Adjustment in the Japanese Automotive Industry
A Microcosm of Japanese Cyclical and Structural Change?

Michael J. Smitka
Professor of Economics
Williams School of Commerce
Washington and Lee University
Lexington, VA 24450-2232
MSmitka@wlu.edu

The Japanese economy is in its 3rd recession in a decade. Economists (and, less intelligently, policymakers) argue over whether the cause is one of secular slowdown, structural rigidities, or merely a larger-than-normal business cycle. This paper carries this debate over to the microeconomic realm through a case study of the automotive industry. It highlights the presence of all three of these elements at the industry and firm level. Data are presented showing slow but steady adjustment in the auto industry. Large-scale strategic change, however, is both unusual and recent; twelve years after the slowdown began, substantial excess capacity remains. As in the United States, firms find it very difficult to alter their internal organization and strategic framework.

Introduction

Japan’s was the miracle economy for the three decades of the 1960s through the 1980s. But the 1990s turned into a “lost” decade, and the economy has yet to regain momentum. It suffers from three interlocking diseases. The most obvious, of course, is the “bubble” and its bursting, a macroeconomic shock that among other things left an overhang of excess capacity. The second is secular stagnation, as an aging society lowers potential growth while increasing the demand for low-productivity services. The third is a system that soured, symbolized by a political economy still oriented towards agriculture and construction, and wooden management tied to structures better suited to the high growth era, such as interfim keiretsu links and the lifetime employment system.

To someone outside Japan, the auto industry might seem immune to these problems. In early 2002 Japanese “marques” accounted for 27% of the US market, the highest total ever; Honda and Toyota were both busy ramping up production at new European assembly plants while adding to capacity within NAFTA. In most of Asia, one or another Japanese firm dominates the local scene, albeit in most cases through joint ventures with local firms. Even in China, where Volkswagens has over
50% of the passenger car market, a Toyota joint venture in Tianjin and a Honda plant in Guangdong are gradually increasing their output and market share.

Yet the domestic industry is in fact a microcosm of Japan’s larger problems. First, during the “bubble,” industry leaders both inside and outside Japan believed Japanese firms would dominate the global automotive market. Consistent with that, at the peak of the boom, assemblers and parts makers were busily boosting capacity, from 13.5 million to 15 million units. Second, with an aging population and a strong yen, this was beyond any conceivable growth of the market; the secular trend was one of declining exports and stagnant domestic demand. Third, the industry’s structure reflected the political economy of the 1950s and 1960s, which insulated the domestic makers from foreign competition. During the 1960s this small and fragmented market allowed multiple niche producers to coexist; out of a large number of entrants, 9 passenger car producers and 4 makers of medium and large trucks as the industry survived into the 1990s. Management was also rooted in the past; even after the “bubble” burst, the industry continued as though at most incremental adjustment was needed. Despite the passage of a full decade, Toyota and its affiliates still maintain one million units of excess capacity. While Nissan began closing plants in the mid-1990s, it was slow to address problems of poor dealerships, high parts costs and stodgy product design.

Individual industries are also subject to shifts in technology and regulation that are independent of the above factors. Overall, the pace of technical change in the auto industry is greater than at any time since the 1920s. Heightened quality expectations, demands for safety and convenience, and a likely mandate for alternative propulsion systems have made designing and building vehicles far more dependent than in the past on integrating complex systems, with a consequent increase in fixed costs and potential economies of scale. Twin revolutions in IT and materials enabled this, while the former holds forth the promise that automotive firms can actually manage themselves as global businesses, coordinating engineering across oceans. Suppliers are affected even more, since they are now being asked to operate in multiple countries and take on design, engineering and testing; no longer can they be simple manufacturers. Restructuring is the by-word at automotive companies in the EU, the US and throughout the developing world. It is useful to remember that in 2001 these pressures were not unique.
to Japan; in the US and the EU Ford, DaimlerChrysler, GM and Fiat all lost money, even while Peugeot and BMW were enjoying record years.

Restructuring is evident. Nissan, the former Japanese “national champion,” debated strategy until it was at the verge of bankruptcy, only to be bailed out by a firm whose dominant shareholder is the French government. Mazda and Mitsubishi Motors are likewise run by non-Japanese executives, from Ford and DaimlerChrysler, respectively. Indeed, during the past several years all but two of the 11 incumbents have fallen under the control of, or entered into shareholding alliances with, other firms. Several suppliers have also been gobbled up by others, foreign and domestic.

What, then, is the status of the industry as a whole? Why was change so long delayed? Has the domestic Japanese industry turned itself around – Nissan, after all, has already returned to profitability under the leadership of a Lebanese-Brazilian Frenchman. I argue below that slow change is the norm, and not just in Japan. After all, despite its brush with bankruptcy in 1980, Chrysler did not launch thorough-going reforms until 1989; General Motors lost market share every year between 1980 and 2001, before hiring the individual who engineered Chrysler’s turnaround. Little fundamental happens in the auto industry in under a decade.

