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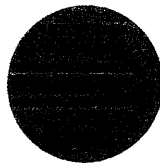
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**THE DECLINE OF  
THE JAPANESE AUTOMOTIVE INDUSTRY:  
CAUSES AND IMPLICATIONS**

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**MITJP 96-21**

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## I. Introduction<sup>1</sup>

Until a few months ago, it was common knowledge that “lean” production systems, together with flexible factories, gave Japanese automotive manufacturers an almost insuperable advantage in world markets. To the superior management highlighted in *The Machine That Changed the World*, most added the advantages of low labor and capital costs and a supportive government. Japanese firms are also held to be willing and able to engage in dumping and other unfair practices with impunity, given the laissez faire attitudes of successive Republican administrations in the U.S. In sum, but for limited political intervention on the trade front, what remains of the auto industry in the U.S. would have vanished. Having watched the transformation of the North American market, Europeans are convinced that their industry would soon follow an equally inevitable path to oblivion. They, however, are making a preemptive effort to restrict both imports and new “greenfield” entry.

Indeed, the past decade *has* been traumatic for the U.S. auto industry. The term the “Big 3” is now a misnomer. In passenger cars, GM and Ford held the #1 and #2 spots in 1992, as they have for decades, but Honda was 3rd and Toyota 4th. Chrysler in 5th place maintained a comfortable lead only over Nissan, the laggard of what should now be termed the “Big 6”.<sup>2</sup> Similarly, General Motors may still be #1 world-wide, but the United States industry proper has lagged Japan in total output since 1980, and in 1991 was behind the European Community as well. We have seen equally dramatic changes in technology, the structure of the market (at least within the U.S.) and trade.

During the next decade we will again see immense flux in the world automotive industry, as the geographic locus of production moves south and trade patterns again shift, while technical change continues apace. The most notable of these will be the rise of North American production alongside the decline in world markets of the Japanese industry. Indeed, the resurrection of Chrysler and Ford’s snatching of the top-selling car slot from Honda—Ford also has the best-selling truck—presage this change. Meanwhile, the recession in Japan is battering their industry.

What I argue here is that the problems in Japan go beyond those caused by a brief downturn. The Japanese industry enjoyed two major advantages over that in the U.S.: a lower cost base and

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1. Unless noted otherwise, data are converted at ¥111 = U.S.\$1.00. To maintain simplicity and stylistic variation, I use “American” and “U.S.” though in most places I mean U.S. *and* Canadian *but not* Mexican.

2. In terms of total vehicle sales, however, the Big 3 remain distinctly on top, since they dominate the light truck, minivan and sport utility segments. Chrysler alone sold over 500,000 minivans in 1992.

better management. Luck also smiled upon them; they were uniquely situated to take advantage of the structural change that followed from the 1970s oil crises. But these twin gaps have now been closed, if not reversed, and the run of good luck has ended. Indeed, the red ink that is starting to appear in Japan is not primarily a function of their current recession. It is, rather, an indicator of the rapid loss of competitiveness of the Japanese industry, and will not readily be overcome. One indicator of this is that U.S. assemblers and parts producers are both beginning to take export markets seriously, for the first time in many decades.

First, while “Japanese” management *is* better, it is *not* uniquely Japanese. Under pressure from foreign competition, and with those very firms as tutors, the old core firms—even, recently, GM—undertook to reform and renew their management. New, more efficient firms also established production bases in North America. Interfirm variation remains, but this no longer follows national boundaries, and is no longer central to bilateral differences in competitiveness. Indeed, Chrysler now sets the standard for product development, and for rethinking its product strategy.

Meanwhile, Japan’s cost base shifted; it is now (with Europe) a high-cost location. Indeed, I estimate that Japanese labor costs for the industry as a whole are 17% above those in the U.S. This is critical, because 41% of automotive production is exported, and a loss of export markets would be disastrous. Furthermore, despite half-hearted government attempts to slow down investment in the industry during the “bubble”, major additions to capacity are now coming on-stream within Japan. Cost problems aside, the timing is abysmal, because home and foreign markets are stalled, while the bonds issued to fund this expansion must now be refinanced at much higher interest rates. The industry’s competitiveness has eroded, and its luck has run out.

In contrast, the North American industry is on the whole healthy. However, this does not mean that the Big 3 and the UAW will return to their former positions of glory. Japanese firms now account for 2.4 million units or 20% of assembly capacity in the U.S. and Canada, and there has likewise been entry by Japanese and European parts makers. The Big 3 will never fully reverse this loss of market share, particularly as GM remains weak in the high-volume middle of the market. At the same time, new entrants in parts production and assembly are not unionized (though there are exceptions), while the Big 3 continue to “outsource” parts now made internally. Both cut into union power, and the UAW’s steady decline in influence will continue. Indeed, should Clinton’s health care reforms fail, there will be real pressures to cut into benefit packages. But outsourcing will not necessarily mean gains for traditional parts firms, either. As outlined below, their market has shifted

in both quantitative and qualitative terms. Auto makers are less and less interested in purchasing simple parts, and traditional firms are on average ill suited to sell the sophisticated bundle of design and manufacturing services their customers are demanding. But again, much of this transition has now been completed.

Thus part of the recovery of the industry in the U.S. and Canada is due to new entry by more efficient firms and exit by those less capable. Overall industry employment has seen surprisingly little change. (See the accompanying tables.) It is hard, however, to exaggerate the social trauma that accompanied this transition, and this makes it easy to sympathize with the European attempt to limit not just imports, but also new entry within the EC, however futile this may prove. ("European" firms are not so constrained; GM, for example, has opened a plant at Eisenach, in former East Germany.) The Japanese industry will likewise face massive adjustment; Isuzu has already exited from passenger car production, Nissan has announced a major plant closing, and other firms are in precarious health. In contrast to the U.S., however, I argue that the adjustment costs will be far smaller in Japan.

This paper traces the decline of the Japanese auto industry, from the perspective of North America. Alongside a detailing of the "twin gaps" story of the ascent and waning of the industry in Japan, I sketch the corresponding fall and now rise of that in America. Indeed, the U.S. is currently the most desirable place in the world to build cars. As a result, for the first time since the 1920s we are seeing a strategic focus on export markets by the U.S. industry. In parallel with this, exporters based in Japan and (more recently) Germany are focussing on local production.

The consequences of this are far-reaching. The import share of the American market will continue its steady decline, while U.S. exports will rise rapidly; both Japan and Europe will become significant markets.<sup>3</sup> Total Japanese exports will likewise diminish, though in the short run this will be partially offset by the rapidly growth of markets in Southeast Asia and Latin America, in which American firms have a weak base. For the 800,000+ workers in the American industry, this will be good news. It will mean hard times in Japan, where the industry also employs 800,000. Trade tensions will ease with Japan; they will increase with Europe. More generally, the diffusion of "lean" production will place pressure on all high-cost producing regions—similar changes are beginning within the EC—while the rapid shift of comparative costs, relative to the useful life of physical and

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3. This, however, will likely be swamped in the short run by the impact of a Japanese recession and U.S. expansion, and so will unfortunately not contribute in the short run to an easing of bilateral tensions.

human capital in the industry, should raise flags for any firm or country that finds itself dependent upon export markets. International trade in vehicles and parts, however, will remain important. Improved logistics and the diffusion of manufacturing skills will make it increasingly attractive to import labor-intensive products from lower-wage regions. Car and truck manufacturers will find direct exports and, increasingly, OEM sales (and purchases) of niche vehicles, an important way to keep their factories and their distribution operating at capacity. But while I return to these issues briefly in the conclusion, my primary focus is on the changing economics of the Japanese industry.

Several caveats are in order. First, this analysis is that of an economist, though I have organized this paper with an eye to the political implications of the changes now underway. Second, for analytic purposes I break the industry down into four categories: parts manufacturing and assembly in the U.S. and again in Japan. I thus focus on manufacturing, and do not examine distribution and marketing. Third, as should already be obvious, I define the industry on the basis of geographic locus rather than corporate ownership; for my purposes, I treat as "American" the Japanese assembly and parts plants operating in the U.S. Not everyone will agree with this value judgment. Fourth, I will make only passing references to the EC, Mexico, Korea and ASEAN, due to space limitations and my own research interests. Nevertheless, the changes I trace here will have a direct impact on those markets, and the underlying dynamics should provide an indication of future changes within Europe, and a note of caution for the ambitions of firms in the newly industrialized economies.

Fifth, and critically, my conclusions rest upon assumptions about the future course of exchange rates, and secondarily of technology and market structure. I will not justify these at length. I am convinced that the dollar will weaken further over the next several years; others have assured me that another oil crisis is not just around the corner; and I view a revolutionary change in technology as both unlikely, and unlikely to dislodge current assemblers. In sum, I am confident that the core of this argument is robust. What is beginning to occur in the automotive industry is but the microeconomic expression of larger macroeconomic trends. The aging of Japan's population will inevitably bring about a shift in domestic savings and trade balances. At the micro level this will be seen as a rise in real wages and a decline in the competitive position of tradable goods. That is precisely the story I tell for autos. It is also helpful in understanding the equally dramatic changes now underway in Japan in steel, cameras and consumer electronics, which are not as readily apparent to American consumers.

Sixth and finally, by sticking to a bilateral framework I implicitly argue that these changes will work to the advantage of the U.S. In effect, I assume that benefits accrue to geographic concentration

and hence to current producing regions (but not necessarily current producers). This is in part because of logistics, given the physical size of an automobile and its components; it is also because location near tool-and-die makers and access to other specialist manufacturing services reduces costs. The interaction of design engineering and the factory floor has been historically important in Japan, and this extends to outside suppliers. (We can see this occurring in the U.S., where senior management at GM and Chrysler is moving physically to their corporate technical centers.) It is not inconceivable that the beneficiary of change in the U.S. industry will be Mexico, while Korea and Southeast Asia will benefit most from the changes within Japan. That, however, I believe is unlikely.

### Organization

In Section II below I analyze the recent history of the U.S. and the Japanese auto industries. This will illuminate the underlying causes of the upheavals of the past 15 years. Section III focuses on the collision of the two industries, and the response by the assemblers and parts makers in the U.S. and Japan. The core of the paper is Sections IV and V. I argue in Section IV that the gap in management capabilities between the U.S. and Japanese industries has now been eliminated, while Section V provides data on the reversal of the cost advantage of Japan over the U.S. Finally, Section VI returns to examine what I believe to be the main implications of these shifts.

## **II. The U.S. and Japanese Automotive Industries in Isolation**

### The United States

The late 1920s and 1930s were formative years for the U.S. automotive industry. Henry Ford's obstinate support of the Model T cost his firm its initial domination of the market. In turn, while GM was but an agglomeration of separate firms under a holding company in 1921, by 1926 Alfred Sloan's full-line strategy made it the market leader. Chrysler also became a major player in 1926, with the acquisition of the Dodge Brothers operation. As smaller firms gradually exited, the "Big 3" emerged to form an oligopoly that dominated the North American market until the 1980s.<sup>4</sup>

A second element in the organization of the industry was its unionization by the United Auto Workers in the mid-1930s. As an industrial union, the UAW imposed pattern bargaining: wages were fixed across the Big 3. In addition, narrow job classifications were instituted, with seniority rules used



to govern transfer among jobs. This should not hide considerable variation at the union “local” (plant) level, but such deviations in the application of work rules and how broadly jobs are defined requires the acquiescence of the central union organization.<sup>5</sup> Effectively, though, firms in the industry could not compete on the basis of a lower cost structure. Even if a firm were to win a protracted battle with the union, under pattern contracting the benefits would immediately be available to competitors.

The third and final element was the adoption of a vertical integration strategy by the Big 3. Already by the 1930s Ford and GM were heavily involved in parts production. At GM the original holding company by chance included many parts producers; on the other hand, Henry Ford for apparently idiosyncratic reasons adopted a conscious strategy of making everything, including his own rubber, steel and glass. To these factors should be added the difficulties that the Big 3 encountered in developing strategic alliances with the suppliers of major components (e.g., GM with Fisher Body), the threat posed by labor strife at firms not under organized by the UAW, and the attractiveness of in-house manufacturing as a means of controlling the lucrative afterparts market.<sup>6</sup> Materials and parts comprised only 50% of manufacturing costs at GM and 60% at Ford, versus 70-75% in Japan. (With their small size, Chrysler and AMC were unable to integrate as extensively into parts production.)

Of course, this meant that component suppliers were internal divisions with no outside competitors, and hence faced little pressure to change. At the same time these divisions in the aggregate purchased simple items from literally thousands of outside firms. Such purchasing contracts were let annually on a competitive basis against blueprints drawn up by the Big 3. This proved to be administratively efficient, and by limiting the discretion of purchasing staff it was an effective check against abuses. From the standpoint of suppliers, however, this system made it impossible to count on

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4. This continued until about 1955, when the last of the smaller firms merged to form American Motors, itself never very large or successful. Along the way firms such as Graham, Nash, Packard, Studebaker, Kaiser and Willys Jeep disappeared. Volkswagen assembled cars in the U.S. in the 1970s, but closed its operations in the mid 1980s. Chrysler closed most of AMC's plants soon after their merger in the late 1980s, leaving only the Jeep and Eagle names.

5. Carpenters, millwrights and other specialized trade unions further complicated matters. Still, at GM entire plants—some 25,000 workers—are unionized by the IUE (International Union of Electrical Workers). The classic study of variation across plants is Katz (1985), who examined GM. See also Rosenbaum (1984) on white collar workers.

6. See, respectively, Helper (1990, 1992) and Crandall (1968). Outside suppliers were not always willing to expand capacity as demanded by their customers; given their customers' high profits they felt that they, too, should be offered a fat margin. Integration provided a way around these conflicts. Furthermore, demand for replacement parts is insensitive to price, and so could be extremely lucrative, accounting in the 1930s for over 1/3 of Big 3 profits.

future orders for the same part, and so constrained their ability to invest in specialized production equipment, particularly in the passenger car segment. As the pace of technical change increased in the 1970s, this contributed to the gap in efficiency that developed relative to the Japanese producers.

The net effect of these three features—an industry dominated by three vertically integrated firms organized by a single industrial union—was the formation of a tight oligopoly in the domestic market. Furthermore, the destruction of Europe in World War II and the initially low level of economic development in Japan helped keep import competition weak. The fact that demand overseas was for small cars—whereas subcompacts were a niche market in the U.S.—contributed to the dominance of the Big 3. They were thus able to charge high prices for their vehicles, while paying little attention to controlling costs, nor did they feel much need to stress product quality or to work to improve automotive technology.

