blue collar workforce (Cusumano 1985).

Perhaps the most revealing testimony on the insensitive nature of lean production's labour practices, however, is provided by its creator, Mr. Ohno himself. Ohno admitted (in Cusumano 1985), for instance, to have never tried, personally, to do any of the tasks he demanded the workers to do to see how easy or hard they were. He, nonetheless, seemed to have been aware of how unreasonable many of his demands were, for as he himself put it, 'had I faced the Japan National Railways union or an American union...I might have been murdered' (Cusumano 1985: 306). For this reason, and in spite of all his organizational achievements on the factory floor, he considered his success in controlling the union in the early 1950s to have been the most important advantage Toyota gained over its domestic and foreign competitors.

The stressful conditions found at Toyota are by no means confined to it or even to Japan. Though Toyota continues to be the 'leanest' and 'meanest' among lean producers, the studies done by Yamamoto (1980) at Nissan's plants in Japan, Parker and Slaughter (1988) at NUMMI (Toyota's joint venture with GM in California), Fucini and Fucini (1990) at Mazda's plant in Michigan, and Garrahan and Stewart (1992) at Nissan's plant in

Sunderland in the UK have revealed that all the Japanese lean producers operate in a similar fashion and that the pressures inherent in the system — what Parker and Slaughter (1988) call 'management by stress' — are prevalent at all locations.

The experience overseas has also revealed how sensitive the Japanese auto companies are to the labour issue. These have shown to be very selective indeed about the sites they choose as locations for their plants. Thus, in selecting a locale they take into account factors such as the local labour laws and regulations, the presence and strength of labour unions, and the makeup of the labour pool in the surrounding area down to their professional, religious, and ethnic background. Dennis Des Rosiers, an auto industry consultant who has carried out several site studies for Japanese auto companies in the US, relates in this respect that:

> 'They ask for profiles of the community by ethnic background, by religious background, by professional makeup. They want to know how many accountants there are in the area versus how many farmers. Those are key variables.... There are demographic aspects that they like. They like a high German content [i.e. people with German ancestry]. Germans have a good work ethic — well-trained, easy to train, they accept things...[the Japanese] don't like other types of profiles.' (quoted in Cole and Deskins 1988: 17-18)

Most Japanese plants overseas have accordingly been built in rural 'green field' sites at places with relatively lax labour laws, little or no tradition of labour union organization, and an available labour pool that fits into their pattern of occupational and ethnic preferences. Nissan, for instance, selected for its US plant a semi-rural location in Tenesse where

labour union organizing is hampered by 'Right-to-Work' statues. Honda, meanwhile, chose to locate in Ohio[1] (a highly industrialized state) but in a rural area distant from any large cities and the influence of the powerful United Auto Workers (UAW) union of America (Mair *et al.* 1988; Rubenstain 1988, 1990; Kenney and Florida 1991). These 'green field' sites are also perceived by the Japanese companies, according to Mair *et al.* (1988: 366), to offer resourceful employees possessing strong mechanical aptitudes, few 'bad habits' and a solid 'work ethic'. Rural workers were also viewed as having low levels of occupational and geographical mobility, thus reducing the likelihood that highly trained staff would quit. The pattern for selecting locations in the UK have also been similar, and all the Japanese plants located there (not counting joint-ventures) have been built at 'green field' sites where there is no strong union representation (Sewell and Yu 1991). Indeed, one of the chief reasons Toyota, Nissan and Honda chose to base their main European operations in the UK has been because of the fact that Britain, as a result of the Thatcherite labour reforms of the 1980s, now boasts the most stringent anti-union laws in the European Union (EU) (Garrahan and Stewart 1992: 136).

Once established, the Japanese auto companies have been known to adopt meticulous hiring practices in order to select employees with the

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[1] Moreover Ohio, with a high proportion of its population made up of people with German ancestry, fits into the Japanese ethnic preferences category described by Des Rosiers.

greatest potential for successfully implementing lean production methods (Mair *et al.* 1988; Keller 1993). Thus, applicants undergo, according to Berggren (1993: 39), a rigorous screening process consisting of tests on intelligence, dexterity, and aptitudes designed to reveal their talents, ambitions, initiative, and creativity. Berggren reports that it has been usual for the Japanese companies to screen between thirty and one hundred applicants to fill each opening in their factories. Sewell and Yu (1991) point out in this respect that Nissan, for instance, screened over 24,000 people in order to fill the 400 initial jobs that were available at its plant in Sunderland. Cole and Deskins (1988: 18), meanwhile, point out to the fact that the Japanese companies in the US have adopted a deliberate policy of avoiding hiring minorities, especially blacks, who 'they may perceive as being poor risks as workers because they have lower levels of education than whites,...are more prone to drugs and crime, or evidence a greater propensity to unionize'. The workers the Japanese companies select in the end therefore constitute in many respects an elite labour force: young[1], strong, intelligent, highly motivated, but at the same time obedient and cooperative with a strong group orientation and social skills, and hence well suited to work under their stict working regime.

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[1] In countries like the US where there is no national health system such as in Europe or Japan, this represents an additional advantage over local producers like GM or Ford. Since private health insurance premiums in the US are borne by employers, premiums for the much younger labour force working at Japanese factories (average age 22) are, needless to say, much lower than those working for the Big Three (average age 38-45). The Economic Strategy Institute, a Washington-based think-tank run by Clyde Prestowitz (author of *Trading Places*), estimated the Japanese companies' cost advantage in this area at US$505 per employee in 1991 (see *The Economist* 15 February 1992: 67).

In the Japanese companies defence, however, it must be said that the pressures and exploitation to which the labour force has been subjected cannot be seen (at least in Japan) simply as a result of what Marxist scholars would readily describe in terms of 'the heartlessness of managers' or 'the greed of the owners of capital'. One of the salient features of Japanese corporations is, in this sense, their strong egalitarian ethic[1] with duties and responsibilities (and their respective doses of pressure and stress) shouldered as equally as possible by all members of the organization, from the upper echelons of management to the lowest ranks at the shop floor (Smitka 1991). As Kamata, himself, notes:

> 'Not only team leaders, the lowest management people, but also unit leaders have been required to work on conveyor lines. Even foremen, normally part of higher management, may sometimes put on working gloves and lend a hand. Then these men have to take home their paperwork such as the writing of daily reports and the calculation of day-by-day work units.' (Kamata 1982: 203)

Thus, it was difficult even for Kamata to keep his sense of antagonism sharp, especially since his fellow workers did not feel alienated and did not see themselves as the victims of unjustice. Moreover, in Japan the companies fulfill a social role which focuses not on profits or the payment of dividends to shareholders but on the creation and the maintenance of employment (Drucker 1986: 182-183; Hattori 1985: 110). The Company and the employee are therefore mutually bound by duties and responsibilities to each other. The company assumes an all-embracing

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[1] This egalitarian ethic, however, is not usually extended to women, the sick and invalid, or the non-Japanese.

paternalistic attitude towards the employee: it guarantees him a job for life, it gives him accomodation, it extends him credit, and it even plays the role of 'match-maker' when it comes the time for him to find a wive. Nakane Chie, a Japanese sociologist, writes in this respect that:

> 'The *kaisha* (corporation) is the community to which one belongs primarily, and which is all important in one's life. Thus in most cases the company provides sole social existence of a person, and has authority over all aspects of his life ... it alters even his ideas and ways of thinking... Some perceive this as a dangerous encroachment upon their dignity as individuals; others, however, feel safer with total group conciousness. There seems to be little doubt that in Japan the latter group is in the majority.' (quoted in Kubiak 1990: 7)

Thus, Japanese employees must show complete loyalty and devotion to their company. Sethi *et al.* (1984) describe the pressures at work in this regard in the following way:

> 'There are extreme social pressures for overt demonstration of loyalty to one's company or employer, especially in large enterprises and trading houses. This loyalty is 'demanded', and disloyalty severely punished. Loyalty is demonstrated not only by working hard and by longer work hours, but also by unquestioned obedience to the employer. In Japan, where lifetime employees in large enterprises are seen as an elite and privileged class, the loss of such jobs is an unbearable catastrophe. The employee loses not only economic, but also social status. Japanese are usually regarded by other nations as diligent and hard workers. But they are to a large extent forced to be hard workers, because the penalty for failure to conform is just too great.' (Sethi *et al.* 1984: 23)

The oppression that employees feel at their workplace then is not the oppression of coercive external authority. Instead, it comes, as Dore (1982) points out, from inner compulsion bred from submission to the norms and targets which the organization has set for them. In an different

sort of setting — such as in the case of Japanse-owned plants overseas — this could be taken as an example of the 'internalization of Taylorism'; in Japan, however, this is mostly the result of the social and cultural pressures that prevail in society and it would be prevalent in the working environment regardless of the type of production system used by the company in question.

CHAPTER SIX

THE JAPANESE SUBCONTRACTING PYRAMID

THE JAPANESE SUBCONTRACTING PYRAMID

It has now been realized for some time that in addition to their production methods, the greatest manufacturing strength the Japanese companies possess lies in their subcontracting systems. Thus, while most of the Western motor companies have traditionally preferred to vertically integrate — in the belief this made them more efficient by reducing their dependence on other firms and lowering their vulnerability to opportunistic overcharging — and therefore buy the minimum necessary from outside suppliers, Japanese companies have, in contrast, adopted the strategy of subcontracting most of the components that go into a vehicle (about 70-83 percent in terms of manufacturing costs) to outside firms (Lamming 1993: 39). Yet, it is how parts are purchased, not the mere volume of subcontrating, that determines the benefits of this approach. There are some Western companies, such as Chrysler and Saab for instance, in which purchases from suppliers are roughly equivalent to the levels achieved by the Japanese automakers (Womack *et al.* 1990). Yet, as in the case of other Western companies, the relationship these firms have traditionally had with their suppliers has been one that can be described as arms-length, market-based, short-term interactions. Western automakers have usually operated under free market principles using a competitive bidding system to select as suppliers those firms that can come up with the lowest estimates for the manufacture of a given part or component. The

problem with this approach lies in the fact that the typical Western motor company may utilize as many as 10,000 suppliers (Smitka 1991) — between 485 (Saab) and 2,500 (GM) at any one time for any given model (Lamming 1993; Boston Consulting Group/PRS in Sadler 1994) — and therefore communication and coordination of operations prove usually difficult. Moreover, the suppliers are bound to the automaker by renewable annual contracts only for the production life of a model. Without the assurance of future orders, the suppliers are naturally reluctant to make major investments in the improvement of facilities or the modernization of machinery, and therefore their cost and quality levels are often not the best they could actually be.