First and foremost, the difficulty of strategic reform is not merely because of the Japanese context, but is generic to large firms and complex institutions. After all, the strength of their core bureaucracies is handling large-scale, recurring tasks and coordinating group efforts. The natural response to hard times is to try to handle those tasks more efficiently and to make other incremental changes rather than to disband and lose accumulated organizational capital. Second, change is also hampered by the dynamics of the automotive industry, which operates on an 8-year product planning cycle. Plants have varying degrees of flexibility, so that 2 plants operating at half capacity cannot be readily combined into one; unless a model line is dropped permanently, that may not allow cutbacks in engineering or purchasing. Introducing a new model likewise may require delaying the replacement of another, with the gains from capturing an apparent new trend largely offset by the poor sales of a design that becomes “long in the tooth.” Furthermore, only hindsight lets one distinguish short-run swings from long-term shifts in the competitive environment. In addition, even in a down market certain segments will grow, so that the experience of individual firms will differ from the industry average.
Heterogeneity is the norm, not the exception, and that makes generalization difficult. Given that proviso, the evidence suggests that, at the industry level, overall employment has fallen slowly but steadily since 1991, at about the same rate as revenue declined. However, wages continue to rise, so that the wage bill has only fallen slightly. Fixed capital, furthermore, rose by 80%, and remains high. Other measures suggest that, on average, incremental change has dominated at the industry level. This hides considerable variation at the firm level. Honda, for example, is enjoying record sales, with a strong showing in the SUV and minivan segments; in contrast, Nissan’s are down by 40%. In 2001, Honda was hiring contract workers; both Mitsubishi and Mazda were trimming their permanent workforce with early retirement programs. Even more dramatically, the full-sized truck has collapsed, with sales off by 60% on average. By and large, however, announcements of dramatic restructuring – including corporate takeovers – have only come in the past 2 years, and it remains difficult to assess the direction and extent of change.

**Growth of the Japanese Domestic Auto Industry**
Part One: Cyclical & Secular Change: The Sales Collapse

The Bubble

The story of the “bubble” is well-known. The slowdown in growth in the 1970s led to a massive shift in the flow-of-funds in the economy. Following the first oil crisis of 1973, fiscal policy compensated, maintaining growth. In the 1980s, however, the Ministry of Finance succeeded in reimposing fiscal restraint, and what followed was an extended period of easy money. Beginning in 1987, asset prices exploded, with the stock market more than tripling in value, and urban real estate prices likewise booming. Investment also increased, with much new construction, and increases in plant and equipment. Eventually the Bank of Japan responded, raising interest rates repeatedly from May 1989. But the stock market continued to rise through the end of the year, and land prices did not peak until 1991.

This rise in paper wealth was accompanied by an increase in consumption, including automobiles. During 1980-1987 domestic motor vehicle sales expanded 20%, from 5.0 to 6.0 million units, as both car and truck sales rose. In the next 3 years, 1988-1990, domestic registrations rose an additional 30%, driven almost entirely by a 56% expansion in the market for new cars. Sales of full-sized cars exploded, climbing 4-fold during the “bubble”; at their peak in 1992, over 714,000 were sold, an almost 10-fold increase over the 72,000 level of 1980. Total domestic output was 11.0 million
units in 1980, buoyed by exports to the US. Despite a steady decline in exports as the yen appreciated after the Plaza Accord in 1986, total domestic production expanded 10% during the bubble years, to peak in 1990 at 13.5 million units. It was also a much richer mix of vehicles, total shipments increased more, by 36%.

Investment responded. For an industry that was poised to dominate the global market, funds were available for the asking; warrant bonds carried coupons of almost zero. But 0% interest rates produced 0% management: if money is free, almost any investment project can pass muster. At the peak of the bubble, the domestic industry was busily adding 1.5 million units of new assembly capacity, for a domestic total of 15 million units. Parts firms invested correspondingly, particularly around northern Kyushu, where a new automotive district developed, while the Tohoku region in northern Japan likewise managed to recruit several plants.5

That process, of course, has since been reversed, and without a subsequent recovery in growth. The stock market is now back where it was in 1988, and land prices are if anything lower. Other than a short-term boom in 1996 and early 1997, growth has been poor. Indeed, Japan is now in its 3rd recession in a dozen years. Automobile sales responded accordingly. Domestic sales returned to the pre-bubble level of 6 million units, while exports continued to decline. Output is now hovering at the 10 million unit level, 30% below the capacity level of the early 1990s. The vehicle mix has shifted as well. Compact cars are off by 40% from peak, a decline of 1.5 million units. This is partly offset by a boom in minicars, registrations of which rose by 60%; the sales of full-sized cars also are up 60% from their 1990 levels, though they are 17% below their peak. Overall, industry shipments declined 10% in value terms.

Secular Trends

Some of this is due to secular trends, not the bubble. In 1992, the Japan Automobile Dealers Association was predicting an increase in sales, based on demographic shifts: as the population aged, more individuals were entering their peak car purchasing years.6 That proved misleading. More important was the extension of car ownership among the residents of the outlying suburbs of Tokyo and other urban areas, a process that had already peaked. Furthermore, average car life was increasing, helped by a liberalization of the car inspection rules – shaken – that had added to the cost of owning an
older vehicle and hence encouraged a faster replacement cycle. Likewise, new standards for trucks and buses had been phased in during the late 1980s; that gave rise to a sharp increase in demand. But trucks are even more durable than cars, and sales have yet to recover.

Similarly, exports reflected a variety of factors – such as a weak yen and moribund management at overseas rivals – that were bound to change over time. Since the Plaza Accord of 1986, the yen has remained roughly twice as strong as in the early 1980s, while overseas producers improved quality and productivity, and exploited market segments where Japanese firms had little or no presence. Exports are still important for the domestic industry as a whole, and critical for individual firms, notably Mazda. But the long-run trend over the century-plus history of the industry has been to “build where you sell.” While its realization takes time, Japanese firms are assiduously building capacity overseas, with the inevitable substitution of local production for exports.