### Japan

The Japanese industry developed along very different paths. First of all, the early postwar years saw new entry into (initially) truck and (later) passenger car manufacturing. Ford and GM, the two firms that dominated the domestic market until the outbreak of the Pacific War, stayed out. But Toyota, Nissan and Isuzu, which had all commenced commercial operations by 1937, resumed automotive production after the war. In addition, former aircraft manufacturers (e.g., Prince, Mitsubishi Motors and Fuji Heavy Industries), 3-wheeled vehicle makers (Daihatsu and Mazda) and motorcycle makers (Suzuki and Honda) entered the market. At the peak there were 14 firms; 11 manufacturers survive today, and other firms assemble vehicles on a contract basis.<sup>7</sup> In addition, even though Toyota has been the largest firm since the 1950s (and Nissan #2), there was considerable flux in market shares and steadily declining prices. Vigorous rivalry prevailed, in sharp contrast to the U.S.

Second, the union structure in Japan contributed to, or at least did not inhibit, strong interfirm rivalry and internal technical change. Attempts to form an industrial union in the auto industry failed, with the final blow coming in Nissan's victory after a long, bitter strike in 1954. While annual wage

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7. Contract assemblers include Hino Motors, Press Kogyo, Toyota Auto Body, Gifu Auto Body, Toyo Koki and at least six other companies, none of which have an independent car marketing operation. (Hino does market heavy trucks..) In all, over 50 different vehicles are made on an OEM basis in Japan; at Toyota, contract assembly accounts for 45% of all vehicles. See Mary Ann Maskery, "Japanese Farm Out Production," *Automotive News*, March 16, 1992.

demands are loosely coordinated across firms and industries in the annual “spring offensive” (shunto), interfirm differences arose in final settlements and interim bonuses, especially for firms with unusually good or bad performance.<sup>8</sup> In particular, an individual union found it hard to push for raises above those being offered at rival firms. But in contrast to greater interfirm differences, the gap between automotive wages and those at large firms in other areas of manufacturing remained small, relative to the U.S. In addition, contracts did not lock firms into rigid work rules. Unions thus neither restrained competition among numerous rival producers, nor imposed barriers to technical change, nor set autos apart from other industries in terms of wages and benefits.

Finally, during the early postwar period the industry shifted away from vertical integration into the systematic procurement of parts and components from outside firms. This let the assemblers economize on capital expenditures, given the excess capacity that existed at machining and similar firms until the late 1950s, an era when banks were reluctant to lend to the auto makers. A second advantage was that subcontracting helped counter union strength by reducing the need to hire new workers. In addition, outside suppliers typically paid their employees lower wages.<sup>9</sup> In any event, the auto companies themselves concentrated on final assembly, body and chassis stampings, engines, and the transmission. In turn, virtually all small stampings, electrical components, engine parts, interior and exterior trim and pumps and similar mechanical components were purchased from suppliers.

Given the low production volumes of the 1950s, both suppliers and assemblers initially relied on general-purpose machine tools. Work could readily be shifted to new suppliers, while suppliers could just as readily work for firms in different industries. But this began to change as production volumes increased. In 1959 Toyota built the first specialized assembly plant in Japan, and Nissan followed soon thereafter. With mass production and the accompanying use of specialized machinery and tooling, it was important to limit the number of suppliers, and to contract for the duration of production, which typically meant four years. Of course, specialized production facilities likewise limited the ability of parts producers to serve non-automotive customers.

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8. Average annual contracted cash compensation (monthly wages and bonuses but not overtime) differs by 13% among the Big 5 in Japan. Toyota is at the top, at ¥5.31 million [U.S.\$42,500] followed by Honda, Nissan, Mazda and finally Mitsubishi at ¥4.70 million [U.S.\$37,600]. Isuzu's average was 8.1% less than MMC, 14.1% below the top five average and a full 18.6% below Toyota. Data are based on provisional spring 1992 wage settlements for the April 1992 - March 1993 period, as reported in *Nikkan Kogyo Shimbun*, March 26, 1992.

9. See Smitka (1991a) for details, and Smitka (1990a) and Helper (1990) for U.S.-Japan contrasts.

Parts firms and the auto makers thus became interdependent, and over time a contracting environment evolved that was very different from that of the U.S. Auto companies there came to rely upon 200-300 direct suppliers, who provided components and subassemblies on a long-term basis. Indeed, the Japanese auto firms themselves account for only 22% of industry employment. Furthermore, over time Japanese suppliers came to play an increasing role in design, with their engineers working alongside those of the auto companies. Given this interdependence, auto firms guaranteed continuity of orders over the medium run, but normally two or three suppliers made similar parts (headlamps, door trim). The competitiveness in the industry was thus carried over into the design and manufacture of components. This was in sharp contrast to the Big 3, whose internal parts divisions held an effective monopoly.

Finally, it is useful to point out that in the 1950s the state-of-the-art in Japan was far behind that in Europe, much less the U.S. Companies fully anticipated that, with a bit of work, efficiency could be improved and costs reduced. In Japan “Not Invented Here” became a statement of pride that managers had taken care to seek out better ways of doing things, rather than a derogatory rejection of a top firm of what must of course represent inferior practice. In 1970 the industry still felt sufficiently weak that several firms sought alliances with the Big 3.<sup>10</sup> Still, by the late 1970s this process of change, supported by the overall contracting environment, brought the Japanese industry ahead of best-practice in the U.S. and Europe in manufacturing, during an era when Japanese wages (and steel prices) were lower than in the West. The combination meant a significant advantage in costs, estimated at up to \$1,200 per car in the early 1980s, despite lower volumes.

### **III. The U.S. and Japan Automotive Industries in Collision**

The 1970 Muskie Law, placing limits on automotive emissions, marked the onset of change in the North American industry. This was followed by many other individual changes, particularly the two oil crises of the 1970s, the net effect of which was to provide a beachhead for foreign—largely Japanese—producers to sell subcompacts in the U.S. market. During the 1970s and 1980s other policy changes, combined with gaps in the American cost base and management capabilities, allowed the Japanese to push out from this beachhead into other segments of the American market. By 1991, nearly one of three passenger cars sold in the U.S. was made by a Japanese-owned firms. Even

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10. GM owns 37% of Isuzu and Ford 25% of Mazda, though Chrysler sold its 15% stake in Mitsubishi in 1991-92.

though this production increasingly took place in North America, the transition remained traumatic: most such entry involved in a shift in the location of production, and hence a loss of both jobs and investor's capital.

To return to the early 1970s, after a long rear-guard action the Muskie Law passed and in short order the Big 3 were forced to develop cleaner engines or, failing that, catalytic converters. Second, Ralph Nader drew attention to quality and safety problems in U.S.-made vehicles. Third, the Vietnam War expansion of the late 1960s turned into a full-fledged economic boom in the early 1970s. In the ensuing inflation, the automatic cost-of-living adjustment (COLA) clauses in the UAW contract led to rapid increases in wages, opening a large gap over the course of the 1970s between automotive and other manufacturing wages, that is, increasing the relative cost base of the industry.<sup>11</sup> Finally and most important, the simultaneous boom in Japan, the U.S. and Europe made it possible for OPEC to quadruple the price of oil.

For the first time subcompacts came to constitute a sizable slice of the market; at the peak, following the second oil crisis of 1979, this niche widened to comprise one-third of all passenger cars sold in the U.S. The Big 3, however, initially made no small cars; most of the demand was met by Japanese vehicles. Furthermore, it was easier for small cars to pass the emissions hurdles. Indeed, Honda with its CVCC engine did not even require a catalytic converter, which simultaneously reduced manufacturing costs and, by reducing weight, improved fuel economy. This became even more advantageous when the CAFE corporate average fuel economy regulations took effect in 1978. Next, in California Japanese cars had already obtained a reputation for sturdiness and a good repair record. Quality problems at the Big 3 were already significant enough by 1973 for the UAW to try to launch a campaign at GM; at the time, however, management viewed this as an intrusion on their prerogatives, and squashed the attempt.<sup>12</sup> Last but not least, inflation in Japan, which had been higher than that in the U.S. throughout the postwar period, was brought down to a low level by late 1974. Thus while Japanese costs continued to decline, given productivity increases and a stable yen, they escalated sharply in the U.S. as wages increased, productivity growth stalled and the dollar regained strength.

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11. In the 1980s, the Big 3 in turn came to rue the extremely generous health benefits that were standard in the industry. Note that because of favorable tax treatment, firms and workers have a strong incentive to increase the share of compensation received in the form of benefits. Such distortions seem to matter less in Japan.

12. This anecdote is told of Irv Bluestone in the short note, "The baddest old days." *UAW Ammo*, (1992), 9. My thanks to Mr. Ogiso of the Japanese Auto Workers for sharing it with me.

As a result, imports of Japanese vehicles increased from 500,000 units at the start of the 1970s, to 1 million units by 1975 and nearly 2 million units following the second oil crisis in 1979. The latter jump coincided with the "Volcker" recession in the U.S., magnifying the impact. For the first time since the 1920s, there were significant new players in the market, ones the Big 3 could ignore only at their peril. The immediate response, however, was political. A "voluntary" restraint agreement (VRA) of 1.68 million units was negotiated in 1980, and led immediately to higher prices. The Big 3 hoped to limit Japanese inroads, and wait until Americans lost their taste for small cars, as had happened previously with the Rambler, the Corvair and the Volkswagen Beetle. In the interim, pollution and fuel economy (CAFE) regulations were forcing the Big 3 to rapidly their entire fleets, an extremely costly and unexpectedly difficult proposition. Higher prices could at least limit the pain.

The VER proved to be a mixed blessing. While Japanese producers had a large cost advantage, fierce interfirm rivalry kept both prices and profits low. The VRA, however, effectively mandated Japanese producers to organize a cartel and fix prices in the U.S. And raise prices they did, by \$1,000 or more a car. These profits, furthermore, went straight to their bottom line; Toyota's nickname in Japan became Toyota Bank. Thus, while higher prices helped the Big 3 to stem red ink, they also enriched their Japanese competitors. Second, quotas provided strong incentives for Japanese producers to move up-market to medium-sized cars, the bread-and-butter of the Big 3: if they could only sell a limited number of cars, it was more profitable to sell big ones than small.<sup>13</sup> Finally, as had been anticipated, the Japanese transplanted assembly operations to North American soil to avoid the quota.

Despite equity ties with Japanese firms dating from the early 1970s, the Big 3 (and the UAW) apparently knew little of their new-found rivals. They openly viewed the Japanese advantage as arising from cheap and pliant labor and an (in their eyes) undervalued yen. Furthermore, they thought that Japanese firms would be unable to develop larger cars, and anticipated a return to the fold of the Big 3 when Americans tired of driving foreign subcompacts. Management advantages were nil. Thus while it was understood that the VRA would encourage "transplant" factories, the Big 3 did not believe that Japanese firms would be able to assemble high-quality small cars in the U.S. with American workers. The political holding action would thus prove sufficient.

In this they were mistaken. The Big 3 clearly underestimated the depth of appeal of smaller cars; only now, a decade later, is that market segment shrinking back to single-digit levels. But they

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13. Production costs change little with size, while prices and hence potential profit margins rise rapidly.

proved to be simply wrong in evaluating the management capabilities of Japanese firms. In 1982 Honda opened the first U.S. “transplant” factory, and Nissan soon followed. But the real impact came when NUMMI, the GM-Toyota joint venture, commenced production in 1984. This firm reopened the shuttered GM plant in Fremont, California with a commitment to hire from the original pool of unionized workers under a UAW contract. It was soon the highest-productivity, highest-quality assembly plant outside of Japan—and despite GM having closed it in part because of labor strife, the operation ran smoothly. Japanese producers also proved successful in upscaling their offerings, and it became apparent that Big 3 management practices were a large part of the problem.

In the end, then, the Big 3 faced competition not only at the fringe but also in the core of their market. Second, they faced competition not merely from imports, but also from vehicles assembled in the U.S. by American workers. The success of the Japanese in running efficient, high-quality assembly plants in the U.S. undoubtedly surprised them almost as much as the Big 3. But it made it far more difficult to bring political pressure to bear, since these “transplant” factories were spread across 7 different states and Ontario. In the end, all 5 major Japanese car firms opened plants, as well as 3 of the 4 smaller firms. The end result is a North American industry comprised of 12 firms, divided among 6 major producers and 6 smaller firms; two German firms are also planning to enter.<sup>14</sup> The U.S. market is thus competitive in a way that has not been true since the 1920s.

The Japanese producers faced strong incentives to increase local content, partly due to political pressure but primarily due to cost pressures with the sharp appreciation of the yen that began in 1985. However, for the structural reasons noted earlier, the American parts industry was geared to making simple items to customer specifications, whereas the Japanese auto companies purchased primarily components and subassemblies, which were in whole or in part designed by their suppliers. In many cases, therefore, the Japanese companies did not even own the blueprints, while many American suppliers had no engineers—much less engineers based in Tokyo who could work with Japanese firms throughout their product development cycle. There was thus a mismatch between what the U.S. parts industry was geared to sell and what the Japanese assemblers needed to buy.

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14. The smaller firms are Mazda and Mitsubishi, followed by Suzuki, Hyundai, and the Subaru-Isuzu joint venture. These cover not only California, Tennessee and Ohio but also Kentucky, Michigan, Indiana and Illinois. In addition, Kawasaki has a motorcycle plant in Nebraska, BMW will open an assembly plant in South Carolina and Volvo has an operation in New Brunswick, Canada. Mercedes Benz has also announced its decision to produce in the U.S.

With 10,000 or more parts in a vehicle, even in the best of circumstances the proportion purchased locally would initially be small; differences in contracting practices and testing standards added to the frustrations. But more important was that, given the structural differences between the U.S. and Japanese parts industry, they found few traditional suppliers in the U.S. with the requisite engineering and production know-how to meet their need. Rather than attempting to help existing firms to hire engineers and learn how to meet their requirements, a process that took 25 years in Japan,<sup>15</sup> they found it much easier to encourage their suppliers at home to follow them abroad.

The result thus was a massive influx of foreign parts firms into the U.S. The most visible portion of this was the arrival of nearly 300 Japanese auto parts firms, either directly or through joint ventures. (There has been nearly equal entry by European parts firms.) At the start these new entrants targeted the transplant factories of their Japanese customers. Such production, of course, tended to displace imports. But to achieve profitable levels of output, most also sought to sell to the Big 3. The shift in the strategy of the Big 3 towards "Japanese" purchasing practices—procuring more components from the outside, and asking for greater supplier engineering input—created a natural opening for these firms, and they met some success for their labors. The net effect has been a major blow to the traditional parts producers in the U.S. and, as the stock of Japanese vehicles on the road rises, this is also beginning to affect the firms that have specialized in making replacement (repair) rather than production parts.