The Japanese companies by contrast have very close, long term, stable relationships with their subcontractors. To be sure they use far more suppliers than Western companies do — perhaps as many as 47,000 in the case of Toyota (Fruin and Nisiguchi 1992) — but these are organized in tiers or layers, so that from the viewpoint of the number of firms in each layer, the production system resembles a pyramid structure. It has been estimated, for instance, that the production system of any one specific Japanese auto manufacturer comprises an average of 168 first layer, 4,700 second layer and 31,600 third layer subcontracting firms (Fig. 6.1).

The company at the top of the pyramid (i.e. the automaker) has direct transactions with (and therefore focuses its communication resources on)

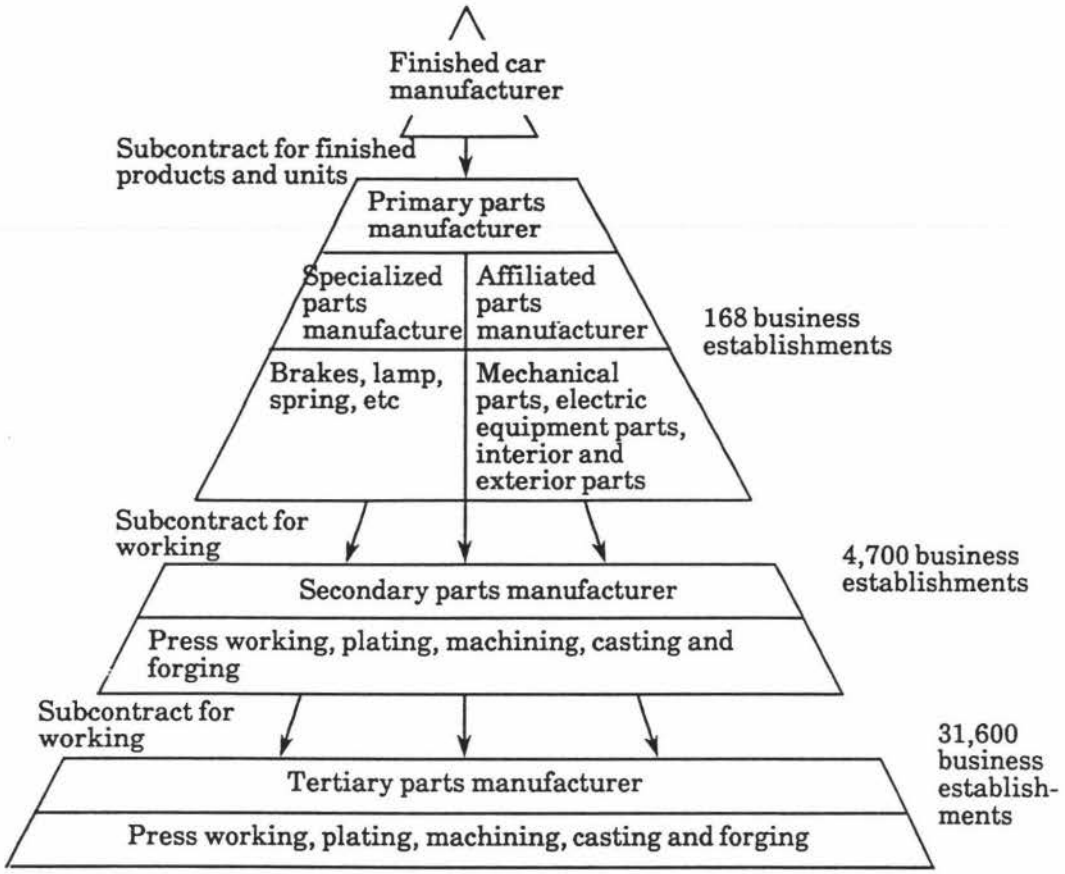

Figure 6.1
Division of Labour in the Japanese Motor Industry
Source: JETRO (1990), p. 1.

only two or three hundred ancillary firms: all the first layer subcontractors, some of the second layer, and a few independent companies. The first layer subcontractors are usually suppliers of major parts and components to the automaker and act in turn as parent firms to smaller enterprises (second layer subcontractors) to which they farm out the production of a number of components or stages in the production process. These smaller ancillary firms subcontract the manufacture of some basic parts or processes to yet another group of even smaller businesses (third, and even fourth layer subcontractors) which in most cases are little more than

workshops and come to constitute, in this sense, the base of the pyramid. Generally speaking then, the further removed in the production chain from direct dealings with the automaker (i.e. the higher the number of the subcontracting layer) the smaller the firm, the lower its capital intensity, wage level, value added and technological capability, and the more labour intensive its operations will be. Sheard (1983) notes in this respect that,

> 'This differentiation of subcontracting layer by firm characteristics gives rise to a filtering process whereby in general labour intensive, small batch and low value added operations are transferred successively down the layers of the production system in the form of subcontracting work from large to medium-sized to small to workshop firms, with firms at each level specializing in production tasks commesurate with their labour costs, technological level and capital intensity.' (Sheard 1983: 35).

More significantly, however, the relationship beween parent firms and their subcontractors has strong paternalistic overtones and extends far beyond a mere transactional one. Parent firms often have shareholdings in their subcontractors and dispatch directors, managers and even production workers to them. Furthermore, many subcontractors are partially if not fully integrated into the production system of the parent firm assuming a branch plant type character and must accept strict conditions and controls such as price and quality of product and delivery of transaction terms. The Japanese motor companies have succeeded, in this sense, in creating a system which can be characterized in terms of what Blois (1972: 243) first described as 'vertical quasi-integration', that is, a system structure 'whereby companies gain the advantages of vertical integration without assuming the risks or rigidity of ownership'.

The emergence of this system was the result of the particular conditions that prevailed in Japan in the period following the end of World War II. Up to that point, and like most of their Western counterparts, the Japanese companies had tried to vertically integrate and minimize their reliance on outside suppliers (Cusumano 1985). This all changed, however, in the 1950s. The auto industry went through a series of bitter strikes in the face of layoffs from 1949 to 1953, and when output began to expand, the motor companies avoided rehiring by shifting work out to suppliers. The main reason for subcontracting was thus to avoid renewed conflict with militant labour unions, and to support more tractable 'company' unions. Moreover, the strong egalitarian ethic that had emerged as a result of the labour settlements that had been reached with the new unions put the motor companies under strong pressure to employ only a relatively homogeneous group of individuals[1], and to therefore subcontract both less skilled work and more specialized tasks to other firms that drew their workers from a different segment of the labour market (Smitka 1991).

Additionally, there were other factors that made subcontracting appear like an attractive and sensible strategy. The end of the war had left many small manufacturers' facilities idle, and excess capacity remained until the late 1950s. By subcontracting parts production to such firms, the motor

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[1] Smitka (1991) notes in this respect that this is common practice in Japan. Companies usually limit themselves to employing a relatively homogeneous subset of individuals from a heterogeneous universe of potential workers. This is true even in smaller firms despite the lack of the unions or the bureaucratic dictates of large organizations.

companies could thus tap their resources: their unused capacity, their entepreneurial vitality and knowhow, the specialized skills of their work-force, and at the same time benefit from their relatively lower wage scales. In doing this, moreover, the automakers could avoid the capital expenditures necessary to expand output, and therefore concentrate their re-sources in those areas and processes with the highest value added component (e.g. manufacture of engines, final asembly) and hence maxi-mize their return on capital investment (Sheard 1983; Odaka *et al.* 1988).

For all its apparent advantages, however, the system had, from the automakers' point of view, one major drawback: a relative lack of 'control'. Since the suppliers were independent companies there was always the potential for coordination problems to arise (and they did arise), especially in issues concerning reliability of delivery and quality of parts. Furthermore, in the competitive setting of the 1950s there was always the possibility that a supplier could defect to, or be 'stolen' by, a rival auto firm. To avoid this sort of problems, the auto companies pressed their subcontractors to become more fully integrated into their production systems. They demanded, for instance, that suppliers dedicate most of their capacity to them and from 1956 on formed vertical networks of affiliated suppliers, or *keiretsu*[1] (Okumura *et al.* 1965 in Smitka 1991).

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[1] This type of *keiretsu*, also called 'vertical *keiretsu*' — Lamming (1993) uses the term *kyoryokukai* — is not to be confused with the much larger and powerful though more loosely integrated 'horizontal *keiretsu*' that dominate the Japanese economy. Though there are many similarities between the two, vertical *keiretsu* are usually formed around a big manufacturing

(continued...)

This — buttressed by the so called 'suppliers associations' created by the automakers to coordinate activities among the ancillary firms — placed the subcontractors under tight control and made it difficult for them to defect to a rival or develop other business relationships. To cement ties even further, the motor companies bought stock issued by their most important ancillary firms and fostered other links (e.g. dispatchment of key personnel, extension of credit, technical assistance, purchase of material imputs, etc.) that increased the suppliers' dependence on them (Odaka *et al.* 1988; Smitka 1991). This process was repeated at each layer of the subcontracting system, with first-layer subcontractors developing similar links with second-layer suppliers, and these, in turn, with third-tier firms, so that these thousands of medium and small-sized companies also became, in effect, part of the automaker's' *keiretsu* familiy and under its indirect but effective control[1].

The control gained by the automakers over their subcontractors was one the most crucial developments in the history of the Japanese motor

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[1] (...continued)
firm in a very strict hierarchical fashion, while horizontal *keiretsu* are more like alliances of equals comprising many large manufacturing, financial and trading firms usually aligned with a major bank. Thus the many suppliers of Mitsubishi Motors, for instance, would constitute part of that firm's vertical *keiretsu*, while the automaker itself together with other Mitsubishi companies (e.g. Mitsubishi Electric, Mitsubishi Heavy Industries, etc.) would be aligned with the Mitsubishi Bank and belong to the Mitsubishi horizontal *keiretsu*.