Overall, then, the secular trend appears to be toward a 10 million unit market, as the postwar extension of “motorization” has given way to replacement demand and low levels of exports, both of which are subject to the business cycle at home and abroad. Ironically, this argument would be familiar to anyone following discussions of the future of the domestic industry in the early 1970s. But the oil crises spurred exports and domestic growth, supported by “bubble” riches, induced firms to keep expanding.
Part Two: Structural Factors: Domestic Disequilibrium and Technology-driven Globalization

The Japanese auto industry is being buffeted by more than the business cycle and the secular peaking of the overall market in a now-mature economy. Its domestic structure is also out-of-synch with that of the global industry. The domestic market developed under protectionist policies that, in parallel with virtually the entire developing world, left it dominated by a large number of comparatively small firms. As a result, it tended towards excess capacity and low profitability, though this is hardly unique to Japan; after all, that is to be expected of an industry best characterized as monopolistically competitive. In the long run, the number of firms might reasonably be expected to shrink, as happened in the US in the early postwar era and in Britain and other parts of the EU during the past 20-odd years.

On top of this, in the 1980s the pace of technical change picked up. This was due in part to regulatory mandates for improved safety and lower emissions. Combined with competitive pressures to integrate advances in microelectronics and materials science, R&D expenditures increased. But this is a fixed cost, and higher fixed costs equate to greater potential economies of scale. At the same time, the use of IT promised to allow firms to manage disparate operations around the globe, without the need for a full local engineering and development presence. In practice this led to widespread M&A activity. Mergers reduced the number of assemblers while increasing their presence outside of their home markets, and led to the creation of mega-suppliers that aim to be “global systems integrators.” Unless the analysis of industry executives in the US and the EU is off base, firms in the Japanese auto industry ought to be subject to the same forces.

Domestic Structure

Historically, protectionism shaped the development of the industry in Japan, as was true of Europe and the developing world. When production commenced in Japan in the 1920s, it faced few restrictions, and in 1936 Ford planned to break ground on an integrated production facility, modeled after the Rouge and Dagenham in England. Japan, in other words, was poised to become a power in the auto industry, positioned to serve as the production base for exports throughout Asia. It is thus ironic that nationalist policy squelched those plans at the last minute, and in the end the industry achieved volume exports only some 30 years later, at the very end of the 1960s. This import substitution orientation continued into the postwar period; when in the mid-1950s tariffs of 40% proved unable to
slow European imports, the government imposed non-tariff barriers, over the objections of Governor Ichimada of the Bank of Japan. Later, the government encouraged the industry to consolidate in a single firm that would produce a “people’s car.” Despite repeated attempts, it was never successful in that endeavor.

Closed markets allowed high prices to persist, and as in Latin America and throughout Asia, this attracted new entry. About 30 firms engaged in production at one or another point in the 1950s and 1960s, though most had only a brief existence. Honda was the last entrant, with volume production only from 1964-5, while the weeding out of smaller firms ended with Nissan’s takeover of the failing Prince in 1966. Nine producers of passenger cars remained, plus four truck makers – for a total of 11 firms – alongside which are a variety of contract assemblers. Only 3 of these firms, Toyota, Nissan and Honda, produce a million or more passenger cars, and only Toyota sells over a million units, though those are spread across multiple segments. Others rely, to a greater or lesser extent, upon exports, and on sales to a single market segment. Such producers are very much at risk from swings in their market, and have a hard time maintaining a scale of operations sufficient to cover their fixed costs.

The structural problems of this and other industries are thus rooted in the peculiarities of the postwar growth process of the Japanese economy. In the automotive case, import substitution industrialization led to excess entry. That could be sustained as long as markets were expanding. But at the time of the first oil crisis, sales were already slowing, and contemporaries predicted stagnant demand from then on. However, an unanticipated export boom – no one foresaw the growth in demand for small cars in the US – and then the “bubble” economy kept this plethora of firms in business. Given economies of scale prevailing today, that structure is not sustainable. The MITI officials who pushed for industry consolidation in the 1960s were probably correct in their analysis, even if they were powerless to implement it.

The “New” Economies of Scale: Consolidation and Globalization

Strategy in the auto industry relies on a combination of the positioning and marketing of product and the management of costs. In the past several years, industry leaders have apparently concluded that economies of scale – in particular due to an increase in fixed costs for research and development, including for hybrid and fuel cell vehicles – require total vehicle output of at least 5 million units, and
passenger car output of 4 million units.\(^9\) At the same time, the application of information technology to vehicle design and engineering facilitates creating multiple vehicles off of a single basic “platform,”\(^{10}\) while allowing engineers at different sites – indeed, on different continents – to work together.\(^{11}\) The expectation is that by using platforms the breadth of models can be maintained, and region-specific variations offered, even as the number of independent manufacturers decreased. Each of these emerging global giants, then, plans on operating in all major markets to spread the costs of platform development and R&D across a larger number of vehicles.