Friction has thus expanded from auto assembly to all facets of the industry.<sup>16</sup> The underlying difficulties were exacerbated when the VRA expired, and a new voluntary export restraint raised the quota in FY1985 from 1.68 to 2.3 million units, just as the new capacity at the transplants began to come on line. While part of their production took the place of imports, total sales and hence market share rose steadily. A chronic loss of Big 3 market share thereby ensued, reflecting above all the steady decline of GM. This forced a stream of 12 assembly plant closings at GM in the 1980s, and several since.<sup>17</sup> Of course, imported vehicles are built mainly from foreign-made components. Parts

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15. See Smitka (1991), especially Chapter 3.

16. However, while the tariff for passenger cars is 2.5%, the tariff on trucks is 25%, effectively preventing Japanese firms from garnering a significant share in what today is the fastest growing segment of the market. This may change. Nissan has assembled pickup trucks at its Smyrna Tennessee plant since its inception, and jointly designed a minivan with Ford, now being assembled in a Ford plant. Toyota recently completed an expansion of capacity at NUMMI, its joint venture with GM, to enable it to begin producing pickups there.



makers thus saw their car market shrink to 70% of its former size, as their traditional customers' share of the final market declined. On top of this came increased imports by the Big 3. (Ironically, this was encouraged by U.S. government policy, since the CAFE regulations made it advantageous to import components from overseas so that some large car models could be reclassified as imports.<sup>18</sup>) In any event, this led to the designation of auto parts as one of the subjects of the 1986 bilateral MOSS (market-oriented sector-specific) talks, aimed at eliminating barriers to U.S. auto suppliers seeking to do business with the Japanese auto companies; to the lowering of the VER to 1.65 million units; and to antidumping suits.

That such policies were adopted is hardly surprising, given the magnitude of domestic adjustment. New entry of course meant the decline or demise of many existing firms, at significant cost to shareholders and managers. But new entry also shifted the geographic center of the industry. Previously assembly was heavily concentrated in Southeastern Michigan; among the new ventures, only the new Mazda facility located there. Thus, while perhaps 150,000 jobs have been added by Japanese factories, most are in locations remote from the sites of traditional firms. The displacement of workers in one place by those in another must therefore be added to the 150,000 worker decline in overall automotive employment since 1979. When these changes are taken together, over 300,000 jobs have already disappeared. (The ongoing restructuring at GM and other plant closings and relocations will bring total displacement to nearly 500,000 jobs.) It is hard to overstate the social costs this imposed. One example is the city of Detroit; Chrysler had been the largest employer, surpassing even the city government, but by 1990 it employed no one within city boundaries. (Unlike GM, though, Chrysler has added new capacity; its Jefferson Avenue North plant on Detroit's east side is now open.)

This rightly has been and continues to be a cause of concern to policy makers. The industry, of course, is happy to clamor for limits on competition. But it is wrong to attribute the decline in car imports, now at a level nearly 800,000 units below their peak, merely to political measures. The cause of the industry's problems were the two gaps outlined above, stemming from poor management at oligopolistic firms and a high cost base. The oligopoly is gone, and as is argued below, the constituent firms are now far better managed—while firms in Japan have encountered problems. Equally important, the relative cost base also improved. This has turned the U.S. into the most desirable place to build

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17. With the exception of the Jeep plant in Toledo, the former AMC plants at Chrysler have also been shuttered.

18. Taylor (1991).

cars—as evinced by the recent decision of BMW to locate its new plant not in Germany, not even in Europe, but in South Carolina. Even without political intervention, Japanese purchases of American automotive products will increase rapidly, and American imports would have declined.

#### **IV. The Changing Advantage of Japanese Management<sup>19</sup>**

It is no longer accurate to view Japanese manufacturing methods as providing an absolute advantage. First, a number of unexpected difficulties with these management methods are making themselves felt in Japan. Second, and far more important, in qualitative terms the U.S. industry has caught up with “best practice” across a variety of dimensions. (The reporting of various comparative measures on a rank-order basis obscures the shrinking of the absolute differences.) Henceforth the deciding factor will be the costs of inputs—labor, materials, transport and other manufacturing services and capital costs—and marketing strategy and the management of distribution. In this section I sketch the core elements of “Japanese” management and then trace their evolution in both the U.S. and Japan. (Other IMVP research covers this in greater detail.) Section V shifts the focus to input costs.

In Japan high capital costs and low production volumes—along with the chance timing of input from a number of American consultants—led suppliers and assemblers to produce multiple parts and vehicles on the same assembly line, while trying to hold inventories in check. Union pressure to avoid layoffs, the difficulty of hiring skilled workers and the pace of technical change made it important to be able to train and redeploy workers; the lack of union work rules facilitated doing so. All of this helped generate the distinctive manufacturing management practices that arose in the 1950s, and helped undergird the rapid growth of the industry in the 1960s.<sup>20</sup> These management practices, together with the siting of plants, reflect decisions made long ago in a very different economic environment.

The revolution in manufacturing management—the new learning on the superiority of Japanese manufacturing practices—emphasizes the factory and labor relations, and more recently supplier relations (Smitka 1991; Helper and other past and current IMVP research) and the organization of

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19. This section draws heavily upon Smitka (1992), of which Smitka (1990b) is an earlier version. For recent survey studies in the U.S., see Helper (1991, 1991b) and Cusumano and Takeishi (1991).

20. There is little “traditional” about Japanese management!

product development (Clark and Fujimoto 1991). The first area to elicit widespread attention was quality control. Under the tutelage of American management consultants in the 1950s, the Japanese sought to build in quality, using numerous intermediate checks carried out by workers, rather than final inspection. It proved extremely effective, given the good education and low turnover of ordinary workers, and the willingness of management to delegate responsibility to them. Together with higher final product quality, this also reduced costs through the early detection of problems and substantial reductions in scrappage and rework.

More notable as a truly Japanese innovation is “just-in-time” (JIT) production, which uses a “pull” system to schedule work in response to downstream requests. This reduces inventories and decentralizes adjustment in response to minor variations in production volumes to the shop floor. While lower inventories generate a one-time financial saving, they also reveal bottlenecks and thus provide practical guidance for the efficient allocation of production engineering efforts. They also create incentives to reduce setup times as a means of reducing batch sizes, which in turn allow a closer matching of production and demand.<sup>21</sup> Corresponding to this, the final assembly lines were designed to handle multiple “platforms” simultaneously. Thus the mix of vehicles within the plant could be balanced so that minor variations in demand would not affect capacity utilization, and production of “hits” could be shifted to plants making less successful models. From the late 1960s JIT was even extended to incorporate suppliers. Soon shipments were being made several times a day, with parts such as seats or tires sequenced by color and option level prior to delivery to match the assembly line.

Finally, human resource management, supplier management and engineering management also revealed strengths. On the shop floor, tasks were assigned to teams rather than individuals; QC (quality control) circles and self-scheduling of vacations reinforced team identity. Along with providing a measure of flexibility in job allocation, this mobilized peer pressure as an incentive. Furthermore, pay and promotion systems were designed around the individual rather than the job. There was thus little resistance from workers to retraining; indeed, “on-the-job” training through systematic job rotation was the norm. This in turn facilitated the use of JIT and quality control techniques.

But advantages were not confined to production; the use of outside suppliers generated rivalry, reducing parts prices, the biggest single source of manufacturing costs. Furthermore, Japanese companies

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21. By the late 1960s, die-change times in Japan were measured in minutes instead of the hours that then prevailed in Detroit. See Womack et al. (1990).

made heavy use of value analysis to improve the integration of disparate functions, such as design, engineering, manufacturing and purchasing. These efforts were even extended across corporate boundaries to encompass supplier engineers. When applied in combination with a project-based rather than a task-based organization, Japanese firms proved more adept at the design process, in terms of the speed and cost at which they could develop a new model, and the ease of manufacturing of the final vehicle.

In short, the new learning runs the gamut of manufacturing functions, from the shop floor to the organization of white collar functions such as engineering. Not all of these elements had been well described in 1980. But to the extent they were known, the tendency in the U.S. was to ascribe them to conditions peculiar to Japan: lifetime employment, friendly company unions, a cultural proclivity to groups, and a willingness for workers with memories of war-related deprivation to sacrifice on their companies' behalf in return for a stable job and income. American workers would not prove so pliable or loyal, nor would unions grant flexibility. Now, ironically, portions of this system are under strain within Japan, while there are being successfully implemented in the U.S., even in union shops. The comments on management change below are largely qualitative in nature. They reflect, however, the emerging consensus of industry observers and the business press, and are matched by the concerns managers expressed in my own interviews at parts firms and assemblers.

### Manufacturing Management in Japan

The JIT system is now under strain. One impediment is logistics; the inadequacy of Japan's road system is making itself felt. The second is a rapid and qualitative shift in the nature of the labor force.<sup>22</sup> Other areas, too, are under pressure; product development teams have in two senses proven *too* successful.

In Japan as in the U.S., assembly and parts production is typically split among separate plants, even when (as at GM) they are divisions of the same firm. The auto industry itself is thus a major consumer of transportation services. In Japan, the lack of warehousing space adjacent to the factory floor—even were it not for “just in time” small-lot delivery practices—forces frequent shipments. But while many former industrial areas are now urbanized and car ownership expanded sharply during the

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22. This is on top of the increase in wages reviewed in Section VI.

1980s, road systems have changed little. Congestion now drastically lowers the efficiency of truck delivery, the primary means of transporting materials and parts. In the Yokohama-Kawasaki area, where 3 shipments per truck per day could once be made, now only 2 are possible. This effectively raises the direct cost by one-third, while requiring additional investment in truck fleets—adding further to congestion. This is a particular burden on primary suppliers whose production of simple parts is spread among many small subcontractors.<sup>23</sup>

Second, many factories are now quite old. Most plants were initially set just outside cities, but the subsequent urbanization and the ability (and willingness) of residential neighborhoods to block new construction effectively prevents expansion at current sites. However, production volumes have expanded manifold over the years, and despite frequent deliveries the need for inventory space is acute. Refitting plants also is hard. Relative to popular perception, Japanese automotive plants are often not highly automated. But labor shortages are forcing change there, and robots take up more room than humans. Companies are thus forced to relocate if they are to modernize their facilities. Indeed, surveys show that obtaining land is the main reason (alongside easier recruitment of workers) for moving to regions such as Kyushu.<sup>24</sup>

Third, the very rivalry that helped force improvements in efficiency in the domestic auto industry is now imposing costs. Along with clothing and furniture, autos are a quintessential monopolistically competitive industry. Product segmentation has proceeded vigorously, as good sales of one model encourages imitators, until on average no profits remain for anyone to chase. The very success of the product development process has reinforced this inherent tendency, and the “bubble” economy of 1987-1991 led to a profusion of options to tempt spendthrift consumers. Maintaining all of these literally millions of separate parts in production magnified the logistics, inventory and management problems of the entire JIT system.

Fourth, the independence of the product engineering teams was also a weakness. While it made rapid development and coordination across functions possible, it also lessened horizontal links to other teams, past and present. During the boom years of 1987-1991, the process got out of hand. With engineers firmly in control, the natural engineering tendency to optimize design took over.

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23. See a survey of 117 large parts firms reported in the *Nikkei Sangyo Shimbun*, February 13-25, 1992, where 44% mentioned logistics as exerting a serious pressure on profits. My interviews with smaller firms also found this concern.

24. Kyushu Keizai Chosa Kyokai (1992), 68.

Little energy was spent to utilize existing parts and cannibalize designs from other cars, and firms are now launching efforts to reverse this. Newspapers now report part number reduction targets of an astounding 30%-40%. For years to come, however, this parts proliferation will exert a drag on generate the production volumes suppliers need to repay development, tooling and overhead costs.

Fifth, the expansion in domestic demand generated an acute labor shortage. This hit the auto industry hard, because workers in general, and the young in particular, shunned factory work. The catch phrase "3K"—kitanai, kitsui, kiken, Japanese for dirty, hard and dangerous—captures this attitude. It is now the service industries, not manufacturing, that are viewed as the wave of the future. Retaining workers is hard; after 3 years, turnover rates among college graduates hired in April 1987 averaged 28.4%, and reached a full 46.2% among the new high school graduates who are the principal group sought by factory managers. Small firms in particular found it well-nigh impossible to recruit new school leavers at current wages. The current recession has not fully reversed this trend.

Sixth, the geographic concentration of the industry intensified many of the above problems: production is centered in Aichi Prefecture—Toyota and Mitsubishi Motors, and much of the parts industry—and the Kawasaki-Yokohama area to the west of Tokyo. Firms thus compete against each other, and against new industries such as electronics, for the same workers. Meanwhile, demographic change means the pool of young workers is shrinking. On the other end of the same trend, the average worker at most companies is pushing age 40, and at some factories half the workers are over age 50. This has forced down the average pace of production at selected plants, and is affecting the design of new plants and automation.

Nor were the recruiting problems mere media hype. By 1990, the auto industry had turned to foreign workers; it was not unusual to find all the signs in a factory written in both Japanese and Portuguese. Unfortunately no numbers are available, given the nebulous legal status of most foreign workers, and the reticence of assemblers to admit that their factory labor force is heavily non-Japanese.<sup>25</sup> But at some major companies 20-30% of those on the shop floor were from abroad. Those that did not use foreign workers relied just as heavily on more traditional sources, such as seasonal workers, crews of middle-aged workers "borrowed" from other industries (e.g., steelworkers), and retirees.

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25. Furthermore, the variation is wide among firms, though among the assemblers Isuzu, Daihatsu, Hino, Mazda and Mitsubishi Motors utilize Japanese-Brazilians. *Nikkei Sangyo Shimbun*, October 16, 1991.

Along with these groups, the number of women on the factory floor is slowly expanding, something almost as unthinkable until recently as using foreign workers.

Between these expedients of temporary and foreign workers, 30% of the factory workforce is now without experience or commitment to the firm. Average worker quality is lower, and a substantial minority of workers now have little interest in participating in QC circles, a traditional training and incentive mechanism. At least some firms claim that they can operate effectively with up to 50% of the factory consisting of those less skilled and less committed. But it does constrain the ability to assemble multiple vehicle models (or a wide range of parts) in the same facility, absent automation—and automation, given the small size of older plants, typically requires a major relocation.