[1] The close and tightly-knit nature of this vertical *keiretsu* system can be best appreciated form the much publicized case of the American businessman T. Boone Pickens. In 1989, having bought 26.4 percent of the shares in Koito (the largest Japanese manufacturer of car lights and a member of the Toyota group), Pickens became the largest shareholder in the company (Toyota had only 19 percent) but was unable to secure a single seat on the board of directors. He went to court several times but to no avail, and finally gave up and sold his shares in June 1991 (see Lamming 1993: 26, 33).

industry. This not only allowed the auto firms to use this vast array of companies as extensions of their own organizations, but it also paved the way for the gradual and effective introduction of practices such as TQC, JIT, 'periodical price reduction' (a continual cost reduction process based on historical price indexing), and Value Analysis/Value Engineering (VA/VE), among suppliers, which — because of their larger share in the manufacturing process and the much tighter and exploitative conditions under which they worked — were thus able 'to make the single largest contribution to lowering the cost and improving the quality and performance of Japanese vehicles' (Smitka 1991: 136).

With so many of the parts going into a vehicle being manufactured by subcontractors, the quality performance of these firms had an enormous bearing on the overall quality of the vehicles being assembled at the auto firms. It was therefore in the interest of the automakers to improve the quality levels of their suppliers through the introduction of quality control techniques (first SQC and then TQC) at the latter's facilities. Some of the larger subcontractors, such as Nippondenso for instance, had been able to introduce QC independently and at about the same time, or soon after, the motor companies themselves had done so at their own factories (Cusumano 1985). For the majority of firts-tier suppliers, however, quality improvements in those early years were mostly derived from the technological upgrades and new machinery that had been facilitated by government support and the technical assistance given by the parent

companies (Odaka *et al.* 1988). Once QC activities had become established at the automakers' plants though, it was only a matter of time before these spread to their suppliers. Indeed, starting with Nissan in 1953-54, the auto companies began to develop comprehensive programmes to instruct suppliers on QC principles. These efforts gained momemtum in the 1960s, especially after Toyota embarked on its quest to win the Deming Prize, so that by the 1970s, TQC had become standard practice among the suppliers of all the Japanese automakers, and had even spread down the hieararchy to companies at the base of the subcontracting pyramid structures (Cusumano 1985).

The spread of JIT among suppliers was just as significant. Because of Japan's geography, and the great emphasis that Japanese companies had traditionally placed on close and direct face-to-face communication with their suppliers, ancillary firms had tended, by and large, to locate in close proximity to the automakers' plants. This represented a great asset when it came the time to implement a JIT delivery system since it minimized transport costs and the possibility of delay or disruption in delivery.

According to Ohno (1988), Toyota began to instruct suppliers on JIT procedures in 1963. Initially the emphasis was placed on JIT scheduling of incoming parts shipments. In practice this meant that instead of Toyota keeping inventory on its factory floors, suppliers kept inventory on theirs. Yet, with the gradual synchronization of deliveries — frequent deliveries

substituting for storage space[1] — and the assistance provided by Toyota for the implementation of other JIT techniques at its subcontractors' plants (so that they too could become 'lean'), the benefits of JIT were gradually spread down the supplier chain, and the regional production network came to function with a degree of 'precision approaching that of a single well organized factory' (Sheard 1983: VII).

This system was reproduced by the other Japanese automakers and their suppliers when they began to adopt JIT in the late 1960s, though never with the levels of efficiency achieved by Toyota and its subcontractors. Indeed, one of the main advantages Toyota has over its Japanese rivals — not to mention those overseas — stems from the fact that the majority of its assembly plants and most of its suppliers' are located in the vicinity of Toyota City (Robertson 1988) which makes the Toyota production network the most spatially concentrated production network in the world (Sheard 1983: 57). Keller (1993) gives a vivid description of the spatial dimension of Toyota's production network:

> 'It is hard not to be impressed by the vitality and action of Toyota City, perhaps the largest company town in the world, which is extended further by the large number number of suppliers whose operations spread into the surrounding towns and villages. Everything seems to be in motion at all times — an enormous industrial dance of parts delivery and production. ... The streets are jammed with parts delivery trucks day and night, and caravans of cars being taken to their destinations for shipping. Uniformed

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[1] This policy, however, has brought havoc to Japan's roads. With the widespread adoption of JIT by Japanese companies, trucks have become 'moving warehouses' and are responsible for the legendary traffic jams and overall congestion of Japanese roads.

> workers scurry to and from factories. With the exception of a few rice paddies, persimon trees, and small plots for growing onions and other vegetables, the entire landscape is devoted to cars.' (Keller 1993: 56)

Dyer (1994) reports in this respect that Toyota's internal-parts suppliers' plants are located, on average, less than 16 kilometres away from the assembly plants, while those of its affiliated and independent suppliers are, on average, only 48 and 140 kilometres away respectively. Nissan's suppliers by contrast are located, on average, at about 30 percent greater distance from Nissan's assembly plants — which are more spatially dispersed to begin with — than in Toyota's case, while those of the Big Three in the US are 5 to 6.3 times as distant. 'In fact', remarks Dyer (1994: 175),'Toyota's entire production network could fit between GM's two closest Michigan plants!'.

As a result of their close spatial proximity to Toyota's plants, suppliers are able to make, on average, more than eight just-in-time deliveries per day, and keep Toyota's inventories low (Dyer 1994). The levels of efficiency achieved by Toyota's production network are indeed remarkable when compared to those of competitors. Dyer notes in this respect, that Toyota's and its suppliers' inventories as a percentage of sales, for instance, are only one-half those of Nissan and its suppliers, and close to one-fourth those of GM, Ford, Chryler, and their suppliers. These low inventory levels translate into hundreds of millions of dollars in savings, which in turn translates — in the cutthroat competitive setting of motor

vehicle manufacturing — into a huge competitive advantage. Dyer states that if GM, for instance, had an inventory-to-sales ratio comparable with Toyota's, the US giant would roughly save between US$400 million and US$500 million per year. Not that GM and other Western companies have not tried to reduce their levels of inventories, but as Ikeda (1988) points out,

> 'Many of the US and European corporations which have introduced the JIT production system, for example, have successfully used the kanban system to reduce their inventories, only to find that this system cannot be applied to their outside suppliers because close cooperative relationships of the kind seen in Japan are not maintained with these firms. Since the automotive industry is one in which division of labor is dominant and outside suppliers are depended upon for a great deal...benefits...cannot be fully realized.' (Ikeda 1988: 5)

The spatial concentration and close ties of the Toyota production network also allows for greater communication between parent firm and suppliers. Toyota is thus able to engage, according to Dyer (1994), in an average of 7,325 man-days of face-to-face contact per year with its main suppliers, which is more than twice as many as Nissan, and seven times as many as the Big Three are able to accomplish. 'The result of this emphasis on communication', writes Dyer (1994: 176), 'is greater efficiency, faster product-development cycles, and more reliable products'.

Some of the greatest benefits the Japanese automakers have derived from the tight and powerful control they are able to exert over their supplier networks, has been in the area of cost reduction. The automakers have

been able to make what it may appear to be rather severe demands on their subcontractors to reduce in relative or absolute terms the per unit price of a part, component or process they are supplying. Sheard (1983) reports in this respect that an industry survey carried out among small and medium-sized Japanese ancillary firms in 1976 revealed that for 99 percent of subcontractors in the auto industry the unit price of subcontracting work was determined either unilaterally by the parent firm or through mutual collaboration between the two parties with the position of the parent firm being strongly reflected in the determined price in most of the latter cases. Smitka (1991) states that the automakers' cost-down demands are continuous, that is, suppliers are expected to reduce their prices periodically based on a historical price index; in the 1960s these reductions would have averaged 10 percent a year; while in the early 1980s the cost-down demands would have been in the order of about 3 percent every six months or so.

Sheard (1983) relates that the automakers have successfully exploited sets of circumstances to engender in their subcontractors a crisis mentality highly conducive to the acceptance of these exhorbitant cost-down demands. Thus, in the late 1950s and early 1960s, for instance, the automakers stressed the need to catch up to the technological level of other motor vehicle producing countries; in the mid- and late 1960s the imminent arrival of trade (1968) and then capital liberalization (1971) in the industry; in the 1970s the energy crisis of 1973 and 1979 that sent shock-

waves throughout the developed world but even more so in oil-dependent Japan; and in the early 1980s, the perceived need to counter the head-on challenge of the US automakers' world car strategies and the need to retain the newly attained position of number one auto producing nation in the world. In more recent times the demands have centred on the need to cope with *endaka* or strong yen which doubled its value against the US dollar in the period 1985-87, and doubled again between early 1990 and mid-1995[1].

Another way the Japanese automakers have been able to cut down their suppliers' costs (and hence theirs), though in a more equitable way, has been through the use of Value Analysis/value Engineering (VA/VE). VA/VE is defined by Tagliaferri (1994) as 'a problem-solving system designed to identify and remove cost from a product or service or to provide equivalent performance at lower cost without affecting quality'. First developed in 1947 by Lawrence D. Miles, an American industrial engineer at General Electric, VA/VE was first introduced into Japan in 1960 as part of a broad effort by Industry to apply industrial engineering techniques to cost reduction. Toyota was the first automaker to introduce VA/VE internally in 1962, and began teaching it to suppliers in 1963.

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[1] The Yen's revaluation has been particularly troublesome for the Japanese auto companies in the last three years, since this has been much steeper and has gone much further than they had anticipated or were prepared for (¥117-120 per US dollar), and the Japanese suppliers have, of course, been the ones that have borne the brunt of these increases. Yet, as analysts Arthur Andersen & Co. report (in Kerwin 1995) Japanese suppliers have been able (read 'forced') to cut down costs by 38 percent in 1993-1994, outpacing the 30 percent increase in the Yen's value against the US dollar during the same period(!).

Nissan followed in 1964, and used it extensively in collaboration with its suppliers for the design of its new 'Sunny' model which it eventually was able to produce for 30 percent less than the previous model despite enhanced performance (Smitka 1991).

While the details vary slightly from company to company, according to Smitka (1991) it has been customary for the automakers to split the savings generated by VA/VE 50:50. Thus, if a supplier came with a VA/VE study proposal for a certain part, for instance, it would be checked for feasibility by the automotive firm's engineering staff which would determine how much would this new design cut down costs; if it was estimated that it would cut down costs by, say, ¥500, then the price of the part would be effectively lowered by ¥250, increasing a supplier's profit margin by ¥250[1].