Such strategies are hard to implement. Past attempts to develop a “world car” failed, and the new IT-intensive system does not guarantee that firms will obtain the feedback needed to match generic car concepts to the specific demands of local markets.\(^{12}\) Furthermore, the strategies of the luxury car segment and the mass market are different, and that has been the source of expensive missteps by Daimler executives in their Chrysler operations. At present, only two assemblers realize a decent return on assets, Honda and BMW, and they are also the only two firms outside the current wave of consolidations.\(^{13}\) But with more players in more markets, it seems likely that no new niche will long remain the province of an individual firm; no company will ever repeat Chrysler’s success with the minivan. This suggests that no assembler will be able to differentiate itself during the coming decade, absent major developments in drivetrain technology, an area where the major industry players are all placing very large bets.

During the past 4-5 years firms have acted on this belief. The two Swedish car firms, Volvo and Saab, were bought respectively by Ford and GM. GM also acquired a large stake in Fiat, Italy’s “national champion,” with the option to purchase the remainder. In the UK, Land Rover and Jaguar are now part of Ford; SEAT in Spain and Skoda in the Czech Republic were purchased by VW. In Korea, Kia was bought by Hyundai, which in turn is closely aligned with DaimlerChrysler. GM is negotiating the purchase of Daewoo, the remaining Korean car producer. Within Japan, Toyota bought Hino and Daihatsu, while Ford controls Mazda, GM controls Isuzu and has major stakes in Suzuki and Fuji Heavy Industries (Subaru), Renault controls Nissan, and DaimlerChrysler controls Mitsubishi Motors – and so on, in many other markets. Independent “national champion” firms have disappeared in most countries; of Japan’s 11 firms, only two remain. Given this background, consolidation among Japan’s
automakers is as much a reflection of global trends as it is of domestic-oriented restructuring. As will be noted below, this already includes the sharing of vehicles off of a common platform.

 Suppliers versus Assemblers

Another feature of the Japanese auto industry, again rooted in the postwar growth process, is a heavy reliance on outside suppliers. At the end of the war, the industry was vertically integrated, both due to the difficulty in finding appropriate firms, and because relying on outside suppliers placed them at the mercy of a capricious system of allocating raw materials. During the postwar recovery period, companies were short of cash, and could economize on their investment needs by turning to outside metal-working suppliers that had excess capacity. Auto companies thus focused on engines, assembly, design, development and marketing. For parts they turned to what became keiretsu suppliers, some of which supplied all the major producers, while others were closely tied to a single assembler. As a result a single customer dominated sales at many firms, and the industry is characterized by relatively small suppliers. While Japanese producers at home and abroad account for about a third of world output, only 19 of the top 100 global suppliers are Japanese. Parts companies are nevertheless substantial operations – most employment is at firms with 300-plus employees – and in the aggregate they account for 70% of the industry’s employment.

Given this, the supplier base is surprisingly multinational in operation. When Japanese vehicle companies first set up assembly plants in the United States in the 1980s, they found the local supplier infrastructure a poor fit for their needs. As a result, suppliers from Japan were encouraged to open up local plants, and over 300 firms now have manufacturing operations within NAFTA; smaller numbers operate in Southeast Asia and the EU. During 1985-1998 the Japan Auto Parts Industry Association recorded 1075 cases of foreign direct investment; in the aggregate, the subset of JAPIA members that responded to the survey and reported having foreign affiliates now have more employment outside than inside Japan, a startling transformation in the industry over the past decade.

This is potentially important because of a trend of consolidation and globalization among suppliers that parallels that of the assemblers. In the EU and NAFTA this is seen in the growth of large global “Tier I” suppliers of “systems” or (where it comprises a physically discrete package), “modules” on a world-wide basis. This complements the “platform” strategy of their customers, since it entails
integrating various design, engineering and production tasks, and providing production and engineering support around the world. At the same time, it represents a contracting out of internal parts manufacturing and engineering; indeed, in the past 5 years both Ford and GM spun off their internal operations, respectively as Visteon and Delphi, both of which now are among the 4 largest global suppliers. European vehicle manufacturers have long been less vertically integrated, in North America this represents the adoption of a strategy employed by Japanese firms over 40 years earlier. In any case, through a massive wave of mergers, acquisitions and divestitures, large suppliers such as the former seating manufacturer Lear and the instrument and control maker Johnson Controls are now able to supply the entire cockpit of a car, including seats, instrument panel, headliners and other once-discrete items. Conversely, other suppliers have chosen to specialize in narrower product segments, typically centered on one or more “high tech” capabilities with products supplied to everyone in the industry. In general, neither structure is prevalent in the Japanese industry. Many Japanese firms focus on subsystems, but lack the scale and integrative abilities of the global Tier I suppliers. They are thus located in between the old American producers of simple parts (where integration was handled by their assembler customers) and the modern systems integrators, and also have a weak presence in the EU (while EU and NAFTA-based firms have are weak in Asia). Finally, the supplier segment suffers from the same overcapacity and firm-level overlap that plagued the assemblers. All of this suggests that suppliers in Japan must undergo a transformation no less drastic than their customers, driven by trends common throughout the global industry as much as by the stagnation of their domestic market.