Finally, the logistic costs of running the manufacturing system are mushrooming and are not trivial; Toyota's reported direct expenditures are 2% and Mitsubishi Motors 3%. Most of this is for the domestic delivery of vehicles, but similar costs are incurred at each step of the way, from the steel mill to individual parts suppliers to component makers to deliveries to the assembly line. These shipping costs are born by suppliers in the first instance, and indirectly add at least another 3% to total manufacturing costs.<sup>26</sup> Together with the difficulty of retrofitting old factories and in recruiting workers, this is encouraging increased vertical integration by primary suppliers, and the location to new sites with warehouses that make possible deliveries in large lots.

These various problems do not signify a collapse of "Japanese-style" management, but they do represent non-trivial changes in the costs and constraints on producing in Japan that are by-and-large absent in the U.S. Furthermore, the labor-related and logistic aspects can only intensify in the future at existing factories, particularly in the greater Tokyo region. The current recession may produce a brief respite, but in March 1993 smaller firms still reported difficulties in recruiting. As discussed in greater detail in Section VII, this is contributing to a geographic realignment of the industry within Japan that may prove nearly as great as that transpiring in the U.S. The net effect is that the Japanese industry in the current environment is unable to extend their management advantage.

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26. Firms are shifting to ferries instead of trucks.. See *Nikkei Sangyo Shimbun*, July 1 and July 2, 1992.

Manufacturing Management in the U.S.<sup>27</sup>

In 1980 the Big 3 suffered in nearly every dimension when compared to their Japanese rivals, and the same was true of the parts industry. Quality was abysmal, assembly efficiency low, the design process rigid and slow, and the ability of factories and firms to adjust their product mix to demand variations minimal. In addition, labor relations were poor at many facilities. Yet the Big 3 were being forced to compete on costs and quality, and the structure of the market and the regulatory environment was shifting rapidly, placing demands upon the design process and making it important to be able to produce a variety of items at the same facility. These pressures induced a reformation in management in the industry, though massive red ink was often required to get the process started, as noted below. Most of the gap with Japanese "best practice" has now been eliminated, though unfortunately not always in the eyes of the media and consumers.

Part of this change has taken place through new entry by more efficient firms, that is, the Japanese transplants, and the closing elsewhere of old and poorly performing facilities. (At the assembly level 20% of capacity is now accounted for by "transplant" Japanese factories, which in itself pulls up the industry average.<sup>28</sup>) These firms, of course, transmit their practices to their suppliers, and are a source of training for (mobile) American workers and managers, and additional route for diffusion. Business schools and consultants are now joining in.

Most such change, however, stems from in-house efforts by American firms. Ultimately it was a matter of meet the competition or be met by the competition. Change, however, is costly, and only began when it was perceived to be necessary. The timing therefore has been extremely uneven across firms, reflecting the depth of the separate crises they faced. Ford, whose losses in North America in 1979 actually exceeded those at Chrysler, commenced systematic reform efforts in 1979. The attention of Chrysler management at the time was devoted to organizing the bailout package and staying out of bankruptcy. With the end of the recession and the successful launch of the K-car series, Chrysler bounded back to profitability and larger management problems were quickly forgotten. Systematic reform was delayed until 1988. GM, with its grip on the lucrative large car market and its huge dealer network, maintained profitability despite continued losses in market share. Indeed, it did quite well in the mid-1980s, and built 6 totally new robotized plants and refurbished 11 others at a

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27. See Smitka (1992).



cost of nearly \$40 billion. But for this money GM obtained look-alike cars that were poorly received, and discovered that it knew neither how to run automated plants nor how to design cars to take advantage of automated welding and assembly.<sup>29</sup> It required massive red ink to bring about the intervention of the Board to demote President Lloyd Reuss and then fire Chairman Robert Stempel in early 1992. Now an atmosphere of change and reform is present at each of the Big 3, and at their major and many minor suppliers.

This induced innovation began in basic shop-floor tools (such as how to check for quality) rather than in more complicated areas (such as product development). Indeed, such changes began at both Chrysler and GM long before their systematic reform efforts commenced. Likewise, labor relations experiments date back to the 1970s, though they remained piecemeal until well into the 1980s.<sup>30</sup> Ford had a quality program for its factories and for its suppliers up and running by 1983, and GM was not far behind in setting up programs for its suppliers. (Firms in other industries, such as Motorola, Intel and Velcro, actually learned the nuts and bolts of quality management from their automotive customers.) Now virtually all significant suppliers in the industry have operating SPC programs, with the charts available to their customers. (See the IMVP sponsored surveys of Helper.) Similarly, by 1989 Chrysler's Acustar division could accept 6.8 billion incoming parts without inspection, most on a JIT basis, and now sells assemblies to Toyota and Nippon Denso in Japan.

Similar changes have taken place in the use of JIT, in factory organization—all of the Big 3 have at least some plants that can turn out multiple models from the same assembly line—and even in vehicle design. For example, in the late 1980s the Big 3 still required nearly 6 years to develop a new platform. Chrysler now is developing new models on a 36-month cycle, from the approval of the stylist's sketch to Job One, the first regular production vehicle off the assembly line—and they claim to be ahead of schedule. Such changes have not diffused throughout all of GM, but at least Buick and certain component divisions (e.g., AC Rochester) have been turned around.

These results have shown up in the form of much higher vehicle quality and improved productivity.<sup>31</sup> There is now virtually no gap between the better U.S. and the better Japanese facilities. Indeed, at least one international study found the best quality operation in the world to be Ford's Hermosillo, Mexico plant.<sup>32</sup> In the past six months, even public perceptions appear to have

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28. No similar data are available for parts, but the proportion there must be closer to 5%, given local content ratios. This assumes that 20% of the market comes from transplant assembler production, that local content there averages 50%,

begun to change, though the Big 3 suffer from the legacy of their years of poor management and outright abuse of their customers and dealers. But the gap is no longer a qualitative one, and at the quantitative level it is not always in favor of Japan or of Japanese firms. Individual firms and factories have problems, but the same is true in Japan. The parts industry in the U.S. has been slow to change, comprised as it is of many small and historically unsophisticated firms. But the competitiveness of the market means that they now realize that they must achieve world standards in manufacturing practice, or exit the auto industry.

In sum, across almost all segments of the industry the management gap with foreign competition is now sufficiently small that any manufacturing advantage is likely to accrue from the cost of labor and other inputs, not differences in productivity. Customers are willing to pay a premium for a vehicle they desire, as with Chrysler's minivan. Luck in car styling can overcome a modest cost disadvantage. But no firm has proven capable of being consistently lucky, and over time cost will tell. In the future—indeed, already—that tells against production in Japan.

#### **V. The Shifting Cost Base of the Industry**

Though the U.S. and Japanese industries are on comparable footing in terms of management capabilities, relative costs still matter. Wages and interest rates are largely beyond the control of individual firms. Here the gap that has shifted in the U.S.'s favor.

#### **Labor Costs**

The single largest cost in any economy is labor, and in Japan these costs are on average higher than in the U.S. Of course, from the standpoint of manufacturing, wages must be balanced against productivity, but productivity increases in the Japanese auto industry were quite modest in the 1980s—about 2.5%

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31. In 1980, Harbour & Associates reported defects per car as 6.7 at Ford, 8.1 at Chrysler and 7.4 defects per car at GM, while the average for Japanese producers was 2.0 defects per car. By 1989, Ford was down to 1.5 defects per car, GM to 1.7 and Chrysler to 1.8, all better than the 1980 Japanese average. While Japanese quality had improved to 1.2 defects per car by 1989, from the purchasers' standpoint there is now virtually no gap between the Big 3 and their Japanese rivals. Cited in a *Wall Street Journal*, February 16, 1990 article by Paul Ingrassia.

32. Shaiken (1991).

per annum—and productivity has fallen the past three years. On average, therefore, increases in wages show up as an increase in costs. In contrast, the corporate reform in the U.S.—including the closure of the least efficient factories—implies that there have been and will continue to be large gains in productivity, though in the short run this is obscured by the recession.<sup>33</sup> U.S. wages have continued to rise, and given the health care crisis, labor costs have risen even faster. But Japanese wages are up about 5% more, and labor costs in yen terms have risen roughly in step with those of the U.S. When measured in dollars, however, the appreciation of the yen has meant that labor costs in the auto industry as a whole have tripled since 1985 in Japan, while American costs have risen only 26%.

Most of the story is told in Table 1 and Figure 1, which provide data on Japanese wages, productivity and exchange rates, together with wage data for the U.S. As can be seen in Figure 1, wages in Japan rose very rapidly from 1985, and since 1989 have been higher in the U.S. The underlying numbers are in Table 1. The first column is cash compensation in the automotive industry, including bonuses, which is converted into an index in column 2. This is then adjusted for hours in columns 3 and 4, and for exchange rates in columns 5 and 6. Productivity for the transport industry is in column 7, and is used to calculate an index of adjusted dollar-based costs in column 8.<sup>34</sup> This is contrasted with U.S. auto wages in the final two columns. Data have been extrapolated for 1991-93, using conservative assumptions. (Note that these data are on an industry basis, and thus reflect costs at both parts manufacturers and assemblers.)

In 1970, Japanese automotive wages were only 38% of U.S. levels. But with rapid economic growth (and high inflation) nominal wages rose sharply through the early 1970s. The economy expanded more slowly after the first oil crisis hit in 1973, and even though inflation has been quite low from 1975, during the 1980s Japanese automotive wages rose 43% (versus 48% in the U.S., where inflation was high in the early 1980s). Increases in Japan have been particularly high the past half-dozen year, with wages rising 24% during 1985-1991, versus 14% in the U.S. during the same period. Furthermore, in Japan the 1992 annual (shunto) pay increases added another 4.8%. (Initial 1993 settlements are just under 4%.)

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33. However, a study by Steve Herzenberg (US Department of Labor and IMVP) has so far failed to identify any systematic productivity increases in micro data on the industry. This is both surprising and disconcerting.

34. The transport industry includes shipbuilding and other sectors, though autos are the dominant component.

These data are based on industry-wide statistics, and thus reflect changes at parts firms and not just assemblers. While they are only rough estimates, given the need to make industry-wide adjustments for hours and methods of payment, they do at least depict general trends and levels. They are, however, own-currency wages; for traded goods, the obvious concern here, a common currency must be used. That changes the picture dramatically, because the yen has more than doubled in strength since 1985, so that even after correcting for productivity, wages in Japan have more than doubled since 1985 when measured in U.S. dollars. On an industry basis wages in Japan were thus about \$16.73 per hour in 1991 and about \$18.90 in 1992; at the April 1993 level of ¥111 per dollar, Japanese wages are \$22.14 per hour, averaged across parts firms and assemblers.<sup>35</sup> In contrast, U.S. wages averaged \$15.32 in 1991, and since then the American recession kept wages hikes minimal.

What matters to firms, though, is their overall labor cost, not wages per se. However problematic a comparison of wages is, given differences in labor market practices and the definitions and coverage of data, it is even more difficult to account for benefits and other non-wage costs. Survey data by the Nikkeiren (Japan Association of Employers) show that benefits and retirement contributions add another 22% to costs at the typically large firms that make up their membership; analysis of the balance sheet for Toyota yields a similar figure of 20%. (See Figure 2 for trends in Japanese benefits.) In contrast, in the U.S. I estimate that on the one hand benefits add 35% to costs for non-union firms that split the burden of insurance and retirement programs with employees,<sup>36</sup> while firms that offer no insurance coverage can hold benefits to 10%. At the Big 3, on the other hand, benefits for current employees and retirees add a full 100% to labor costs. This counterbalances the impact of low-benefit firms. In fact, industry-wide data from the Bureau of Labor Statistics show benefits were 35% of wages during 1987-89.<sup>37</sup> Correcting 1990 data (respectively) using 20% and 35% for benefits gives a crude industry-wide estimate of labor costs of \$17.70 in Japan and \$19.28 in the U.S. Extrapolating to 1992—using a 5% increase in the U.S., which probably overstates any

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35. This is a conservative estimate. I have extrapolated from 1990 data on the basis of shunto settlements of large, unionized firms. These understate the increase. First, the average age and tenure of workers probably rose, and wage increases appear to have been larger at (small) parts firms, which account for the majority of employment. Second, I made a straight extrapolation, though hours have fallen sharply since summer 1992. Since the incremental pay for overtime in Japan is well below labor costs for a standard work-week, the shorter hours raise average costs.

36. This assumes (i) a policy with a deductible and an employer contribution of 50% of premiums at (ii) a wage rate of \$14 per hour plus (iii) 8% as a retirement contribution. Base data on insurance and similar costs is drawn from Washington and Lee University's compensation program.

change—gives costs of \$22.40 in Japan and \$21.72 in the U.S., a difference of 3%. Projecting to 1993—and again assuming an extravagant 5% increase for the U.S.—gives labor costs of \$22.80 in the U.S. and \$26.57 in Japan at an exchange rate of ¥111=\$1. Even using assumptions that serve to understate the gap, Japanese labor costs are 17% higher than those in America.

Again, these are industry-wide averages, covering parts firms and assemblers. Data are not available that permit any reliable estimates by sector, but to gauge likely trends it is important to at least sense the qualitative nature of costs differences between the American and Japanese parts sectors. In both countries, of course, labor costs are higher at the assemblers than at parts firms. The gap, however, is much bigger in the U.S. than in Japan. Labor costs at the Big 3 assembly plants are now \$40 per hour, 75% above the industry average. Since the Big 3 account for over a third of industry employment, labor costs at parts firms must therefore be on the order of \$15 per hour.

In Japan, the gap between the car companies and parts firms is far smaller, under 20%. For example, at Toyota, the best-paying firm in the industry and hence where the gap is widest, labor costs for factory workers are about ¥3400 or \$30.63 per hour, or 15% higher. With its lower level of vertical integration, the proportion of engineers and managerial workers at Japanese auto firms is higher than at the Big 3, so this understates corporate-wide costs. Still, because the weight of the assemblers in the industry as a whole is correspondingly smaller, labor costs at Japanese parts producers are probably on the order of ¥2400 or \$21 per hour.

In other words, costs at the American car companies are still higher than their Japanese counterparts, perhaps by as much as 20%. At the industry level, however, data show that labor costs are distinctly lower in the U.S. Correspondingly, labor costs for parts firms in the U.S. must be significantly lower than in Japan—my back-of-an-envelope calculation suggests 40% lower.