The Japanese have proved masterful in the use of VA/VE and, as Womack *et al.* (1990) report, have achieved enormous cost savings by designing parts and components that are more functional, easier to manufacture and assemble — which in turn is conducive to high performance in the assembly plant — and at the same time cost less and

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[1] The savings from redesigning a part or group of parts or components can in some cases be substantial. For example, in one case GM found that 41 percent of the productivity gap that existed between one of its factories and one of Ford's producing similar vehicles was traceable to the manufacturability of the two designs. The Ford car had many fewer parts — ten in its front bumper compared with 100 in the GM model (see Womack *et al.* 1990). In another case, GM's Cadillac division was able to save close to US$ 500,000 in annual labour costs by redesigning the rear bumper of its Seville model and cutting the number of parts in half to 63 which could be asembled in 8 minutes instead of the 18 it had required previously (see Woodruff and Levine 1991: 73).

are of higher quality than equivalent Western designs. Since suppliers design most of the parts they manufacture — 80 percent in Toyota's suppliers' case (US International Trade Administration quoted in Smitka 1991) — much of the savings the Japanese automakers have been able to realize from design improvements through the years have been the result of their subcontractors' efforts.

CHAPTER SEVEN

THE JAPANESE MOTOR INDUSTRY IN INTERNATIONAL PERSPECTIVE

THE JAPANESE MOTOR INDUSTRY IN INTERNATIONAL PERSPECTIVE

The high levels of quality and productivity achieved by the lean oduction system, coupled with the benefits derived from the close lationship and tight control they have over their subcontracting networks, ıve given the Japanese automakers a great competitive advantage over eir Western rivals in the international marketplace. The findings of omack *et al.* (1990) are, in this sense, very revealing. Despite the ıntroversial nature of some of their conclusions in reference to labour actices, there is no doubt that the US$5 million study project carried out ' the MIT researchers is the most thorough study ever conducted to date ı the motor industry. Thus, though scholars and analysts had been vare of the Japanese companies' advantages in both quality and oductivity since at least the early 1980s (see chapter three), most udies had only covered a limited number of plants — mostly in the US ıd Japan — and there was no clear idea as to how big and pervasive ese advantages were in comparison to the rest of the world. The MIT udy — which surveyed 90 assembly plants in 17 countries between 1985 ıd 1990 — filled, in this sense, an important gap in the information ıectrum. Table 7.1 summarizes some of their findings on the erformance of the many different plants according to their nationality and cation. These indicate a clear advantage of the Japanese manufacturers s-à-*vis* their Western counterparts in key areas of manufacturing and

assembly operation: productivity, quality, space utilization, level of inventories, workforce training and participation, levels of automation, etc.

TABLE 7.1
Summary of Assembly Plant characteristics,Volume producers, 1989
(Averages for Plants in Each Region)

	Japanese in Japan	Japanese in North America	American in North America	All Europe
Performance:				
Productivity (hours/veh.)	16.8	21.2	25.1	36.2
Quality (assembly defects/100 vehicles)	60.0	65.0	82.3	97.0
Layout:				
Space (sq. ft./vehicle/year)	5.7	9.1	7.8	7.8
Size of Repair Area (as % of assembly space)	4.1	4.9	12.9	14.4
Inventories (days for 8 sample parts)	.2	1.6	2.9	2.0
Work Force:				
% of Work Force in Teams	69.3	71.3	17.3	.6
Job Rotation (0 = none, 4 = frequent)	3.0	2.7	.9	1.9
Suggestions/Employee	61.6	1.4	.4	.4
Number of Job Classes	11.9	8.7	67.1	14.8
Training of New Production Workers (hours)	380.3	370.0	46.4	173.3
Absenteeism	5.0	4.8	11.7	12.1
Automation:				
Welding (% of direct steps)	86.2	85.0	76.2	76.6
Painting (% of direct steps)	54.6	40.7	33.6	38.2
Assembly (% of direct steps)	1.7	1.1	1.2	3.1

Source: Womack *et al.* (1990), p. 92.

Though some of these findings confirmed what was largely known or suspected, some of them were very surprising, most particularly in reference to Europe. In 1984, for instance, the same MIT researchers had estimated that the European producers were about half-way between the Japanese automakers and the American Big Three, that is to say not as competitive as the former, but certainly more efficient than the latter (see

Altschuler *et al.* 1984). After their five-year extensive survey, however, the MIT team had a totally different opinion:

> 'Perhaps most striking was our findings about Europe. Framingham, the North American [GM] plant that fared so poorly in comparison with Takaoka [a Toyota plant] and which has now been closed, in fact had considerably better productivity in 1986 than the average European plant had achieved by 1989. Indeed, as we marched through plant after plant we came to a remarkable conclusion: Europe, once the cradle of craft production in the motor industry, is now truly the home of classic mass production. Average American performance — under the relenting pressure from the Japanese transplants in North America — has improved dramatically, partly by closing the worst plants, such as Framingham, and partly by adopting lean production techniques at others. Europe, by contrast, has not yet begun to close the competitive gap.' (Womack *et al.* 1990: 86-87)

Indeed, one of the most eye-opening findings of the MIT study was the relative inefficiency of the European luxury-car makers, including the German ones (Daimler Benz, BMW and Audi) — which epitomize in the minds of millions around the world the excellence of German engineering and efficiency — compared to their Japanese counterparts[1]. Womack *et al.* report, for instance, that Daimler Benz achieves the high quality reputation of its Mercedes cars at an enormous cost in productivity. In a visit to one of its plants[2] the MIT researchers found that:

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[1] The Japanese plants surveyed by Womack *et al.* and used for the 'luxury' category comparison included those manufacturing the Honda Legend, the Toyota Cressida, and the Mazda 929; the three most expensive sedans being built by the Japanese companies for export in 1989. The Toyota Lexus and Nissan Infiniti models which were just being launched then were too recent to include in the survey.

[2] The name of the company or location of the plant is not disclosed in the MIT report but it is widely known by industry analysts to be Daimler Benz's Bremen factory. Similarly, the Japanese plant mentioned in the quote is known to be Toyota's Tahara plant (see Taylor III 1989: 66; 1991: 56).

> 'At the end of the assembly line was an enormous rework and rectification area where armies of technicians in white laboratory jackets labored to bring the finished vehicles up to the company's fabled quality standard. We found that a third of the total effort involved in assembly occurred in this area. In other words, the German plant was expending more effort to fix the problems it had just created than the Japanese plant [Toyota's] required to make a nearly perfect car the first time.' (Womack *et al.* 1990: 90-91)

The Japanese plant mentioned also turned out to be four times as productive as the average European plant and achieved quality levels far in excess of all the European luxury-car producers' plants except one (Daimler Benz's), and this, as can be deduced from the above, required four times the effort to assemble a comparable product. With performance like this, 'no wonder the Western luxury-car producers are terrified by the arrival of Lexus, Infiniti, Acura, and the Japanese luxury brands still to come', commented Womack *et al.* (1990: 89-90).

Indeed, the launch of these luxury Japanese cars, particularly Toyota's Lexus and Nissan's Infiniti, has been one of the most awesome displays of the Japanese automakers' engineering and marketing skills. When these were first launched in the US, back in late 1989, many analysts believed that they would be a marketing disaster. With no customer base and either new or completely separate showrooms, it seemed to many a mission impossible, even with all of the Japanese companies' huge capital reserves (*Autonews* January 1995). Moreover, with no 'pedigree' to speak of, many doubted that they could compete against the likes of Mercedes Benz and BMW in this most demanding and 'image conscious' segment of

the market (*The Economist* 23 December 1989). Within months of its launch, however, Toyota's Lexus was a stunning success; with an aggressive marketing campaign, pricing to match — at US$35,000[1], less than half the cost of a comparably equipped Mercedes 420 SEL (Taylor III 1989) — and a superb after-sale service, the Lexus made major inroads into the US luxury car market, and what is more, the LS400 model was widely acclaimed by the specialized press (e.g. *Automotive Industries*, *Road and Track*, *Road Test*, etc.) as the best engineered car in the world(!)[2]. By 1991 the Lexus had become the best-selling foreign luxury car in America, ahead of both Mercedes and BMW, and has topped the J.D. Power & Associates survey chart on quality and service (the industry's benchmark) every single year from 1990 to 1995[3] (*Reuters* 1995). Nissan's Infiniti division had a somewhat bumpier start than Toyota's Lexus, but it too was able to gradually increase its share of the luxury car market (see Fig. 7.1).

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[1] Because of the relatively free market access that foreign automakers have to the American market (2.5 percent tax on automobiles) plus the intense competition and the large volume of vehicles involved, the US has some of the lowest motor vehicle prices in the world. By way of comparison, a Lexus LS400, for example, which sold at the time of its introduction for US$35,000 (NZ$55,600 at 1989 exchange rates) in the US, cost NZ$140,000 in New Zealand when it was first introduced here in1990, or more than two and a half times as much. Most of this difference can be attributed, of course, to the stiff taxes imposed on luxury cars in this country (see *Autonews* January 1995: 68).

[2] Daimler Benz counter-attacked the Lexus offensive with the introduction of a new S-class series of Mercedes sedans in 1992, including the massive 600 SEL 408-hp (360 kW), 48 valve V12 sedan, which is now widely acknowledged to be the most advanced car in the world. But as *Automotive Industries* columnist Ken Gross (1991) puts it 'with the base price of its new S-Class at [US]$70,000 [US$150,000 for the 600 SEL] Mercedes must move further up-market to escape the Japanese. Soon there'll be nowhere to run.'

[3] The Lexus, in fact, broke new ground in 1990 by being the first automobile to achieve defect rates lower than 100 per 100 cars. For the 1995 model, the Lexus defect rate was 32 per 100 cars, the lowest rate ever recorded in the industry (see *Reuters* 1995).