Part Four: Statistical Data

Here I rely primarily on three sources of data, the Census of Manufacturers ("Census"), the Monthly Labor Survey (Maigetsu Kinro Tokei Chosa, henceforth "MKT") and output data published by the Japanese Automotive Manufacturers Association (JAMA) and the Japan Auto Dealers Association (JADA). In addition, I supplement that with analysis based upon corporate financial data and published accounts and news stories of individual firms. Recent accounting changes – a switch to consolidated reporting– make financial statements hard to compare across the 1990s, and no longer include employment data. Qualitative data are harder to present and to analyze; I nevertheless utilize one extended firm-level example and select financial data.
Output and Revenue

Overall output is down from 13.5 million to 10 million units, a decline of 26%. However, the performance of the truck and passenger car segments diverge; car output peaked in 1990, and in CY2000 was 18% below that level. Truck output, however, peaked in the late 1980s, and at the peak of the bubble had already fallen by 23%. With the bursting of the bubble truck output fell another 54% and in 2000 was only 35% of its peak level. In unit terms, car output is 1.8 million units below peak, while truck output is down by 2.9 million units. For passenger cars, where the average output of a modern plant is 200,000-250,000 units a year, this represents 7-9 assembly plants. Unfortunately customers do not conveniently stop buying on the basis of individual assembly plants; this excess capacity thus tends to be spread across a larger number of factories. It is nonetheless substantial in the car segment, and the entire truck segment is in crisis.

The picture is more varied at the firm level. Among the specialized truck producers, all are doing poorly; even Toyota, which only produces light trucks, has seen output fall by 670,000 units. Among producers of passenger cars, output at Suzuki is at record levels; its sales fell by a modest 10% after 1991, and then rebounded. Honda saw domestic output drop by over 30% in the space of 4 years, but reversed that trend, helped by strong sales of compact and minicars at home and export of full-sized cars. In contrast, Nissan has done poorly for most of the past 20 years, with output peaking in 1980. It
saw only a modest recovery during the bubble, and its output subsequently plummeted to roughly half its peak level; Mitsubishi and Mazda saw more of a boom, but subsequently also saw sales decline by 40% or more. It is thus probably not a coincidence that all three are now managed by foreign executives.

For capacity, unit output is a useful measure. For overall corporate performance, revenue is at least as important. Unfortunately there is no convenient source for consistent firm-level data; firms only began to consolidate in 1995, and many changed their reporting period at that time, while segment data do not separate out “domestic automotive” operations. These cautions given, data from 52 companies for 1989-1999 are roughly consistent with output changes; on an unweighted basis, revenues fell 19% from peak. More recent data may show greater change, though the sample includes 1997, in which car sales fell the most.\textsuperscript{16} \textit{Census} data suggest a less drastic picture; overall motor vehicle shipments (\textit{Census} class 311) were down 12% in 1999, recovering slightly in 2000. Body producers (\textit{Census} class 3112, primarily trucks) saw shipments drop 25% from peak; assembly (3111) and parts firms (3113) saw only a 10% decline.
Table 1 Financial Performance: Changes in Revenue

<table>
<thead>
<tr>
<th>Company</th>
<th>Most recent</th>
<th>Peak</th>
<th>Wage Bill Change</th>
<th>Most recent</th>
<th>Peak</th>
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<td>Denso</td>
<td>-2%</td>
<td>1997</td>
<td>(-1.1%)</td>
<td>Nichirin</td>
<td>-28%</td>
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<td>1992</td>
<td>+4.4%</td>
<td>Tokai Rubber</td>
<td>11%</td>
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<td>1997</td>
<td>(-18.5%)</td>
<td>Aichi Steel Corp.</td>
<td>-25%</td>
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<td>Yuasa Corp</td>
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<td>1993</td>
<td>(-27.1%)</td>
<td>Asahi Tec</td>
<td>33%</td>
</tr>
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<td>1992</td>
<td>+3.4%</td>
<td>Tople Corp</td>
<td>15%</td>
</tr>
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<td>Isuzu</td>
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<td>1992</td>
<td>(-9.4%)</td>
<td>TDF Corp</td>
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<td>Toyota</td>
<td>-16%</td>
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<td>Metalart Corp</td>
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<td>-18%</td>
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<td>1991</td>
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<td>Akebono Brake</td>
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<td>-6%</td>
<td>1991</td>
<td>--</td>
<td>Zexel (Bosch!)</td>
<td>-13%</td>
</tr>
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<td>Toyota Automatic Loom</td>
<td>-13%</td>
<td>1991</td>
<td>--</td>
<td>Toyota Machine Works</td>
<td>-12%</td>
</tr>
</tbody>
</table>