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37. The Motor Vehicle Manufacturers Association *Facts and Figures '91* and earlier provide Bureau of Labor Statistics data on wages and benefits; the data for Japan are of unknown provenance. In any event, for Japan these data show ¥1762 in wages and ¥310 (15%) in benefits for 1987, ¥1685 in wages and ¥446 (21%) in benefits for 1988, and ¥1807 in wages and ¥354 (16%) in benefits for 1989. Similar data for the U.S. are \$13.57 in wages and \$6.96 (34%) in benefits for 1987, \$13.90 in wages and \$8.05 (37%) in benefits for 1988, and \$14.28 in wages and \$7.23 (35%) in benefits for 1989.

## The Yen

The most important element in the shifting cost base between the U.S. and Japan has been the shift in foreign exchange rates. The yen remains volatile, having risen by 10% during the first 8 months of 1992, and after stabilizing for 6 months, has recently jumped another 12% in the space of three months. Similar volatility in the opposite direction—a sharp fall in the value of the yen—would quickly improve the competitiveness within Japan of production for export.

My own judgment, however, and that of Salomon Brothers and many other analysts, is that a fall in the value of the yen is unlikely—or, equivalently, that the dollar is unlikely to increase in value. Over the medium run the U.S. macroeconomic imbalance—our trade deficit—will combine with lower interest rates to encourage a weak dollar. In contrast, the recession in Japan speaks for a strong yen. Of course, empirically the current exchange rate is a better predictor of the future than the crystal ball of economists. With the spot rate of the dollar at or below ¥111 in mid-April, this too implies that the yen will remain well above the average of the past year.

## Capital Costs

During the late 1980s and into 1990, there was an ongoing debate about the competitive advantage that accrued to Japanese manufacturers due to their low cost of capital. One element was the government provision of accelerated depreciation and other tax breaks; these are now quite modest in scope. Against this must be set the higher Japanese corporate income tax rate; the net effect of differences in the U.S. and Japanese tax systems is in the end both quantitatively small and qualitatively unimportant. Second, a finger is normally pointed at the banking system, which could be a reliable and steady source of capital. Again, the coziness was real, but it is dubious that this accounted for any real difference in costs, or even contributed to longer time horizons.<sup>38</sup> The main difference stems from the level of interest rates, an outcome of macroeconomic policy, and the structure of the equity market. Both Japan and the U.S. have seen huge swings in these areas in the past decade.

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38. Auto companies, after all, must inevitably plan on at least an 8-year horizon, the average duration between the time a decision is made to launch a vehicle and the time when production eventually ceases. GM launched its Saturn subsidiary with no expectation of any revenue for the first 7 years, much less a profit.

With the rapid appreciation of the yen in 1985-86, the Bank of Japan eased up on monetary policy. Its discount rate fell to a low of 2.5%, and was matched by declines in lending rates, with short-term loan rates dropping from 5.8% in 1985 to 4.0% during the period June 1987 through February 1989. This contributed to an economic boom led by a sharp appreciation of asset prices, both of land and on the stock market. The boom spilled over into car sales, and this encouraged a wave of investment by the auto industry, funded by cheap loans and equity finance. The Big 5 assemblers along with 5 large parts firms, for example, floated warrant bonds on the Euromarket at near-zero interest rates, given the expectations of further highs on the Tokyo Stock Exchange. By 1989, however, the government became concerned both that the economy would overheat and produce inflation, and that financial speculation had gotten out of hand. Monetary policy was tightened, and by December 1990 short-term loan rates doubled to 8.0%. (Call market and bill discount rates show an even wider swing.) Stock prices plummeted, and continue to decline in mid-1992, over two years later. In the face of the current recession, interest rates are now back under 5%. But, having just been burned, the Bank of Japan will this time around raise interest rates promptly as the recession ends, for fear of touching off another bubble.

Furthermore, "free" equity finance is no longer available, and with the stock market current at 45% off of its peak, investors will remain reluctant to jump back into the market. Furthermore, the equity-related bonds issued at the height of the boom were not converted into shares of stock and are now falling due for redemption. These bonds must be refinanced at market rates, either through new bond issues or bank loans. For example, Toyota has drawn down its financial assets to finance investment; total financial assets in June 1992 were ¥1.94 trillion, down ¥500 billion from their peak in June 1990. (Since borrowings have increased, net assets have fallen further.) In 1992 the company issued \$1 billion in medium-term Eurobonds as earlier warrant bond issues approach redemption. While Toyota has not borrowed directly from banks, they, too, are suffering from losses on their real estate loans, and will need to maintain margins to restore their balance sheets. A reasonable estimate would be that the cost of capital has risen by 4 percentage points.

Few firms were able to resist the temptation of plowing some of their borrowings into the stock market; today that represents an outright loss. Again, at Toyota, with its conservative reputation, reportedly 10% of assets were invested in stocks and related instruments; these have potentially lost up to half their value. Others were more adventuresome; both Toyota and Nissan have had to bail out dealers or suppliers that suffered heavy losses on speculative investments. Firms that did not go in for

speculation may have fared little better; many invested in long-term projects (such as new factories) that made sense only at very low interest rates. Such investments, in other words, are not generating the cash flow needed to cover the now-higher cost of the funds that were used to finance them. Thus what looked like virtually costless capital up front is proving on average to be anything but cheap.

### Summary

The “two gap” model is intrinsically difficult to quantify. Even a comparison of industry-wide costs must inevitably remain crude. Nevertheless, the gap between the management capabilities of the U.S. and Japanese industries is small and shrinking, Japanese firms no longer face low capital costs, and labor costs in Japan are distinctly higher than in America. Qualitative indicators, however, bear out the trends indicated by these data. Thus, for example, we are seeing the start of rapid increases in exports from the U.S. to Japan, both of vehicles and of parts, while exports from Japan are falling, despite the end of the recession in the U.S. Indeed, Japanese car prices now average roughly \$2,000 more than comparable American models, driving many of those who had owned poor-quality products in the past to examine Big 3 products again. Despite their prejudices, they are pleased by what they see, and driving away with Ford and Chrysler products, while inventories build on Japanese lots. That is the ultimate test that the “two gap” model must pass.

## **VI. The Decline of Japan and the U.S. Revival: Implications**

### Introduction

The Big 3’s loss of their oligopoly in North American was traumatic, and even though a dozen years have now passed, adjustment to this newly competitive environment continues. Dramatic changes are now underway in Japan as well, though I do not foresee an outcome as tragic as that in the U.S. and Canada. The picture in the U.S. is now bright, as the relative cost structure has shifted in its favor, and as Americans have shifted to buying vehicles in segments where the Big 3 are strongest. On the other hand, Japan is now a high-cost manufacturer still highly dependent on exports. With recessions both at home and in major export markets, the short-run picture is not bright. Nor does much point toward a rapid improvement even when the current downturns end. Indeed, exports to the US will continue to fall, and imports rise. This section sets forth these and other trends, and ponders their



implications. As in the preceding sections, the analysis will focus in turn on the U.S. assembly and parts industries, and then the Japanese assembly and parts industries.

However, one final digression into the recent history of the industry is required. In particular, the 1980s saw large investments in new capacity in both the U.S. and Japan, in both assembly and in parts manufacturing. (This boom continued into 1991 in Japan.) Measuring capacity is very difficult, even for assembly; for parts there is no common denominator. Nevertheless, the essence of the story is that capacity has grown far more rapidly than demand. That requires that adjustment over time occur *somewhere*. According to the above analysis, the most visible aspects of that adjustment will be red ink on Japanese balance sheets, and a rapid shift in trade patterns. In contrast to the 1980s, in the 1990s, most of the negative impact will be felt within Japan.

#### The Industry Moving South: The U.S.<sup>39</sup>

New entry in the U.S. began in 1982, with Honda's plant in Marysville, Ohio. Including GM Saturn, there are now 12 new firms in the U.S. and Canada, producing 1.8 million vehicles in 1991.<sup>40</sup> In all, this represents 2.8 million units in added assembly capacity. (The entry of BMW and Mercedes Benz will raise this to 14 plants and increase capacity by another 100,000 units.) With exports yet small and the aggregate market growing only slowly, this new capacity required (and continues to require) a decrease in imports and the closing of existing plants. And indeed, imports are down by over 25% from their peak in volume terms, while at least 16 assembly plants have closed. (I do not have precise figures here; estimates of job displacement were provided above.)

With the rise in the strength of the yen that commenced in 1985, a strategy of running assembly plants that relied primarily on parts imported from Japan was no longer viable. Given the structural mismatch between the existing universe of U.S. parts makers and the new entrants, traditional parts manufacturers could not immediately fulfill their needs. The Japanese, furthermore, did not believe they had the leeway to gradually build up an appropriate U.S. supplier base, a process, after all, that took 25 years within Japan. They thus encouraged their existing suppliers to follow them to

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39. See Helper (1991a) and Mair, Florida and Kenny (1988), and Jones and North (1991) on the U.K.

40. I have not included Ford's Hermosillo plant, even though most of its output is exported to the U.S.. GM also built or refurbished 11 plants in the latter 1980s.

across the Pacific. Of course, Japanese (and European) suppliers saw this as an opportunity to expand their own business. Including the Europeans, over 300 new plants resulted. (Traditional suppliers have likewise built new factories.) Again, this has resulted in the closure of many firms, whose difficulties have been accentuated by a shift in the purchasing strategies at the Big 3 towards "Japanese" patterns of buying subassemblies and asking for greater supplier involvement in the development process of a new vehicle.

Equally significant, not only has new entry taken place in both parts and assembly, but this entry occurred to the south of the previous center of the industry. Indeed, many parts firms have located in the maquiladora region of Mexico, and Ford also has its newest assembly plant in Hermosillo. (Chrysler's newest plant, however, is located within the city of Detroit; another is in Ontario.) The closure of old and inefficient plants in the North has thus been traumatic, since no "sunrise" industries moved into Michigan to take their place. But the bulk of this transition is now over.

### The Industry Moving South: Japan

Few overseas observers are aware that similar changes are underway in Japan. First of all, the boom in domestic sales in 1987-1991 came on top of continued strong exports. This encouraged investment in new plant and the upgrading of existing facilities (along with the proliferation of models). In particular, the southern island of Kyushu has emerged as the new center within Japan, alongside the existing Nagoya and Tokyo-Yokohama regions.<sup>41</sup> Honda is concentrating all of its motorcycle assembly and engine and transmission manufacturing in Kyushu, while Nissan, Toyota and Mazda all have opened new plants. Alongside ones under construction elsewhere, this represents at least 1.4 million units of new capacity. With exports of 5.3 million units in 1992, there is a potential for catastrophic excess capacity.

New entry has not been limited to assembly. In Kyushu alone 128 firms have built new factories or undertaken major expansion of existing facilities during the past 2 years; previously only 107 plants were located there. Another group of plants have opened in the Tohoku (Northeast) region, following Toyota's plans for an electronics plant near Sendai.<sup>42</sup> (Toyota's plant has since been

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41 Mazda was located in Hiroshima, Suzuki in Shizuoka Prefecture between Yokohama and Nagoya, and Daihatsu is in the Osaka area. The factories of Nissan, Honda, Hino, Fuji Heavy Industries, Nissan Diesel and part of Mitsubishi's operations are all located in or near the Tokyo-Yokohama (Kanto) area. See Kyushu Keizai Chosa Kai (1992).

postponed, but few other delays or cancellations have been reported.) Finally, plants in Tokyo have been moving to the fringes of the Kanto (Tokyo-Yokohama) plain, as community pressure makes it almost impossible to expand at existing urban sites. (A similar but less pronounced trend is visible for plants in the Nagoya region.) During January-June 1992, 35 firms announced new plants outside of Kyushu, and 25 in Kyushu. If this 7:5 ratio is representative, then 210 plants have been set up in other regions since early 1989. Together with the 150 plants in Kyushu, this gives 360 new or expanded factories. (This total does not include plants in Southeast Asia that make wire harnesses and other items exclusively for export to Japan.) No systematic data are available on plant relocations, but newspaper coverage suggests that only 10% represent primarily replacements of older facilities.

New plants are being built for a variety of reasons. But the choice of location is determined by the availability of above all labor, followed by land and transport infrastructure. Recruiting is now impossible in urban areas, but that is not true of traditionally poor farming districts such as the Northeast (Tohoku) or Kyushu. Ironically, so many firms have moved into northern Kyushu that latecomers such as Toyota are finding recruiting hard. A second aspect is government incentives.<sup>43</sup> Unlike the U.S. with its Federal system, local governments in Japan have little leeway to provide tax abatements, but they can construct infrastructure. In the medium term this still may not be matched by increased tax revenues, a common complaint in the U.S. To the consternation of the various Kyushu governments, Toyota and several other major ventures are being set up as subsidiaries with independent books. The initial high levels of depreciation will inevitably mean a loss, and thus no profit tax payments, of which local governments would otherwise receive a portion.

### The Future of the U.S. Industry: Assembly

Japanese exports to the U.S. have fallen continuously for the past 6 years. From the 1986 peak of 3.72 million cars and trucks, imports declined to 2.05 million units in 1991 and 1.78 million units in 1992; they are off by an additional 6.4% for the 1st quarter of 1993, or a cumulative drop of 55%. Total imports nevertheless rose initially in value terms, as the composition of exports shifted from subcompacts

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42 Isuzu also has a plant in Hokkaido. Three affiliates of Toyota are constructing plants, Kanto Automotive in Iwate Prefecture, Central Automotive near Sendai and Toyota Auto Body in Mie Prefecture.

43. 『日経産業新聞』 (Nikkei Sangyo Shimbun), October 21, 1991. On the U.S. see Yanarella and Green (1988). Complaints are now being voiced in South Carolina over the generous terms of the BMW agreement.

to larger cars, but value is now declining as well. On the other hand, exports to Japan are up from minimal levels but a few years ago. In Tokyo, Ford and Honda are both running late-night TV ads featuring prominently the American source of their vehicles, while GM ran an innovative print ad campaign. The top exporter, Honda of the U.S., is currently shipping 24,000 cars a year, but Toyota, GM and Saturn have also announced plans to make right-hand drive vehicles specifically for the Japanese market; Chrysler is already shipping a right-hand-drive Grand Cherokee. Ford will soon sell right-hand-drive Mondeos and Probes, and plans to introduce the 1995 redesign of the Taurus. In preparation, it has shifted import rights to a wholly-owned subsidiary, and has bought a large minority stake in the Mazda Autorama dealership channel. American cars will soon be appearing on Japanese roads in significant numbers for the first time since the early 1950s, a hiatus of 40 years.