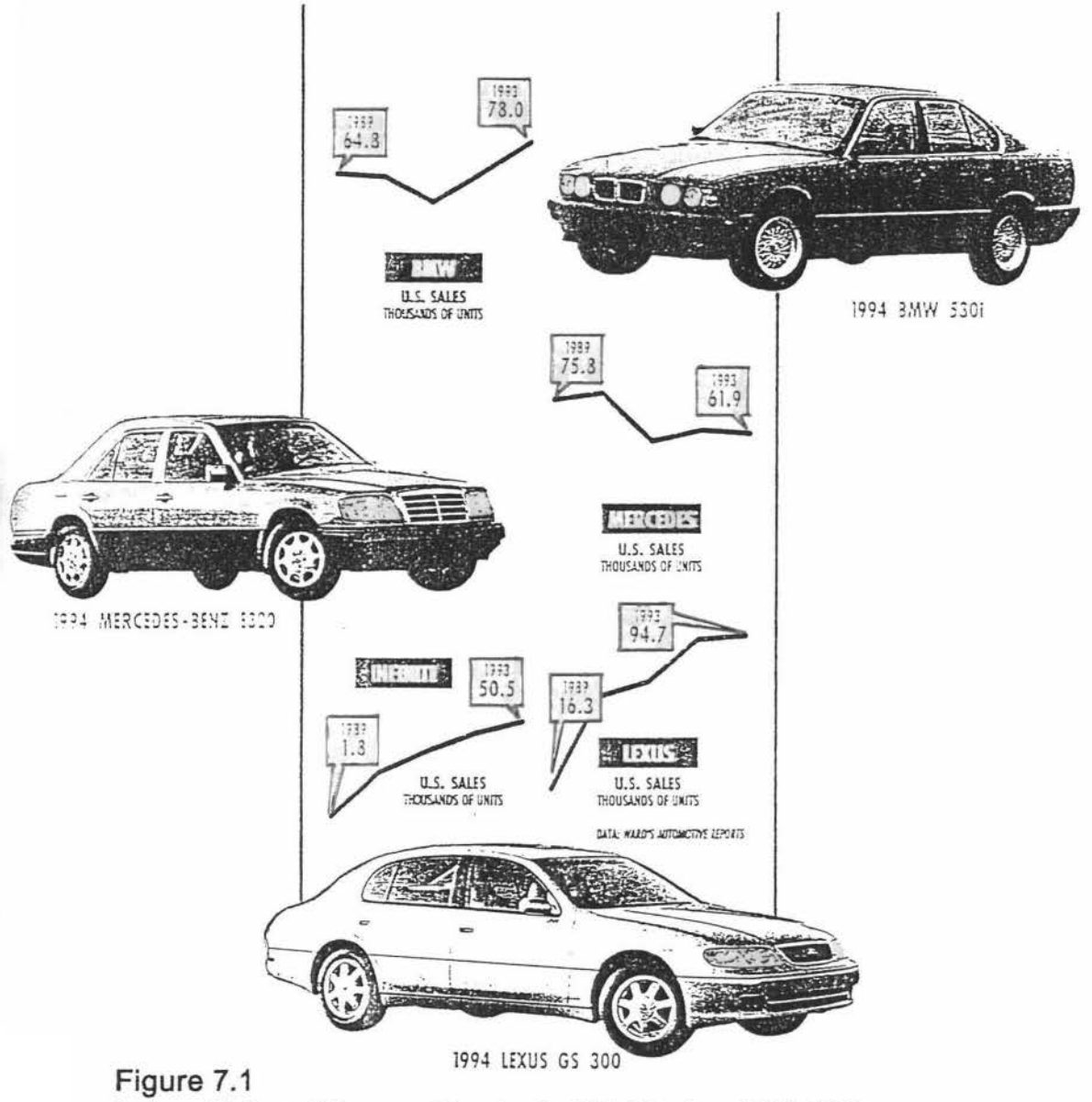

Figure 7.1
Sales of Selected Luxury Cars in the US Market, 1989-1993
Source: Business Week (7 February 1994), p. 44.

Perhaps, the most revealing aspects of the Japanese luxury cars are found in the way these were conceived and developed. The Japanese companies did an exhaustive marketing research for the development of their luxury automobiles, and spared no cash or effort in the task of bringing to market, vehicles that were as good or better than those of their famous German counterparts. Toyota, for instance, is reported (in Scott

1989) to have spent somewhere between US$500 and US$700 million per year (for 6 years) in the development of the Lexus, and that does not include the billions spent on the factory, plant and equipment. It built over 400 prototypes just for testing(!) (Gross 1989); and to test the cars in conditions that were as approximate as those found in its major export markets, it made exact replicas of their roads in its testing ground in Northern Japan. Scott (1989) relates his impressions after first seeing this compound and the incredible lengths to which Toyota went to build it:

> 'I mean, look at the place. This is Germany, right down to the genuine, specially imported white marker posts on secondary roads and every crack, depression and undulation on the autobahn's epidermis. What we are driving around is an exact replica of the roads near Cologne.
>
> A team of Japanese engineers, working with the German authorities, blocked the autobahn in the early morning hours, then coated the entire three-lane surface with special pressure-sensitive sheeting for a distance of three kilometres. After careful rolling, the sheeting was peeled back, its job of moulding the contours faithfully accomplished. Weeks later the template produced this perfect replica on the other side of the world. Same thing with Belgium. Toyota filled a 747 hold with cobblestones...and shipped them to Hokkaido. Switzerland? They've got that too. And France and Holland, and California and upstate New York...' (Scott 1989: 7)

Most amazingly, it took Toyota only six years to develop the Lexus from scratch; a remarkable feat, given the fact that manufacturers at this level take usually between eight to ten years — 16 years in the case of Mercedes(!) — just to make an effective (non-cosmetic) model change (Woodruff *et al.* 1990). Indeed, one the most revealing aspects of the report of Womack *et al.* (1990) has to do precisely with the speed at which the Japanese companies are able to develop new products. Pointing to

the work of Harvard researchers Clark and Fujimoto as well as to their own, the MIT team reported that in their study of 29 development projects reaching the market between 1983 and 1987, they had found that a totally new Japanese car required, on average, 1.7 million hours of engineering effort and took 46 months from the first design to customer deliveries. By contrast, the average American and European projects of comparable complexity and with the same fraction of carryover and shared parts took about 3 million engineering hours and consumed a total of 60 months. Clark and Fujimoto also found that while the American and European companies employed about 900 engineers over the life of a typical development project, the Japanese enlisted only about 485[1]. Yet, despite the much shorter time and the fewer number of people involved in each project, 85 percent of the Japanese development programmes reached the market on the timetable laid out at the beginning of development, while only half of the American projects and two-thirds of the European ones came in on time (Womack *et al.* 1990: 111-118).

Even more striking is the ability of the Japanese companies to introduce the new products into production with a minimum loss of quality and productivity. Thus Japanese plants taking on new models, for example, regain their previous productivity levels in about four months and their quality levels in only six weeks. Western plants, by contrast, have to

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[1] The Lexus development project though, required eight times as many: 24 engineering teams, comprising nearly 4,000 people (see Brooke 1989: 42).

struggle for a whole year to get productivity and quality to their original levels which was lower than that of the Japanese to begin with (Womack *et al.* 1990: 119).

These advantages in product development have allowed the Japanese companies to develop new models at substantially lower costs than their Western counterparts. Harbour (1991) estimates in this respect that while the average Western development project cost US$1 billion[1] in the early 1990s, the average Japanese project cost only one-third as much. This has, in turn, enabled the Japanese automakers to offer an ever wider variety of products and replace them more frequently than their Western counterparts. Thus, between 1982 and 1990, for example, they nearly doubled their product portfolio from 47 to 84 models (almost as many models as all of the Western firms combined) and have been renewing existing products every 4 years, or half the time it normally takes most Western companies to do so (Womack *et al.* 1990: 119).

Product proliferation is by no means a strategy confined to the automobile industry for it has been effectively used by Japanese companies in a host of other consumer products — motorcycles, cameras,

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[1] More recent estimates put the cost of the average development project at US$1.4 billion and it is not unusual to see development projects costing US$3 billion and more; the development of an engine alone (which may be used for more than one model though) costs, on average, US$ 1 billion (see Treece *et al.* 1995). Despite the sharp increase in the value of the yen, the Japanese, however, seem to have been able to maintain their development costs at about US$350 million per model change though Suzuki is reported (in Updike 1995: 20) to have been able to do model changes for as little as US$35 million(!).

watches, consumer electronics, etc — with devastating results for the competition. The benefits of such a strategy are many, but the most important is the ability to cater for the constantly changing needs and tastes of a wider range of consumers in different markets. Doing so, in record time is nowadays a key, if not *the key*, competitive advantage for, as Stalk (1988: 41) puts it, '[time is] as a strategic weapon....the equivalent of money, productivity, quality, even innovation'.

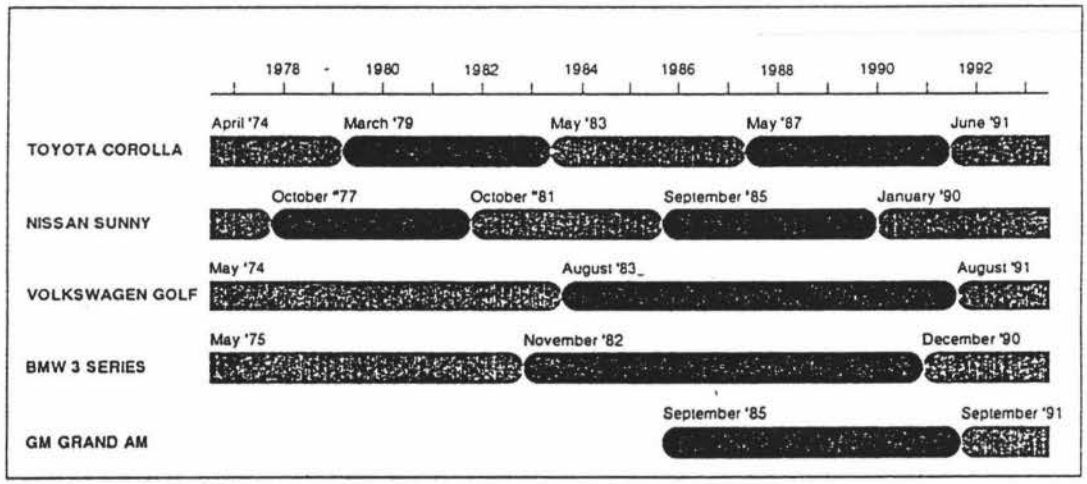

Figure 7.2
Full Model Change Cycles of Popular Japanese and Western Automobiles
Source: The Nikkei Weekly (1992)

With the benefit of hindsight one can see that product diversity has, in effect, always been the cornerstone of the Japanese automakers' marketing strategy and a major factor in their international success. Even in the 1950s, for instance, rather than following a Volkswagen (VW) type of approach (i.e. focus on a single product) which given their small size and budgets would have made a lot of sense in those days, the Japanese companies always strove to cater for the needs of the different segments

in the Japanese market and then, when the focus shifted to exports in the mid-1960s, to tailor their products to the tastes of consumers in their main exports markets, particularly the U.S (see Sobel 1985).