Unweighted Average -12% 1993 <= included in average

Auto Industry Employment Change Indices

Page 15
Employment, Hours and Wages

First, both the Census and MKT show steady decreases in employment, by 12% in the Census and by 14% in the MKT. Neither shows sharp declines at any point (though 1995 shows larger reductions in both sources than any other year), nor do they show a substantial increase during the short-term increase in sales in 1996; they are consistent at that level. The industry, in other words, appears to have shrunk employment in line with shipments (though less than firm-level financial data suggests). Furthermore, employment reductions are of a magnitude that can be generated through attrition. While individual firms may have used aggressive policies, the same does not appear to be true for the industry as a whole.
Second, there have been sharp swings in hours worked. Corrected for changes in overtime, total scheduled hours in the MKT data are constant across the period January 1990 through May 2001. Overtime, however, varies significantly. From a peak at the start of the period, in 1990, overtime fell sharply and steadily from 1991 until 1993. In 1996 through April 1997 overtime again increased, only to fall off again thereafter. Nor were these swings small. In 1990, annualized hours worked ran at 2250 hours; in early 1994, total hours worked declined to an annualized rate of under 2000 hours. The mini-boom in 1996 and early 1997 saw hours inch back up to the 2100 level, and currently they are fluctuating somewhat under 2050 hours. In short, during the decade of the 1990s hours worked fell by 9%, on top of a 124% fall in the size of the labor force. This thus represents a substantial margin of adjustment for the industry. That nearly doubles the extent of adjustment in labor inputs, though the decline remains smaller than the fall output.
All the evidence, however, points to a continuing increase in the base level of wages and until winter 1998, in bonuses. In the MKT, total cash compensation fell by 1.8% in 1998 and 0.5% in 1999, but increased slightly in 2000 and remains 12% above the 1991 level and a full 1/6th more than in 1990. Bonuses fell in 1994 but then rose through 1997, only to fall in 1988 and 1989. The December 2000 bonus was again higher, and overall bonuses in 2000 were at the level of 1995, while base wages had increased 11%. Indeed, while bonuses have varied some in the past several years, base pay appears to still be rising.

The Census tells the same story. For the industry as a whole, cash compensation fell some in 1993 and 1994, and then rose again above the 1990 level, only to decline modestly in 1998 and 1999. In 2000, the total wage bill of the industry had not contracted relative to 1990, despite the large fall in unit output and a significant decline in shipments. Indeed, on a per-worker basis cash compensation has actually increased every year throughout the entire period, and in 2000 was 12% above the 1991 level (and 17% above that of 1990). The Census lets us make one further distinction, between parts and assembly. At the assembler level, per worker and total compensation both fell in 1993 and 1994, but
per worker pay has increased monotonically since then even though lower employment cut the total wage bill modestly in 1999 and 2000. For parts firms, however, compensation per worker rose through 1998, and has not fallen significantly. While the total wage bill fell in 1998 and 1999, that was therefore almost entirely due to a decrease in employment, and in 2000 employment and pay and hence the total wage bill were all higher.

Aggregate data provide only indirect insights into shifts in the industry, and hide variation at the firm level. The data nevertheless suggest that the “lifetime employment system” in Japan still dominates manufacturing. Firms on average are slow to adjust employment levels, and continue to increase base wages as their workforce ages. Hours worked – more accurately, overtime – remains an important margin of adjustment. Bonuses do respond to business conditions, but with a rigid downward limit, in these data at 4 months’ wages on an annual basis. Of course there is more divergence at the firm level; for every Honda and Suzuki that are maintaining their employment levels (indeed, adding contract workers) and paying large bonuses, some other firm must be breaking the pattern. In these data, long-term pressure for further adjustment remains: in the long run, the wage bill cannot increase while revenues decrease.
Capital Stock and Investment

Production of course requires capital inputs as well as labor and materials. I do not have investment data available, and so do not examine that here. Instead I use Census data on fixed capital to examine changes in the amount of capital, and in the capital intensity of production. Both the capital intensity of production and the amount of capital per worker climbed sharply during the 1990s. For
assemblers, capital intensity increased little, rising 19%; at suppliers, however, it climbed 56%. Capital per worker was up more sharply, by 70% at assemblers and 100% at suppliers. In both sectors, the capital stock continued to rise almost 25% after 1991, when production peaked. In general, the capital stock appears to have begun decreasing in 1993, and has fallen 12% at assemblers and 6% at suppliers.

![Capital per Worker](1991=100)

Given the direction of technical change, it is likely that capital intensity would rise in any case. One would expect that as more electronics and special materials are incorporated into vehicles, the capital intensity at suppliers would increase faster than at assemblers, and indeed the rise of the capital stock at suppliers predates the bubble. Similarly, firms across the board would need to invest in IT to enhance their engineering operations. However, there is no sharp rise in the capital stock data for assemblers until the bubble. The data thus seem to reflect a combination of “appropriate” investment, in response to technology, and expansion of capacity that firms now must rue. Without detailed data it is impossible to tell whether the subsequent reduction is merely a combination of lower investment and higher depreciation, or includes the sale or liquidation of assets. Of course if those assets are merely sold, it may help the balance sheet of the seller, but it does nothing to unwind the capacity overhang at
the industry level. At the industry level, adjustment requires that plants be permanently closed. In the case of assembly plants, the contents have little resale value – even the real estate may be difficult to sell, because of environmental concerns – and must be written down.
At the industry level, there is little evidence of qualitative change; the data show no obvious breaks with the past. But dramatic changes are visible at the assembler end. (See Table 2.) Mazda lost its autonomy in 1996, when Ford named Henry Wallace as president, the first outsider to head a major Japanese corporation. Then, during 1998-2000, all but two others in the industry succumbed to outside control (six firms) or alliances (two firms); even GM seems to have finally realized that it has long had effective control of Isuzu. Furthermore, in most of these firms new managers were installed. The issue is whether they are using the same incremental adjustment mechanisms as in the past, or whether they are aggressively paring the large capacity overhang.