The common view has been that these shifts represent a mere bowing to political pressure. The January 1992 visit by President Bush to Japan, and the subsequent grand-standing over the dumping of minivans and related issues seemed to lend credence to this view. But the evidence presented here suggests otherwise: commercial considerations are the motivating factor. One element, of course, is that from the start production within the U.S. was expected to substitute for exports, as it concentrated on high-volume cars. Thus imports automatically declined as the new plants came on stream. But the car companies consistently failed to fill their voluntary export restraint quotas.<sup>44</sup> Political considerations also do not account for the extent of price increases since 1985, since these price increases have not been reflected in increased profits. Increases have been substantial. *Automotive News* reports price increases on comparably equipped cars of 24% for the Big 3 and 45% for Japanese firms during the 6 model years of 1982-1987. The gap was particularly large after the 1985 depreciation of the dollar: Japanese car prices rose 14% in '86 and 7% in '87, versus 6% and 2% respectively for the Big 3. (Because the size of cars increased during this period, average prices rose faster, at 37% for the Big 3 and 67% for the Japanese makers.) Price increases during the four years 1988-1992 have been sharp as well, ranging from 18% for the Honda Accord to 38% for the Honda Civic, and averaging 25% overall.<sup>45</sup> All told, Japanese car prices have thus jumped at least 70% during the past

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44 There are too many firms in the industry to form a cartel without government backing, and MITI has insufficient clout to impose one without a reduction of the VER. There is in addition no evidence for such a cartel. One thus would expect the Japanese auto companies to have tried to fill their quota, *if it had been profitable to do so*.

45 『日経産業新聞』 (Nikkei Sangyo Shimbun), July 13, 1992 citing Maryann Keller.

10 years. Again, this trend continued apace, even before the latest jump in the value of the yen: Japanese prices have risen 10-12% since the start of the 1992 model year, double the rate of the Big 3.

The extent and timing of these increases clearly reflects the impact of the dramatic increase in costs in Japan after 1985. From a political perspective, there was no sudden increase in trade friction at that time. It was simply increasingly difficult for auto makers to profitably export from Japan. Of course two of the most lucrative segments—pickup trucks and minivans—have been closed off by tariffs and political threats, respectively.<sup>46</sup> But the blush is off the Japanese miracle.

Several minor factors contribute to this. One is the concentration of dealerships on the East and West Coasts, where the recession hit hardest. The second is that Japanese car designs have been compromises, aimed at both the Japanese and the U.S. market. While external and internal trim are country-specific and extra safety features are added for the U.S., the overall body design has been identical. Tastes are not. Even without the dumping investigation, Japanese minivans were selling only modestly, and Honda, Toyota and Mazda have seen major sales declines of their cars. They and Toyota are now strengthening their design centers to be able to turn out an “all-U.S.” vehicle, but only Nissan has done so to date, through its joint minivan project with Ford. (Honda will launch a “U.S.” car shortly.) With the cost gap reversed and the quality gap invisible, only unusually lucky styling can generate sales gains.

Thus, despite its many problems, GM turned out enough designs matching consumer wants for its Buick division to actually increase sales during the recent recession. At the same time, the transplant factories have not always performed well, despite presumed cost advantages stemming from their younger workforce and better production systems. Mazda (now Autoallianz), Diamond Star Motors (Mitsubishi) and SIA (Subaru-Isuzu) are all operating well below capacity, and other plants have had short-term problems selling their output. Hyundai in Canada is barely functioning, while the Saturn plant is doing surprisingly well. GM is still scheduled to close several plants, but to the extent there is excess assembly capacity in the U.S. and Canada, it is no longer inevitable that the Big 3 will be the losers; Daihatsu has now withdrawn from the U.S. market. Indeed, between the steady decline in imports, currently scheduled plant closings, and increased exports to Japan and

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<sup>46</sup> An anti-dumping suit would have been inconceivable in the early 1980s, because of the clear cost advantage and profitability of the Japanese car industry. Margins were fat enough to preclude a “guilty” verdict even given the advantage of the use of accounting definitions unfavorable to exporters.

Europe, North American capacity will come into much closer balance. (Again, styling will matter: tight capacity industry-wide will matter little to a factory stuck with unpopular designs.)

In sum, imports are no longer competitive, the Big 3 have turned around their management (even GM is far better than 5 years ago), and some of the transplants are performing quite poorly. Most of the transition in the assembly end of the industry is thus complete. Absent another oil crisis, there will be no repeat of the 1970s onslaught of imports—and even with a shift in energy prices and a return to subcompacts, the Big 6 of today are far more agile and responsive than the Big 3 of the past, and with the gradual integration of the Mexican industry under NAFTA there will be a group of North American plants tooled up to supply that segment.

#### The Future of the U.S. Industry: Parts

The parts end of the industry is in a greater state of flux: more firms have problems at the same time that more firms are doing well. Because of the tremendous heterogeneity of the industry, it is very hard to generalize. That is unfortunate, because given the weight of parts production relative to assembly, the largest sector of the industry is therefore missed. In any event, it is on the one hand clear that the small traditional parts firms are quickly disappearing. On the other hand, the new generation of component and subassembly manufacturers are rapidly displacing imports from Japan, and are in themselves becoming substantial exporters. Indeed, it would not be surprising to see a growth in total employment, even after correcting for the end of the American recession.

First, the influx of transplant parts producers has changed the face of the industry. Second, the larger and more technically skilled of the traditional producers have been expanding. This is particularly true of those companies that had defense industry divisions, and hence have accumulated unique technical skills. But even less flashy companies such as Dana have been opening strings of small-sized factories in rural areas; at such sites, firms can maintain fully loaded labor costs of \$12. Third, with each model change, the number and complexity of components procured by the transplant assemblers in the U.S. has increased. Unlike assembly, the market for parts makers is thus growing. Finally, exports are rising rapidly. Despite the recession in Japan and the U.S., for fiscal year 1991 as a whole sales of parts to the Japanese assemblers and their transplants were up 16% in dollar terms. At least 78 companies now have representation in Japan, including firms with full-fledged engineering centers such as Garrett, Dana, TRW, Bendix, Timken and the GM parts divisions. These changes were

already underway prior to the Action Plan put together for President Bush's visit in January 1992, which may have influenced timing slightly, but not the overall trend. Given the competitiveness of the domestic market, no company can afford to use large numbers of parts when that is not commercially viable. American companies are finding they can export competitively, even given 7-15% shipping costs and the 3% value-added tax. It appears that as long as the yen stays at ¥125 or stronger, exports to Japan are viable for a wide range of items. (See Figures 3 and 4, and Table 2.)

This is not to say that the parts sector is without problems. As noted, small traditional firms are losing their entire market. At the same time, new entrants are not faring as well as they had hoped. Specifically, the transplant parts firms entered the U.S. market with the (accurate) presumption that their customers would be willing to shift purchases of parts from factories in Japan to affiliated factories in the U.S. But on the whole the transplants also assumed that they would be able to sell to the Big 3 and to other assemblers; indeed, without such sales they would not be profitable. To date, most such firms have not achieved their anticipated levels of new sales, and are finding it extremely difficult to earn back their initial investment, or even turn an operating profit. At least two companies have folded their operations, and a half-dozen joint ventures have bought out American partners who had wanted to close down their plants rather than keep going. The Japanese media has reported that as many as 60% of transplant parts firms are losing money, though that may reflect a small sample and the expected losses on start-up rather than real problems. With the current recession and the shift in the cost structure, transplant factories are also turning into active exporters.<sup>47</sup> This helps them kill two birds with one stone, increasing capacity utilization in the U.S. while easing the strain of excess demand within Japan. Thus the transplants are helping as well to increase the export orientation of the North American auto industry, and raise industry employment to levels higher than in 1990. (See Figure 5.)

### The Future of the Japanese Industry: Assembly

Despite the current domestic recession, production levels remain higher than before the start of the boom in 1988. Thus it is surprising that four firms are running operating losses, Nissan, Isuzu, Fuji Heavy Industries and Daihatsu. In fact profits were declining even *before* sales nose-dived: the

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47 See 『日刊工業新聞』 (Nikkan Kogyo Shimbun), January 14, 1992 on Sancor exports of flywheels to Japan.

problems in the industry run far deeper than a temporary downturn in sales. Model proliferation and investment in new plant have been combined with tight labor markets. Steel prices, too, rose 5% in 1991,<sup>48</sup> reflecting rising labor costs there as well, and adding to the automakers' woes. They likewise accepting parts price increases on occasion, and the traditional biannual 2-3% target price reductions by suppliers are not being met. Finally, with sluggish export demand and declining domestic sales, discounting has been steep. A quarter of all dealerships lost money in 1991, and half are expected to lose money in 1992.

With the current cost structure, however, exports will continue to decrease. Europe, the one remaining large market, is closed for political reasons; the quota on Japanese vehicles has been set at 1.09 million units for 1993. In addition, the EC is still less than unified.<sup>49</sup> Half of exports now go to developing country markets. But Southeast Asia and the other rapidly expanding markets also typically insist on limiting imports of built-up cars and push for increased local content. Parts sales will like increase for some time, but exports must soon peak in the ASEAN region as well. Finally, while demographics suggest that car ownership rates will rise further in Japan, the underlying pace of growth remains modest (2-3% per annum). It thus will be 4-5 years until 1991 sales levels are again achieved. In the interim, given the looming cost gap, foreign firms will make inroads, too, to the tune of perhaps 500,000 cars a year—though these firms may have names like Honda of America. I am thus pessimistic that the Japanese domestic industry will ever realize 1991 levels of production again.

This does not necessarily mean disaster for either the economy or even the domestic industry. The recent boom clearly strained capacity in the industry, and most workers will welcome a reduction in overtime, even while complaining about the loss of pay. But more than that, the Japanese government

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48 The recession, however, will make it very hard for steel firms to increase prices again in the near future.

49 『東洋経済』 (Toyo Keizai), 1993.4.17, 140. See also the ongoing research of Mark Maso, School of Management, Yale University. Note that the focus on quotas probably overstates the importance of protectionism. Without the benefit of the oil crisis, the Japanese producers could not have expanded so quickly in the U.S.. In Europe, however, they have no monopoly on small cars or any other market segment. Japanese firms do hold major shares (40%) in Finland and other open markets. But this ignores the fact that local producers in France, Germany, the UK and Italy still dominate their home markets, which account for the bulk of the overall European market. There are two "European" firms that are not tied primarily to one country and yet have done well, namely Ford and GM. But their achievements reflect decades of effort, and in few countries are either of them the top selling firm. Between the importance of established distribution networks and national variations in tastes, a Europe-wide strategy can as yet have only limited success, and so it remains an intrinsically hard market to crack.



in its usual hortatory manner is exerting pressure for a permanent reduction in working hours. In the industry only Honda has consistently kept overtime hours to a minimum, roughly achieving the contracted working time of 1909 hours per year. But other firms averaged 2140 hours, and several over 2200 hours in 1991. To reach the official target of 1800 hours requires a 15-20% reduction in hours—and unless employment is expanded, this would lead to a 15% reduction in output, at least partially alleviating the capacity overhang.

Second, firms initially forecasted strong growth in demand in 1988-89 when they made their expansion decisions. Their stated intent was thus to use the new plants in Kyushu and elsewhere to permit them to shut down and refurbish older plants. Given the current market, however, the “scrap and build” policy is likely to shift to a “scrap” policy. Plant closures will come to Japan, though they will be handled in a far more orderly manner than in the U.S. Thus, while Nissan has announced the closure of its Zama plant, that will not take place until 1995. Which plants to scrap in what order has been decided, in parallel the age of the factories—Zama is Nissan’s second oldest plant, and located in a congested area. Such facilities are too small to readily install automation, and the shift in the labor market now requires that be done. The industry will end up cutting capacity, albeit in a quiet way.

In general, firms will honor their employment guarantees; workers will be asked to move to other plants. Given the geographic concentration of most firms in the industry, this will prove less traumatic than in the U.S. and Canada. Furthermore, the use of contracting out of workers to other firms (shukko) is spreading. For example, Hitachi has recently sent a crew of workers to Hino, and New Japan Steel to Toyota.<sup>50</sup> These workers are paid by the recipient, with the sender kicking in supplemental amounts as necessary to preserve original salary and benefit levels. But it is also worth noting that despite the slowdown, the auto industry was until the past six months still in the position of seeking out workers from other firms, and there are of course isolated plants (e.g., for recreational vehicles) that must rely on overtime to meet demand. In any case, if the average use of “temporary” and other non-regular workers is 20%, and overtime averages 10%, a substantial downturn can be met without firing anyone in the strict sense of the word, while given the rapid aging of the population and the growth in demand for services, “temporary” workers—or workers who refuse a transfer—should be readily able to find new jobs. In this urban Tokyo will differ from urban Detroit.

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50 『読売新聞』 (Yomiuri Shimbun), July 5, 1992. The article is entitled “Increased Unemployment within Firms,” with three subtitles, “Avoiding Layoffs by Finding New Jobs; Sending Workers across Keiretsu Can’t be Helped; and Unneeded Workers Rapidly Increasing.

Even if we are optimistic that the fall in demand can be covered via shorter working hours, profits cannot be maintained. It will be hard to raise prices, while the passenger car market has too many firms to organize a cartel, and the plethora of options would make one virtually impossible to police. Firms in the heavy truck market were able to raise prices in September 1991 by 4.5%—the first such increase in 11 years, reinforcing the argument for qualitative change in the industry. Given the comparability of bare chassis and the presence of only four producers, coordination was in this case possible. (Mitsubishi served as the price leader, with the other 3 matching its increase within 2 weeks of announcement.) But the policy climate is also different: the Fair Trade Commission has cracked down on price fixing among truck dealers with an antitrust case. With excess capacity and thin margins, discounting at car dealers will remain both endemic and unprofitable.