The experience of the biggest Western companies — GM, Ford and VW — illustrates, on the other hand, the negative effects of following a policy of trying to serve different markets with a single or limited range of products that do not take into account the differences in market-specific tastes and needs. VW, of course, was the epitome of this sort of approach. The German company, which in its early days had in its 'Beetle' model a simple, yet sturdy and good quality product, was during the 1950s and 1960s enormously successful in international markets (Rader 1980). Yet, its obsessive focus on a single product — basing all of its strategies and future plans on producing more and more of it — was, as Keller (1993: 159) puts it, 'as though the company was producing bread or beer, and never expected to change the recipe'. As time went by, however, the inevitable occurred: the attractiveness of the car faded and overseas sales plummeted. Yet, when it was time to make some changes the company again concentrated its efforts on a single model[1], 'the Golf' (or 'Rabbit' as it was called in America), which it developed without taking into account the needs or tastes of markets other than the German one. Not surprisingly, outside of Germany and the 'captive' EEC markets, the Golf was a major

[1] VW did develop during the 1970s other models like the Passat and the Polo, but the manufacturing and marketing emphases of the company remained focused on the Golf which VW regarded as the new 'Beetle' so to speak.

flop; and VW's share of the US market, for instance, which had stood at an impressive 10 percent in 1959 dropped to less than 1 percent by 1978; worse, the company was left with a huge stock of 100,000 vehicles which it could not sell in the US (Rader 1980; Sobel 1985). Yet, instead of responding to changing consumer tastes, VW retreated into a defensive posture, in this case that Americans simply did not appreciate sophisticated engineering. When one dealer complained about the lack of certain features in the VW models that were regarded as important by American consumers, he was told by VW management that 'VW makes engineering decisions, not marketing decisions. We let the market come to us' (quoted in Keller 1993: 205). 'This arrogance about the superiority of the product', writes Keller (1993: 205-206), 'has been conveyed into an excuse for poor sales. It's not the company's fault. It's the customer's.'

More recently, from the late 1970s on, Ford and GM have tried to follow a so called 'world car' strategy which has focused on the development of vehicles with a 'universal appeal'. In theory this was a fine and sensible idea: to use the know-how and expertise of these companies' many operational divisions in North America, Europe, Brazil and Australia, as well as those of allied companies such as Mazda and Isuzu[1] in Japan, and Kia and Daewoo in Korea, to produce vehicles that would incorporate features that would make them appealing to customers all over the world

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[1] Ford and GM have had a stakes in these Japanese companies since the 1970s. Ford has a 25 percent stake in Mazda and GM a 37.5 percent stake in Isuzu (Ward's Automotive International 1993).

and hence take advantage of huge economies of scale[1] (see Maxcy 1981; Dicken 1986, 1992). In practice, however, the 'world car' projects have been in both development and sales a disappointment at best. At the development stage, Ford's 'world car', the Escort, for instance, was troubled by a multitude of problems and complications. The Europeans of Ford of Europe and the Americans from the North American Automotive Operations, managed to specify so many changes to this 'world car' to accomodate, respectively, European and American tastes and manufacturing preferences, that on launch day, the European and American versions of the Escort, although practically indistinguishable from the outside, shared — literally — only two parts: the ashtray and the instrument panel brace (Womack *et al.* 1990: 211-212). From the sales point of view, results have also been disappointing. So much so in the case of GM, that the company has abandoned this strategy altogether. Ford is the only automaker that still remains committed to the idea of building and marketing a 'world car' even though its latest attempt, the Mondeo/Contour model (launched in 1993), which cost US$6 billion and took 6 years to develop, has done relatively well in Europe but has been a major flop in the US (Treece *et al.* 1995).

The relative failure of the 'world car' projects is the result of the fact that a single car cannot incorporate all of the features deemed to be important

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[1] These projects were, in addition, supposed to profit from an international division of labour, with each of the companies regional operational divisions concentrating on the production of what it did best or more cost efficiently.

by all of the marketing organizations that will eventually have to sell the car. Moreover, as Ohmae (1989) notes, if a team of engineers has to design a global car, they would have to add up all of the various national preferences and divide by the number of countries. They would have to optimize across markets by a kind of rough averaging. 'But when it comes to questions of taste and, especially, aesthetic preference, consumers do not like averages. They like what they like, not some mathematical compromise'. Thus, Ohmae, concludes:

> 'When it comes to product strategy, managing in a borderless world doesn't mean managing by averages. It doesn't mean that all tastes run together into one amorphous mass of universal appeal. And it doesn't mean that the appeal of operating globally removes the obligation to localize products. The lure of a universal product is a false allure.' (Ohmae 1989: 155)

In trying to design their vehicles, the Japanese companies have, as noted earlier, always striven to tailor their products to individual markets. This does not necessarily mean country-specific, but rather region-specific products. Yutaka Kume, Nissan's president, explains (in Ohmae 1989) the way this is done at his company, which is representative of the Japanese approach: Nissan Management divides the world into what they call the Triad, that is the three major world markets — Europe, North America and Japan. Then, they look at each region and identify each market's 'lead country'. In Europe, Nissan's 'lead country' would be the UK, its biggest market there; in North America, it, of course, would be the US. Then the main requirements of the 'lead country' are examined and a list of models suitable to fill those needs are proposed. Once this list is compiled, a

consultation process takes place whereby managers in others parts of the Triad are asked whether minor changes can make any of these models suitable for local sales. Kume, relates the success Nissan has had in following this type of strategy:

> 'With this kind of thinking, we have been able to halve the number of basic models needed to cover the global markets and, at the same time, to cover 80% of our sales with cars designed for specific national markets. Not to miss the remaining 20%, however, we also provided each country manager with a range of additional model types that could be adapted to the needs of local segments. This approach allowed us to focus our resources on each of our largest core markets and, at the same time, provide a pool of supplemental designs that could be adapted to local preferences. We told our engineers to "be American", "be European", or be "Japanese". If the Japanese happened to like something we tailored for the American market, so much the better. Low-cost, incremental sales never hurt. Our main challenge, however, was to avoid the trap of pleasing everyone halfway.' (quoted in Ohmae 1989: 155)

In recent years this process has become even more localized as a result of the globalization efforts of the Japanese automakers. The Japanese companies are, in fact, striving to create top-to-bottom, paper-concept to finished-car manufacturing systems in each of the major markets of the Triad. This, however, is a strategy which they have followed by the force of circumstances — mainly the erection of trade barriers — rather than by their own design. Indeed, throughout its history the international location of the motor industry has been strongly influenced by the trade policies of national governments, and almost all foreign direct investment decisions have been prompted by tariff barriers to exports (Maxcy 1981; Dicken 1986). In the Japanese companies' case, the circumvention of trade barriers has been, in effect, the most powerful

incentive, and in the early years almost the only incentive, to invest in other countries. True, in the case of companies like Nissan and Honda there was the added incentive of circumventing Toyota — unable to match Toyota's efficiency at home they thought they had much better chances for growth at overseas locations (Mair *et al.* 1988). By and large, however, given the unique features of their manufacturing and subcontracting systems (which they viewed as the bases of their comparative advantage and that were, in their judgement, impossible to reproduce overseas) there was a great reluctance on the part of the Japanese automakers to set up manufacturing operations abroad (Monden 1983).

Yet, faced with import restrictions in many parts of the world, the Japanese firms had little choice but to invest in countries where they wanted to maintain a market access, and thus during the 1960s and 1970s the bigger companies — Toyota, Nissan and Honda — managed to gradually develop a global network of assembly plants. The vast majority of these, however, were very small operations and were, for the most part, located in low-cost developing nations. Sheard noted in this respect (in 1983) that :

> 'The typical overseas assembly plant of a Japanese maker...is located in a developing country, was established in the late 1960s or early 1970s in response to the import substitution schemes of the host countries, is very small in scale (most have an annual capacity of less than 6,000 vehicles) ...and engages in assembly of complete knock-down sets exported from Japan.' (Sheard 1983: 55)

Indeed, 'before 1982 there was not a single Japanese automobile

production plant outside Japan' (Dicken 1992: 294). As far as serving the developed countries' markets was concerned, this was done exclusively by direct exports from the Japanese automakers' home plants (Maxcy 1981). The Japanese companies were able to do this because during the period of rapid world economic growth from the end of World War II up to the time of the oil shocks, barriers to automotive trade in the developed world had been progressively dismantled, and thus for most of the 1960s and 1970s the Japanese automakers had a relatively easy and direct access to the highly profitable markets of North America and Europe (Altshuler et al. 1984: 7).

However, as noted in chapter three, all this changed after 1979. The erection of trade barriers — in the form of VERs — and the looming threat of even more restrictive protectionist measures in their main foreign markets prompted the Japanese companies to radically alter their international strategies. For a start they increasingly shifted the focus of their exports from the small-sized economy cars for which they had become known (e.g. the Toyota Corolla and Toyota Corona, the Nissan Sunny, the Honda Civic) to the bigger and more expensive models (e.g. the Toyota Cressida, The Nissan Maxima/Bluebird, The Honda Accord) they could now build. The higher profit margins they derived from these larger models plus the fact they were now able to charge premium prices for their smaller-sized automobiles — in high demand by consumers but in relatively short supply as a result of the VERs — meant windfall profits for

the Japanese automakers, so that with the same or lower volume of exports than before they were now able to realize much higher profits overall (Kenen 1994). This is a strategy that has continued until the present, and most Japanese car exports are increasingly made up of upmarket models. Japanese motor vehicle exports to the US in 1994, for instance, included 209,050 luxury cars (Regan and Dunham 1995) — a decade ago the export category of 'Japanese luxury cars' did not exist.