Table 2: Assembler Consolidation

<table>
<thead>
<tr>
<th>Firm</th>
<th>Parent</th>
<th>Controlling stake? (=33.3%)</th>
<th>New Mgt?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toyota</td>
<td>Independent</td>
<td></td>
<td>No.</td>
</tr>
<tr>
<td>Honda</td>
<td>Independent</td>
<td></td>
<td>No.</td>
</tr>
<tr>
<td>Nissan</td>
<td>Renault / French govt</td>
<td>Yes, 1999</td>
<td>Yes</td>
</tr>
<tr>
<td>MMC</td>
<td>DaimlerChrysler</td>
<td>Yes, 2000</td>
<td>Yes</td>
</tr>
<tr>
<td>Mazda</td>
<td>Ford</td>
<td>Yes, 1996</td>
<td>Yes, more than once!</td>
</tr>
<tr>
<td>Daihatsu</td>
<td>Toyota</td>
<td>Yes, 1998 to 50+%</td>
<td>Yes</td>
</tr>
<tr>
<td>Suzuki</td>
<td>GM</td>
<td>No, 20% in 2000</td>
<td>No.</td>
</tr>
<tr>
<td>FHI (Subaru)</td>
<td>GM</td>
<td>No, 20% in 1999</td>
<td>Yes! Chairman convicted of felonies scrapped in 1998...</td>
</tr>
<tr>
<td>Isuzu</td>
<td>GM</td>
<td>Yes, 1979 / 1999</td>
<td>Recent / indirect diesel engines to GM...</td>
</tr>
<tr>
<td>Hino</td>
<td>Toyota</td>
<td>Yes, 2000</td>
<td>Yes, restructuring in conjunction w Toyota</td>
</tr>
<tr>
<td>Nissan Diesel</td>
<td>Nissan / Renault</td>
<td>Yes, with banks, 2000</td>
<td>Yes? restructuring in conjunction w Nissan</td>
</tr>
</tbody>
</table>

In fact, among the assemblers, or at least among those that saw major downturns in profits, firms have implemented policies considered unthinkable since the industry went through a period of memorable labor strife in the first half of the 1950s. Toyota still lags in adjustment, but other assemblers have commenced bringing resources into line with demand. This includes the closure of assembly plants to trim capacity, early retirement packages and even layoffs and worksharing to trim headcount, and the sales of shareholdings, subsidiaries and apparently non-strategic internal parts.
manufacturing operations. The inevitable delay between announcement and implementation means that most of the impact will be in 2002 or later.\textsuperscript{22}

The impact of such restructuring can be dramatic. In the space of a little under 3 years, Nissan went from the verge of bankruptcy to a reasonable profit level, despite a continued decline in overall sales. Some of this was helped by a rebound in the United States and in Mexico, but the core domestic operations also saw remarkable change. In 1993, in its first restructuring plan, Nissan announced the closure of its Zama plant (effective in 1995), and cut both investment and hiring. However, sales continued to decline and that proved inadequate. Additional plans had already been drafted (at affiliates, implementation had begun) when Renault took over in 1999. The measures the new management team inherited included a hiring freeze (effectively trimming employment by 1,000 per year); cutting out 2 new car channels and about 10\% of dealerships; sales of shareholdings in a variety of auto parts makers; and the closure of one plant each at its affiliates, Aichi Machinery and Nissan Auto Body. The new management team, installed in June 1999, quickly increased the pace of change. They announced the closing of 3 additional plants, and the trimming of the domestic workforce by 16,000 workers (of whom only 4,000 were production workers, while 6,000 were managers).\textsuperscript{23}
While it is more difficult to document from media accounts, internal reorganization accompanied this. Non-central operations were eliminated. A sintering plant was sold to an auto parts specialist, CV joint production was sold to the British firm GKN, turbocharger production was shut down with the order going to Honeywell Garrett; the forklift division was sold to Takata Industries; aerospace operations went to Ishikawajima Heavy Industries; several internal service units were sold to outside firms or via MBOs (management buyouts); even the headquarters building was sold, though since it was then leased back, that was purely a financial maneuver to help Nissan pay down current debt at the cost of future lease payments. Likewise, a number of plots of land were sold; combined with the initial equity infusion from Renault (about ¥600 billion), and sales of shares (holdings of Fuji Heavy Industries, for example, were sold to GM for ¥20 billion), Nissan was able to pare debt from ¥2,000 billion in 1999 to ¥804 billion by September 2001.

Matching this were changes in purchasing. The number of suppliers is being pared by 40%, from about 1,000 to 600, while the practice of using 3 suppliers in parallel eliminated, to be replaced by a policy of a 70:30 split, closer to Renault’s “sole source” strategy. Various purchasing operations were centralized, not just from the plant but on a worldwide basis with Renault. Nissan held shares in 1,394 firms; the new COO (and later President), Carlos Ghosn, announced that those would be eliminated for all except a handful (“four” - not two handfuls!) of key affiliates. Joint operating teams have been set up between Nissan and Renault purchasing operations. In addition, several Nissan suppliers have merged (Calsonic and Kansei) or been purchased by foreign firms (Ikeda Bussan, Jidosha Kiki). This is an obvious priority. After all, the majority of the cost of production stems from purchased parts, not internal operations, so rethinking supplier strategy is an obvious element of any strategic repositioning.