Along with labor costs, capital costs will remain high. Under a 5-day work week and shorter working hours, the same facility will be used only 80 hours a week, instead of the 108 hours of operation under a 2-shift, 6-day week with one hour of overtime per shift.<sup>51</sup> Fixed costs, in other words, must be spread across fewer units. Thus even if the industry is able to reduce capacity without layoffs, this cannot be achieved for free. Indeed, the trend is to greater automation, to permit firms to use their aging workforce effectively, to encourage younger workers to stay, and to simplify jobs for foreign and other workers. It is thus hard even to cut investment, even as it is becoming harder to make a profit on such investment. It would not be surprising if one or two firms with weak dealership networks are unable to survive these pressures on profits. If they are lucky, they will become mere subcontract assemblers. Indeed, Hino, Fuji Heavy Industries and Daihatsu have been partly that for 2 decades, building cars for Nissan and Toyota, while Isuzu is highly dependent on GM. Without the truck market as a cushion, FHI and Daihatsu are particularly vulnerable, while relative to previous size Mazda has been the most ambitious in building new assembly capacity. Only Mitsubishi Motors has seen its profits increase this past year, buoyed by several simultaneous successful product launches and a conservative investment strategy. But a string of poor-selling models could seriously weaken even the strongest of the Japanese producers.

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51. Three shift production can partially allay this; whether workers will prove amenable remains to be seen.

### The Future of the Japanese Industry: Parts

As grim as the future of the assembly end of the industry may be, the transition will be more painful for parts firms. First, in the aggregate they employ 75% of the auto industry's workers, and so the quantitative amount of adjustment will be greater. Second, at least in the medium run it will be much more vulnerable to import competition, given the ease of shipping parts, the greater labor intensity of much of parts production, and the simpler marketing task for foreign producers (at least once they have a rep who knows the ropes!). Third, direct parts suppliers are continuing to integrate vertically, a trend that began 30 years ago. Fourth, the heightened pace of technical change will bring to the fore materials and technologies that will make the capacities of some firms obsolete—while providing windows of opportunity for others, particularly in electronics, new materials and systems integration. (Toyota itself is aiming to make 10% of its semiconductor needs.<sup>52</sup>) Offsetting these trends are the increasing complexity of vehicles, as the installation anti-lock braking systems, active suspensions, airbags and other safety equipment and cooling systems becomes more widespread. But exports of parts will decrease more rapidly than that of vehicles, as domestic content increases, while imports are already on a rise. (See the accompanying tables on parts purchases from the U.S.) Hollowing out appears inevitable, and I believe the rise of production in the less developed world will not help the industry in the aggregate.

New capacity, as noted above, is now coming onstream, while profits have already been falling. In a recent survey of 49 of its larger members, the Japan Auto Parts Industry Association found that 25 had decreased profits despite increased sales. Likewise, the industry average decreased from a peak of 4.2% at the onset of the boom in 1988, to 2.4% in the fiscal year ending March 1992. In other words, profits have fallen steadily in the face of an overall increase in sales. Labor costs have not been matched by productivity increases, while with the proliferation of models overhead rose; R&D costs, for example, averaged 7% of sales. Even if current assembler efforts to increase parts commonality bear fruit, it will take some time before this would help profits. Such changes can be put into effect only as new models are launched, while parts must be kept in production for 10 years after the last new car is assembled. The excesses of the "bubble" will be felt by parts suppliers for years to come.

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52 Ironically, one of the reasons for this is to offset the power of Nippon Denso. Toyota has no clout, despite the latter's origins as an operating division of Toyota, with Toyota remaining its largest shareholder. 『日刊工業新聞』 (Nikkan Kogyo Shimbun), November 27, 1991 and interview at Toyota and Nippon Denso, summer 1991.

Again, these problems are intensified by shifts in trade. In yen terms, parts imports doubled from ¥76 billion in 1988 to ¥153 billion in 1990, though this was as yet but 1% of production. On the other hand, as local content increases the growth of exports to the U.S. has virtually halted, going from \$8.55 billion in 1989 (¥1.18 trillion) to \$8.49 in 1990 (¥1.23 trillion). In fiscal year 1991 total parts exports (to all destinations) actually decreased 3% in yen terms.<sup>53</sup> Given the underlying trends in wages and exchange rates, the structure of parts trade will soon shift enough to be felt strongly throughout the industry.

As in the U.S., smaller parts firms will be hurt the most. Such firms have faced the most rapid increase in labor costs, and have had great difficulty merely recruiting workers, particularly in the Tokyo region. As technology shifts and vertical integration increases, they will find their former customers less interested in continuing to purchase high-volume items. They will also be the most affected by imports, because of their general tendency to be on the labor intensive side of the industry.

Current data on such firms are difficult to find; the Census of Manufactures, which gives the most comprehensive picture (as well as permitting geographic shifts to be traced) is only published with a 3-4 year lag. A more current source, a yearbook and other publications that draw upon the resources of the Japan Auto Parts Industry Association, reflect its membership of large, direct suppliers. Likewise, newspaper coverage for obvious reasons focuses on the same group of firms, and especially on the companies listed on the stock exchange. Nevertheless, the wave of investment in new plants noted earlier means that not even larger firms will be immune.

## **VII. Summary**

Both the parts and the assembly end of the Japanese auto industry are suffering from a shift in their labor costs that has eliminated their long-run competitiveness in export markets. This is particularly true when viewed against the United States. The Japanese industry now faces a recession, coming on top of a period when large additions were made to manufacturing capacity. While the social costs of adjustment will be lower than in the U.S. because of tight labor markets, many firms will inevitably run into serious management difficulties. Even in the best of cases, profitability will remain low into the foreseeable future.

The changes in the auto industry are even more visible in other industries. Most VCR decks are now made in Southeast Asia, and the same is true for compact cameras and many other items inextricably linked in foreign consumers' eyes with Japan. The obverse side, of course, will be a gradual decline in exports and an increase in manufactured imports. This is, after all, an inevitable consequence of an aging population, which brings about a relative decrease in the working-age population in the face of increased demand for services. Labor costs in manufacturing thus rise. Affluence also brings a greater desire for leisure. The ability to rely on overtime as a buffer against shocks in demand will weaken. This will change the nature of the business cycle, and together with the shift in the age and skill structure of the population will bring an end to the "classical" Japanese large-firm employment system of the 1960s. It is not yet clear in what direction it will evolve. One distinct possibility is a vast increase in immigrant labor; five years ago it would have been inconceivable to most observers that Japan would host 500,000 illegal workers in 1992. That, too, will bring about a qualitative shift in labor relations. In short, the Japanese economy is changing quite rapidly, though as yet only a partial outline of its future structure can be discerned.

Over the next five years autos will fade as a bilateral issue between the U.S. and Japan. That will not mean an end to change within the North American auto industry, particularly as production in Mexico has now passed the 1 million mark, nor will it mean a collapse and social turmoil on the Japanese end. Still, few could have imagined this reversal a few years ago. Indeed, many are not yet aware of its full extent.

Europe can learn lessons—or at least look into the future—by examining Japan. As cross-border trade increases with the progress of EC harmonization of rules, and as "lean" manufacturing diffuses, the relative cost base will come to the fore; German manufacturers will face obvious pressures to adjust. Second, import competition will remain important; the focus will shift, however, from Japanese producers to American and (perhaps eventually) ASEAN firms. Third, the logic of balancing production lines so as to maintain capacity utility will be important; already a number of cross-firm ties and short-term OEM relations have developed. Here, indeed, it is the North American producers that are the laggards. Finally, what to build where will be sensitive to considerations of foreign exchange risk. Over the long run, the world industry is likely to drift back to producing locally for local markets, albeit with ASEAN developing as a fourth center. In this the industry in the year 2003 will resemble more closely the 1930s, with limited amounts of intra-regional trade.

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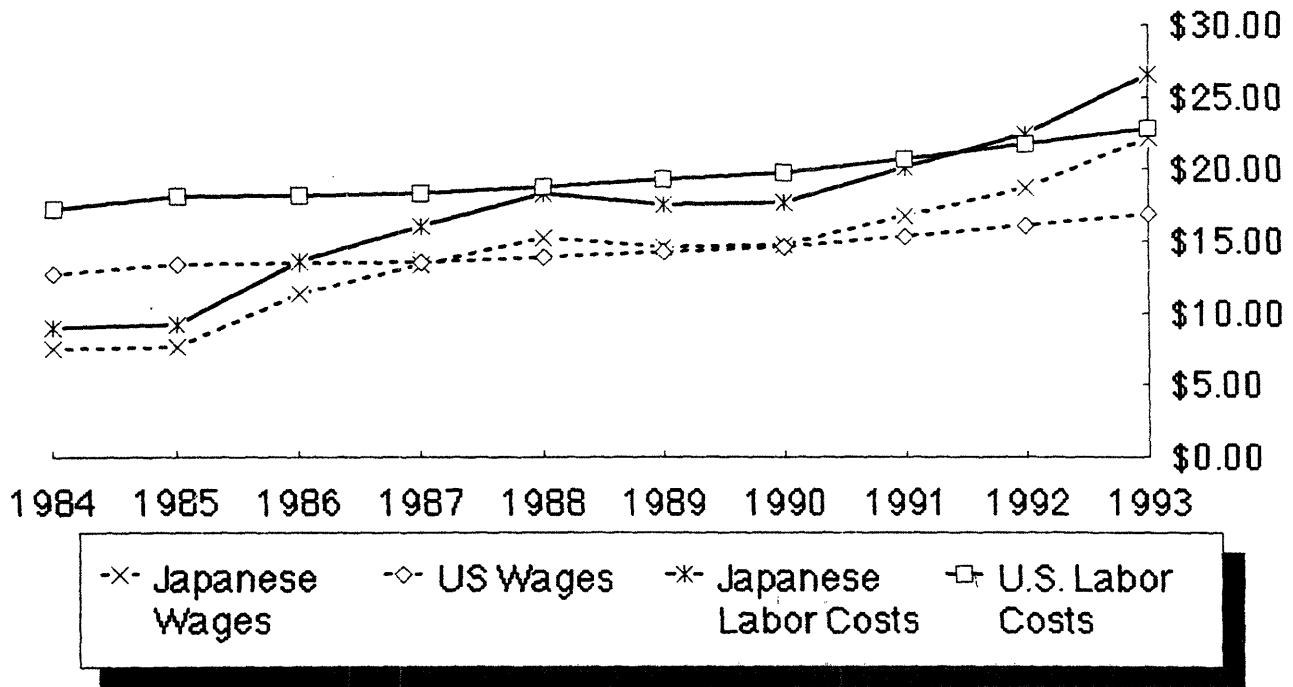


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Wages and Labor Costs, U.S. and Japan

Year	Japanese Wages	U.S. Wages	Japanese Labor Costs	US Labor Costs	Gap Japan/US
1992	\$18.90	\$15.78	\$22.69	\$21.30	106%
1991	\$16.74	\$15.32	\$20.09	\$20.68	97%
1990	\$14.75	\$14.61	\$17.70	\$19.72	90%
1989	\$14.65	\$14.28	\$17.57	\$19.28	91%
1988	\$15.24	\$13.90	\$18.29	\$18.77	97%
1987	\$13.36	\$13.57	\$16.03	\$18.32	88%
1986	\$11.33	\$13.45	\$13.60	\$18.16	75%
1985	\$7.66	\$13.39	\$9.19	\$18.08	51%
1984	\$7.49	\$12.73	\$8.99	\$17.19	52%
1983	\$7.28	\$12.14	\$8.73	\$16.39	53%