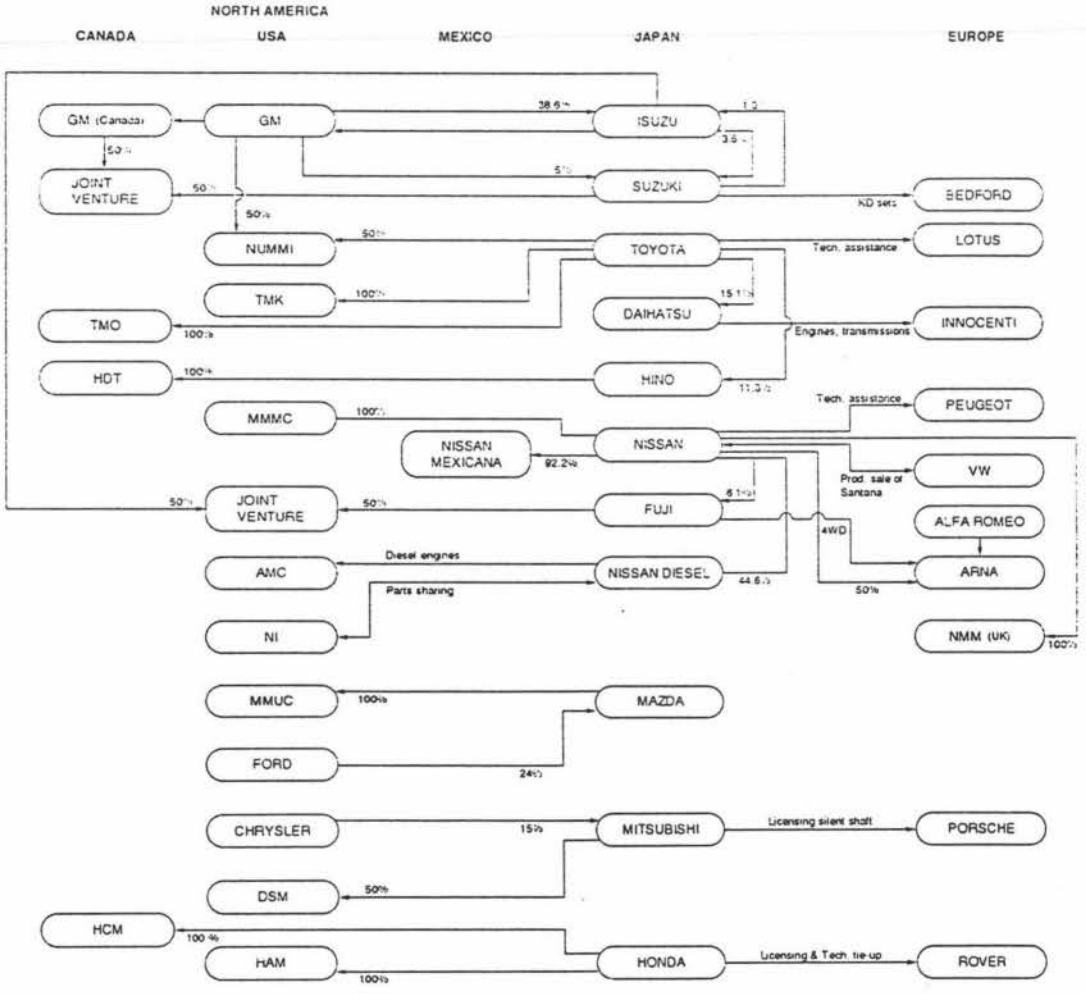

Figure 7.3
Investments and Tie-ups of Japanese Automakers in N. America and Europe
Source: Dodwell (1986)

To deal directly with the protectionist measures themselves, however, two main strategies were devised: the development of a network of joint ventures and other types of commercial arrangements with foreign manufacturers in key overseas markets, and the establishment of production facilities — better known as 'transplants' — in both North America and Europe. Fig. 7.3 shows in this regard the numerous and complex set of relationships that were established between Japanese and Western automakers during the early 1980s[1] as well as some of the first wave of investments made by the Japanese companies in production facilities in North America and Europe.

For the Japanese automakers the main advantages of establishing joint ventures with Western manufacturers lay in the fact that these constituted a way of securing access to their foreign partners' home markets and at the same time minimized the risks involved in setting up operations abroad (Robertson 1988, Kobayashi 1988). This was especially true when it came to the establishment of production plants for these allowed the Japanese companies to learn from their overseas partners about operating actual manufacturing facilities in foreign environments. The most important of the joint ventures was, in this sense, the one established by Toyota and GM in Fremont, California in 1983: the New United Motor Manufacturing Inc.

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[1] Womack reports (in Mowery 1988: 307) that: 'Since the full emergence of the Japanese industry in the late 1970s the rate of joint venture formation in the motor sector has accelerated dramatically. More tha 100 transnational joint ventures have been initiated worldwide since 1980, the majority since 1984'.

(NUMMI). Lamming (1993) describes the motives behind each company's decision for this undertaking and the advantages each sought to achieve from it:

> 'NUMMI represented a foothold in the USA for Toyota, at the expense of letting GM "in on a secret" (the Toyota method), whilst for GM the venture was a learning exercise (GM managers from many US plants were sent to learn in NUMMI) at the expense of letting a competitor into its home market. Toyota also underwent a learning exercise about operating in the USA, benefitting from its local partner's knowhow in a social and cultural sense. The venture itself had its own purposes: to build a successful small car (Chevrolet Nova/Toyota Corolla) and to show that Japanese manufacturing techniques could work with American labour, infrastructure and plant.' (Lamming 1993: 89)

Indeed, the fact that the NUMMI venture was set up in what had previously been a problem-ridden and money-losing GM plant, and that Toyota was able to convert it in no time into an extremely efficient and profitable enterprise, demonstrated beyond any doubt that lean production methods could be successfully 'transplanted' to foreign environments (Berggren 1993:). Honda and Nissan had also set up their own transplant facilities in the US in 1982 and 1983 respectively, with similarly encouraging results (Mair *et al.* 1988). These successful experiences dispelled whatever doubts the Japanese automakers had about the viability of running production facilities abroad; and this, coupled with the effects of *endaka* (strong yen) after 1985, signalled the start of a second wave of Japanese investments in North America. Accordingly, Honda (1986 and 1989) and Toyota (1988, 1988) went on to open another two plants each, while Nissan (1991) built one additional factory in joint owner-

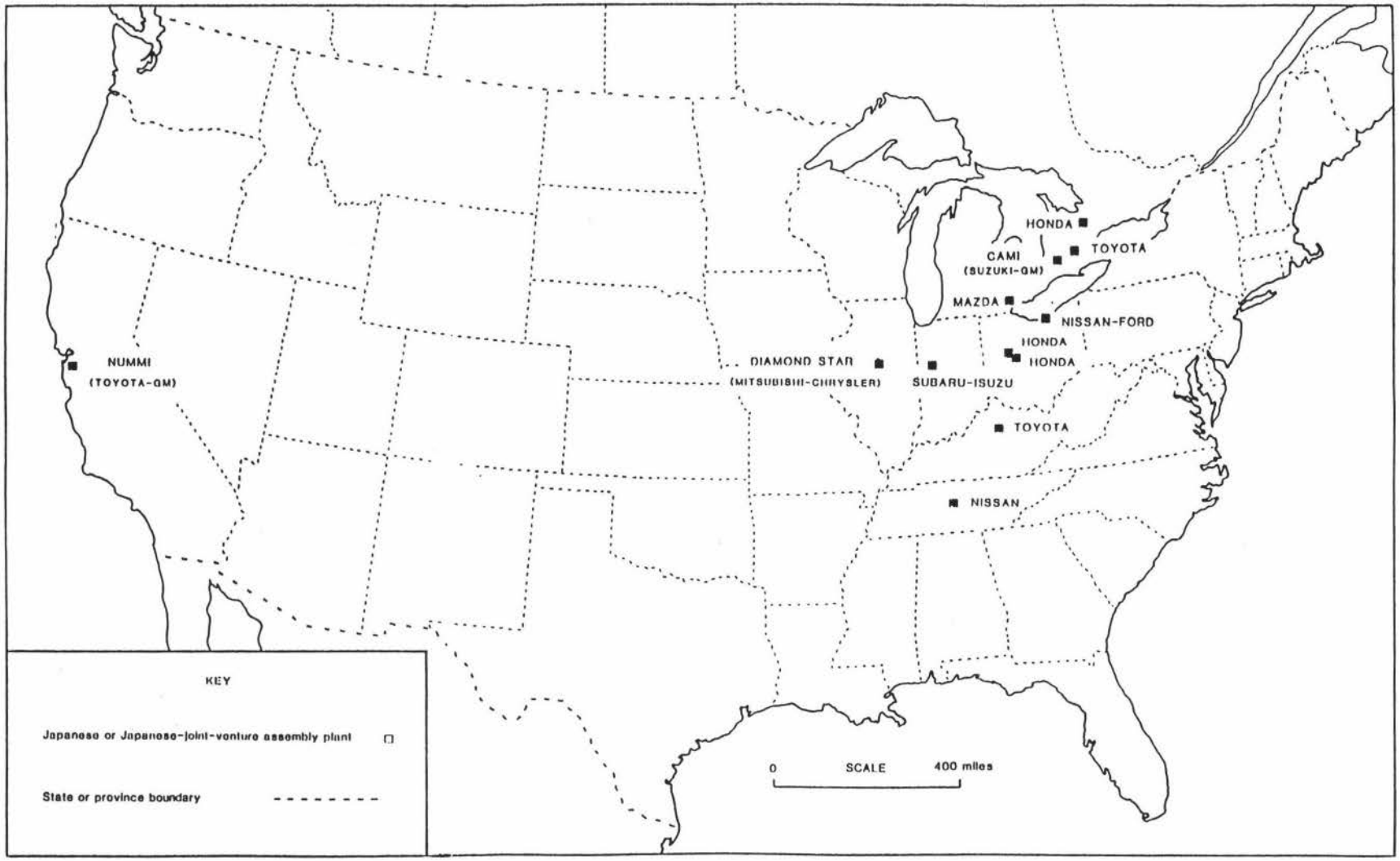

Figure 7.4 Japanese 'Transplant' Production Facilities in North America *Source:* Mair *et al.* (1988), p. 362.

ship with Ford. Mazda (1987), Mitsubishi (1988), and Suzuki (1989) also established plants in joint venture arrangements with American automakers[1], while Subaru and Isuzu (1989) went on a 50:50 partnership of their own (Mair *et al.* 1988; Kenney and Florida 1991). Altogether there were 12 Japanese transplants (Fig. 7.4) with a total planned production capacity of 2.7 million vehicles set up in the period 1982-1992 (Dicken 1992: 295). The pace at which these investments have taken place is unprecedented. Womack *et al.* (1990) commented in this respect, that:

> 'The speed and scale of this process are truly extraordinary. Indeed, nothing like it has ever occurred in industrial history. In effect, between 1982 and 1992 the Japanese will have built in the U.S. Midwest an auto industry larger than that of Britain or Italy or Spain and almost the size of the French industry.' (Womack *et al.* 1990: 241)

Just as extraordinary has been the way in which the Japanese companies have been followed to North America by a large number of their suppliers from Japan — over 400 of them (Lamming 1993). Encouraged by the automakers as well as MITI (Reid 1989), the suppliers have set up production facilities in close proximity to the assembly plants. The Japanese automakers have in this way tried to reproduce their subcontracting and just-in-time delivery systems in North America and have in the process radically changed the structure and spatial distribution of motor vehicle production in that continent (Mair *et al.* 1988, Kenney and Florida 1991).