US and Japan: Automotive Wages and Labor Costs

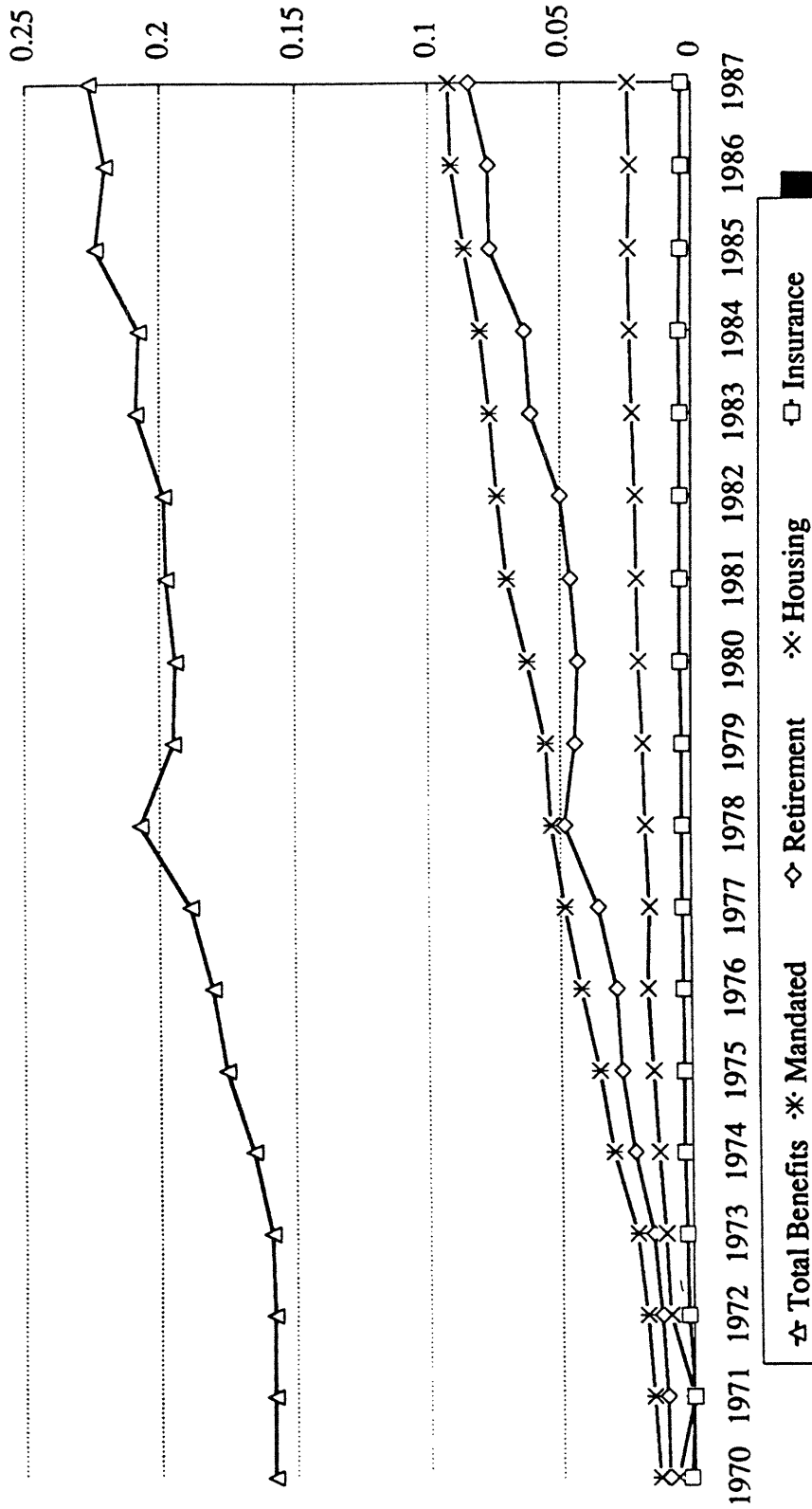


## Changing Japanese Wage Structure, Automotive Industry

Year	Monthly Cash Compensation	Index 1985=100	Hours per month	¥ per Hour	Forex ¥ / \$	Japanese Auto Wages \$ per hour	\$ Index 1985=100 (A)	Productivity 1985=100 (B)	(A)/(B)	US Wage Index	US Auto Wages	US Productivity	Year
1993	—	—	—	¥2,458	¥111.0	\$22.14**	289.1*	—	—	126.1*	\$16.89*	—	1993
1992	—	—	—	¥2,363**	¥126.6	\$18.67**	243.7*	—	—	120.1*	\$16.09*	—	1992
1991	—	—	—	¥2,254**	¥134.7	\$16.73**	218.4**	111.5	195.9**	114.4	\$15.32	—	1991
1990	¥399,039	116.3	186.7	¥2,137	¥144.9	\$14.75	192.7	113.0	170.5	109.1	\$14.61	108.6	1990
1989	¥383,521	111.7	189.6	¥2,023	¥138.1	\$14.65	191.3	107.0	178.8	106.6	\$14.28	109.1	1989
1988	¥368,514	107.4	188.6	¥1,954	¥128.2	\$15.24	199.1	105.7	188.3	103.8	\$13.90	109.6	1988
1987	¥352,767	102.8	182.7	¥1,931	¥144.5	\$13.36	174.5	100.0	174.5	101.3	\$13.57	106.6	1987
1986	¥347,421	101.2	182.4	¥1,905	¥168.1	\$11.33	148.0	99.2	149.2	100.4	\$13.45	100.4	1986
1985	¥343,223	100.0	188.3	¥1,823	¥238.1	\$7.66	100.0	100.0	100.0	100.0	\$13.39	100.0	1985
1984	¥332,470	96.9	186.8	¥1,780	¥237.6	\$7.49	97.8	97.7	100.1	95.1	\$12.73	95.2	1984
1983	¥315,468	91.9	182.5	¥1,729	¥237.5	\$7.28	95.1	93.7	101.4	90.7	\$12.14	90.4	1983
1982	¥303,701	88.5	179.8	¥1,689	¥249.3	\$6.78	88.5	91.7	96.5	86.8	\$11.62	79.7	1982
1981	¥291,992	85.1	183.1	¥1,595	¥220.5	\$7.23	94.4	95.5	98.9	82.3	\$11.02	76.6	1981
1980	¥278,381	81.1	186.0	¥1,497	¥226.8	\$6.60	86.2	87.3	98.7	73.6	\$9.85	80.4	1980
1979	¥258,848	75.4	183.7	¥1,409	¥219.1	\$6.43	84.0	70.1	119.8	67.7	\$9.06	70.5	1979
1978	¥239,994	69.9	181.0	¥1,326	¥210.4	\$6.30	82.3	60.5	136.0	63.5	\$8.50	—	1978
1977	¥223,317	65.1	181.3	¥1,232	¥268.5	\$4.59	59.9	63.9	93.7	58.6	\$7.85	—	1977
1976	¥202,052	58.9	178.6	¥1,131	¥296.6	\$3.81	49.8	65.5	76.0	52.9	\$7.09	—	1976
1975	¥173,333	50.5	170.0	¥1,020	¥296.8	\$3.44	44.9	63.3	70.9	48.1	\$6.44	—	1975

Notes: Data are derived from the *Monthly Labor Statistics* published by the Japanese Ministry of Labor (毎月勤労統計) for the automotive industry. Labor productivity data are based on Japan Productivity Center data as published in their quarterly statistical series and in the *Japan Statistical Yearbook*. The weighting is revised every fifth year, and for older data I have linked these separate series at the endpoints. In addition, these data are for the transport machinery industry (of which shipbuilding is a significant component), rather than exclusively for the automotive industry, which is however the dominant component. Foreign exchange rates are as reported by Toyo Keizai in their *Annual Economic Statistics*. US wage data are from the Bureau of Labor Statistics for SIC 371, as reported in the US Motor Vehicle Manufacturing Association *Facts & Figures '91* and earlier. \*\*Japanese 1991 data are an extrapolation using the 5.5% average auto wage settlement and actual exchange rates and productivity data. For 1992 I assumed a 4.8% increase, and for 1993 a conservative 4% increase (although Spring Offensive settlements are higher). Productivity has undoubtedly continued to decline in Japan. For the US I have assumed 5% wage increases in 1992 and 1993, higher than the realized increases in 1990 and 1991. I have thus tried to extrapolate high for the US and low for Japan, so as to produce smaller wage gaps for 1992 and 1993.

### Growth of Japanese Benefits



△ Total Benefits   \* Mandated   ◇ Retirement   \* Housing   □ Insurance

Japanese Purchases of U.S. Auto Parts

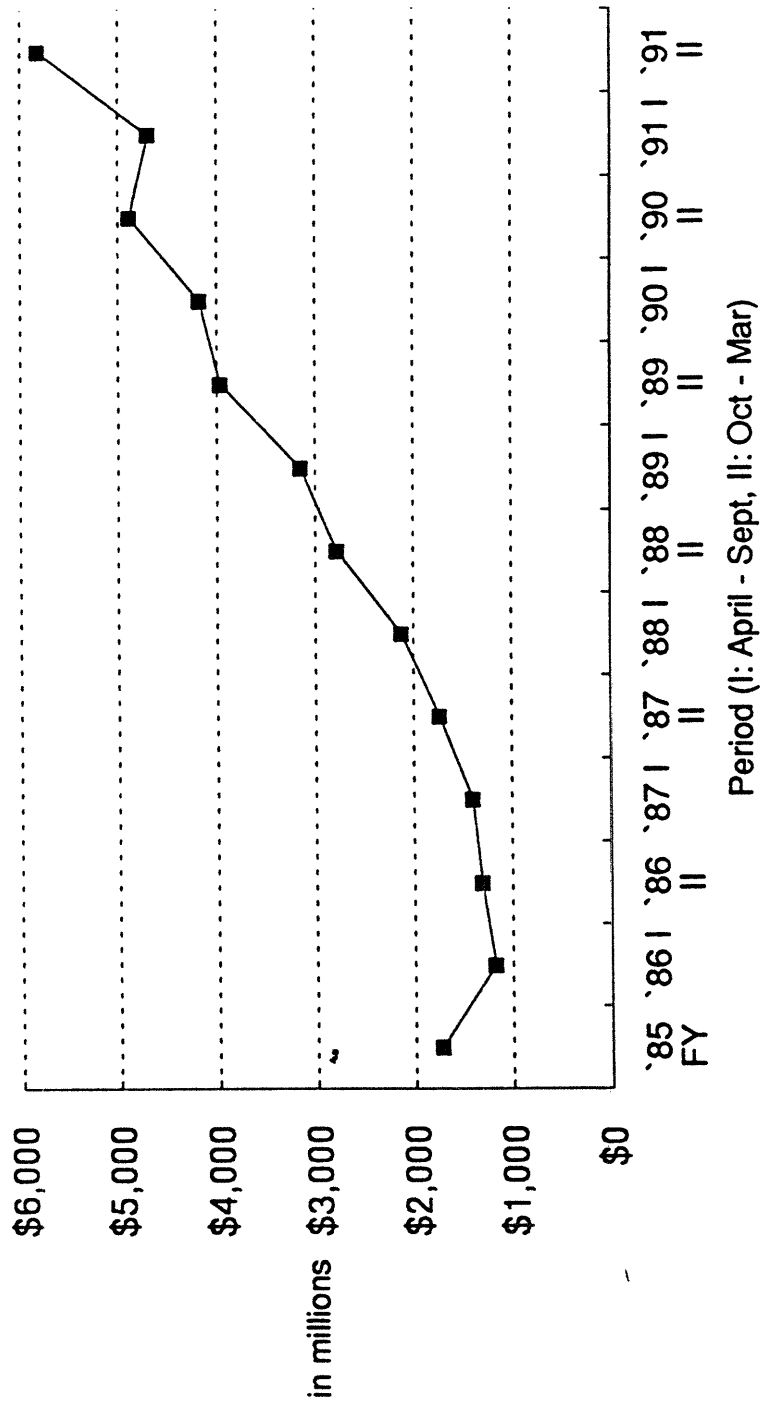
Period	TOTAL	Change				Parts				Accessories	Change		Materials	Change
		TOTAL	Engine Parts	Chassis and Drivetrain	Body Parts	Electrical Parts	Change	Materials	Change					
'85 FY	\$1,726									\$76			\$176	
'86 I	\$1,177	*36%	\$206	\$188	\$396	\$685	\$76	\$57	\$76	\$57	*50%	\$121	\$176	*37%
'86 II	\$1,313	12%	\$119	\$95	\$347	\$438	\$57	\$50	\$50	\$50	-12%	\$126	\$126	4%
'87 I	\$1,400	7%	\$128	\$111	\$429	\$478	\$41	\$41	\$41	\$41	-18%	\$180	\$180	43%
'87 II	\$1,735	24%	\$189	\$130	\$461	\$459	\$48	\$48	\$48	\$48	17%	\$207	\$207	15%
'88 I	\$2,128	23%	\$161	\$156	\$596	\$540	\$133	\$133	\$133	\$133	177%	\$273	\$273	32%
'88 II	\$2,781	31%	\$215	\$224	\$783	\$553	\$84	\$84	\$84	\$84	-37%	\$361	\$361	32%
'89 I	\$3,153	13%	\$265	\$308	\$1,039	\$773	\$100	\$100	\$100	\$100	19%	\$375	\$375	4%
'89 II	\$3,969	26%	\$442	\$362	\$1,215	\$835	\$102	\$102	\$102	\$102	2%	\$432	\$432	15%
'90 I	\$4,183	5%	\$451	\$531	\$1,518	\$945	\$100	\$100	\$100	\$100	-2%	\$471	\$471	9%
'90 II	\$4,891	17%	\$600	\$645	\$1,777	\$1,037	\$111	\$111	\$111	\$111	11%	\$549	\$549	17%
'91 I	\$4,702	-4%	\$596	\$639	\$1,807	\$1,210	\$109	\$109	\$109	\$109	-2%	\$506	\$506	-8%
'91 II	\$5,826	24%	\$776	\$842	\$2,214	\$1,373	\$123	\$123	\$123	\$123	13%	\$499	\$499	-1%

Source: Data from the U.S.-Japan MOSS Automotive Parts Followup. Units are US\$ million.

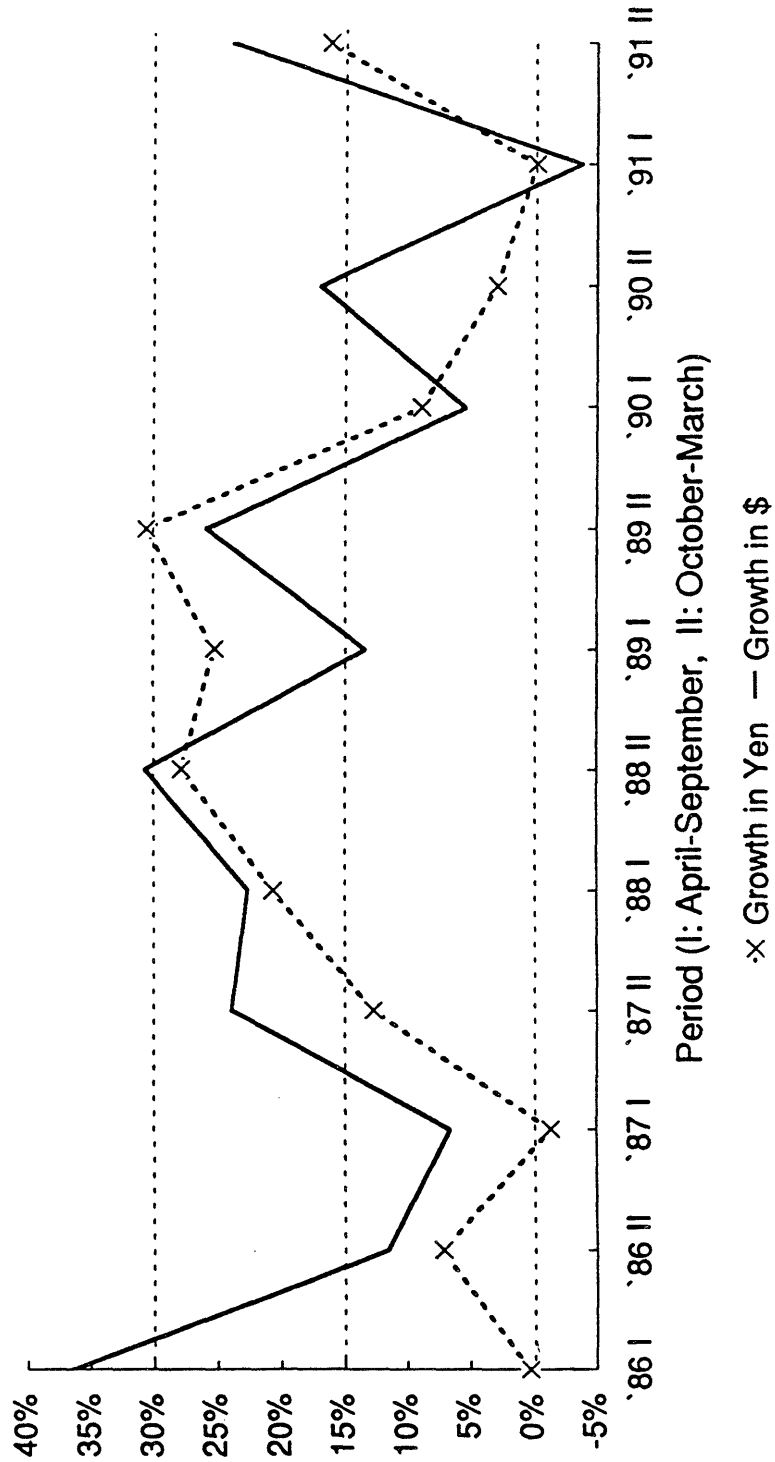
I - April - September

II - October - March

### US Auto Parts Sales to Japanese Makers



### Growth of U.S. Auto Parts Purchased by Japanese Automakers



# US Auto Industry Employment