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[1] Even though these plants are jointly owned by Japanese and American automakers, they are still considered Japanese transplants for they are run under Japanese management using lean production methods.

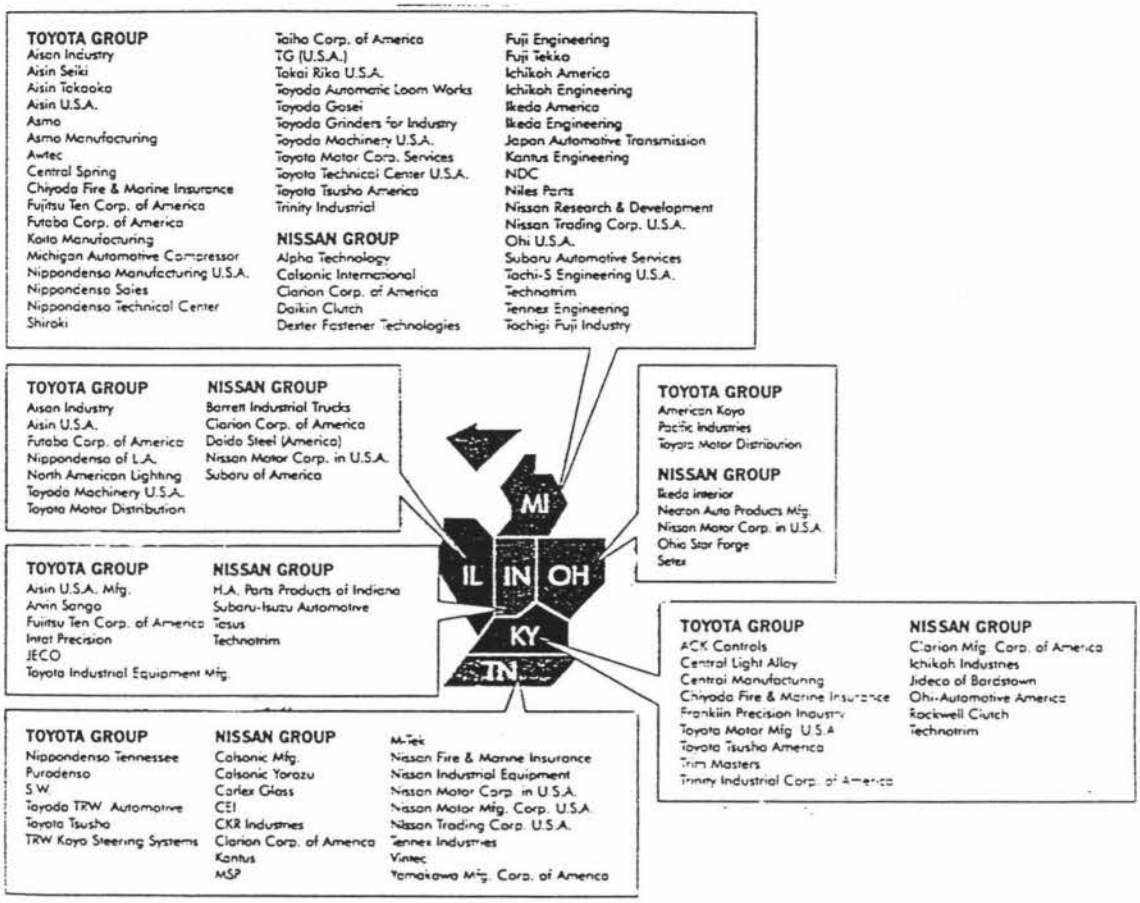

Figure 7.5
Toyota and Nissan's *Keiretsu* Network in America
Source: Rapoport (1991) p. 84.

The Japanese automakers have also made considerable investments in engine, transmission, and components plants. Honda, Nissan, Mazda and Mitsubishi have established North American product and product-processing engineering operations as well. These centres are growing rapidly and have received renewed impetus with the revaluation of the yen in recent years. They are already doing significant design and engineering work too: the body alterations needed to create the Honda Accord sedan were engineered at Honda's Marysville engineering centre in Ohio, and all the production dies were cut there as well. Similarly, Nissan's Ann Arbor enginering centre has done similar engineering work on the coupe version

of its Sentra model (Womack *et al.* 1990). More recently, The Toyota Previa van and the new Avalon model, for example, were both designed in the US, and the latter was also built at Toyota's assembly plant in Kentucky (Kamath and Liker 1994).

In Europe, Japanese progress has been much slower due to political factors. Market restrictions in the Latin European countries (France, Italy, Spain and Portugal) and in the UK, for instance, have limited the Japanese companies to an 11 percent market share overall in the EU; while the rules for entry for manufacturing, which include domestic content requirements of 60 percent (80 percent after two years), make it substantially more expensive to set up production facilities there: the Japanese companies cannot just build assembly plants, but they have to also construct an engine plant and develop local suppliers for a host of components simultaneously (Robertson 1988). In spite of these restrictions, however, the Japanese automakers have made substantial investments in the EU and have established production facilities in a number of countries (Fig. 7.6). The largest most important of these are those located in the UK which has become host to three Japanese assembly plants with a production capacity of a half a million vehicles (Jones and North 1991).

What the Japanese automakers are evolving towards, then, is a worldwide structure along the following lines: there will be a strong Japanese parent with two full-range subsidiaries, one in America and one

Figure 7.6
Japnese Auto Plants and Related Activities in Europe
Source: Jones and North (1991), p. 113.

in Europe. Each of the three will design motor vehicles and components to match local tastes. Ultimately, no parts will be shipped across oceans, though some designs will be. But each will export vehicles to one another. An 'American' car for instance, would be designed and built in the US for the local mass market, but also exported as a niche product to Japan and

Europe. This is similar to what GM and Ford already practise in Europe, but with one important difference: the American firms' subsidiaries rarely trade cars or parts with their parent company.

None of the Japanese firms is anywhere near this goal; they make only one or two models at each plant, which is too few. Honda in Ohio may be the closest, with its wider model range and higher output, though the company's progress in Europe has been rather slow. Yet, there is no doubt that the efforts on the part of the Japanese companies to increase local production will continue: because of the effects of *endaka*, a tri-polar strategy is no longer just a marketing ploy but a necessity, and for some companies, such as Nissan and Mazda, even a matter of survival.

Outside the three major world markets, the Japanese companies have also established a very strong presence. This is particularly true in the Asia-Pacific region where they already lay claim to an estimated 80 percent of total sales (Robertson 1992). The Japanese have secured this position with their usual combination of long-term thinking, persistence, and flexibility. In countries that ban auto imports from Japan, such as South Korea, the Japanese have taken minority stakes in Korean auto companies and provided technology or parts supplies. In countries whose political and economic stability and economic prospects have been uncertain, such as the Philippines, the Japanese have signed on with local partners and have cautiously expanded their presence. Since Asian

governments worry about the prospect of Japanese economic domination, Japanese automakers have smoothed the way by helping to build local motor industries and have been remarkably successful in developing a regional auto-production base (Hata 1992).

While the individual markets of developing Asia are tiny compared to those of the US, Europe and Japan, collectively they are becoming an important part of the global auto market. The region as whole, is in fact, the world's fastest growing market, already responsible for half the world's new motor vehicle demand; and by the beginning of next century it could be as large as one of the Triad markets (Robertson 1992). In the global 'auto wars' Asia could in fact become the Japanese companies' triumph card. As Womack *et al.* (1990) remark:

> The failure to establish a manufacturing presence in Japan or elsewhere in East Asia — to seriously challenge Toyota, Nissan, and Honda in their home maket and take away this rich profit lode — is surely one of the West's worst competitive lapses.' (Womack *et al.* 1990: 209)

If it was left to market forces alone to decide future developments in the global motor industry, the Japanese automakers would be virtually unstoppable. Yet, political rather than purely economic factors often come into play in deciding developments in many markets. It is here that strategy (especially commercial and political strategy) comes into play and the Japanese automakers have so far proved masterful strategists in all the markets they have cared to enter, gaining market share through a

combination of aggressive marketing, the tailoring of products to suit local needs, low pricing (including 'dumping'), excellence in customer service; and cicumventing trade restrictions or other obstacles by active lobbying, and as we have just seen, by the formation of joint ventures with local manufacturers and the establishment of assembly plants.

Given their advantages in efficiency and productivity *vis-à-vis* their Western counterparts, and the success their strategies have had in the past as far as market penetration and circumvention of trade restrictions is concerned, the Japanese automakers are well poised to make further gains globally in the future. True, in the last few years they have experienced many difficulties associated with *endaka* which, coupled with slumps in both Japan and their main foreign export markets, have hurt their overall competitiveness. Yet, the underlying financial structure of the Japanese companies is extremely solid — Toyota, for instance, is reported to have US$35 billion in cash reserves (Ingrassia and White 1994) — and, even in this time of crisis the Japanese automakers continue to invest in the future. Many, for instance, are increasing spending on production automation to help offset the country's acute labour shortage; and despite profit worries, research budgets are been beefed up rather than cut. That level of capital investment means that the automakers are likely to roar out of this slump the way they emerged from the 1970s oil crisis and the mid-1980s yen runup: once the recession lifts and the financial markets stabilize they will probably go back to their agressive growth policies.

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