Furthermore, Nissan had been the most bureaucratic of the Japanese auto firms, and coordination between engineering and purchasing was poor. Under Renault management, cross-functional teams became central, and purchasers and engineers were physically regrouped to facilitate communication. On the development and engineering side, cost control and styling decisions were separated, giving designers more sway; previously they had been subordinate to engineers, and the whole process laden with committees. The net outcome is reportedly savings of ¥100 billion per year through better design and operational efficiency, rather than merely through beating down the prices
paid suppliers. Part of this process is a reduction in platforms, a project already underway before Renault’s acquisition. Now, however, that includes sharing basic car designs with them rather than using separate platforms, and sharing engines and transmissions. In 1999 Nissan had 7 plants making 24 separate platforms; by 2001 that was reduced to 4 plants and 15 platforms, and by 2004 that should be cut to 12 platforms. In addition, Renault hopes this will lead to better-received designs; to help that process along, the chief designer responsible for a series of hit cars in Europe was shifted to Tokyo. In line with that, Nissan has a product blitz underway that launched 5 new products globally in fiscal year 2000, and another 5 in FY2001 and at least as many planned for FY2002.

Third, Nissan has also attacked its dealership structure. Nissan had owned its main Tokyo-area dealership, which perennially lost money, along with many dealerships in other prefectures. Some dealerships were unionized, which further blunted the incentives of the sales force, while the lack of entrepreneurship left Nissan with a concentration of stores in central regions of Tokyo and a dearth of outlets in the suburbs. With the downturn after 1997, over 1/3rd of all car dealerships in Japan lost money; Nissan’s were worse than average, with none in the top 10 in profitability, and many had to be propped up by the parent company. In March 2000 Nissan sold 20% of the shares in Tokyo Nissan to outside investors, for a mere ¥650 million ($6 million); with that, it dropped from being the dominant shareholder to holding only the 7th largest stake. A series of sales and mergers among dealerships elsewhere, and at Nissan Diesel, reflect long-needed attention to reform the distribution end of the business; by 2001, Nissan had already dropped 335 out of its 2,000-odd dealers. A new entrepreneurial attitude is apparent as well; a “super dealer” with a test track, restaurant and used car lot with 1,000 vehicles at the site of the former plant Zama plant is unique in Japan, and attracting 60,000 visits a month. At a more strategic level, the Sunny and Prince channels are being consolidated as “Satio” under a “red” corporate logo, and the “Nissan” and “Motor” channels were also being consolidated, cutting the network in half. At a more symbolic level, one of Carlos Ghosn’s early official acts was to visit dealerships in Hokkaido in northern Japan, where Nissan’s relative performance was worst.

A long history of shareholding ties to suppliers and dealers is thus being brought to a close; the *keiretsu* system no longer places an arbitrary limit on the upstream and downstream side of Nissan’s
business; indeed, the stake it held in Exedy, a clutch maker, was sold to Aishin, a major Toyota affiliate, something once unthinkable. Internally, bureaucratic barriers have been lowered, and the firm has made large cuts in employment through early retirement programs – the cuts noted above were on a consolidated basis, and were not a smoke-screen for workers transferred to subsidiaries. While elements of the “lifetime employment system” remain strong, with transfers still the preferred route for handling workers at plants that are closing, and for operations that are sold, the iron grip that the Nissan union had obtained in the 1950s is now broken.

This is an example of only one firm, but similar changes appear to be underway at Mazda and Mitsubishi Motors, with plant closings and the solicitation of 2,000 or more early retirements each. The truck makers are resorting to even more drastic parings, including work sharing and large-scale involuntary separations. However, Suzuki and Honda are doing well; indeed, in late 2001 Honda was employing a record number of contract workers to try to increase output. In contrast, Toyota has faced no crisis this decade, and profits have increased the past two years; despite an apparent large capacity overhang, it appears not to have changed its way of doing business, and indeed has gone the opposite direction of the rest of the industry, raising its stake in members of its keiretsu.

Among suppliers, response is equally varied. Most dramatically, a number of suppliers have been acquired by foreign parts manufacturers, including Bosch and JCI; domestic mergers have also taken place, including ones across former keiretsu lines. The business media provides little information on suppliers, while statistical sources that might detail recent changes are not yet available (e.g., the Census and the yearbook of the Japan Auto Parts Industry Association). The US experience, however, is that while suppliers can trim their labor force and hold down investment, any larger change in strategy requires shifts in purchasing practices by their automotive customers. While Japanese auto companies talk about “modules” they do not seem to be moving as aggressively in that direction as firms in the US and the EU. One margin of adjustment is overseas production. Most of the larger Japanese suppliers have established operations in Southeast Asia and China, some with the explicit intention of exporting their output back to Japan. Given the disparity in costs – Census and MKT data suggest parts firms average wage inclusive of bonuses is $24 per hour, higher than in the US – that trend is likely to continue.27
Part Six: Summary: Is Corporate Change Possible?

The response of Japanese domestic auto industry to the 30% decline in its market was slow. Even in 1991, when the stock market had been falling for over a year and real estate prices had begun their downward plunge, the industry was still adding capacity. It thus took roughly a decade for the industry to embark on a new direction; the same appears true of the overall Japanese economy. That was also the case in the US market, and producers in Britain never changed, despite over 2 decades of chronic losses. There is thus nothing peculiarly Japanese about delay, at least in the automotive industry. Now that change has commenced, it appears to be rapid and substantial; Nissan has already returned to profitability, and even FHI (Subaru) and Suzuki, despite the buoyant minicar segment, are moving forward with product sharing and joint distribution with GM.

To date, however, the visible change is at the assembly end of the industry. Most employment – 70% or 626,000 of the industry's 888,000 total workers – lies in parts manufacturing, not the design, development, assembly and marketing of cars that comprises the operations of the assemblers. A further 1.28 million workers are in dealerships and repair facilities, which are also undergoing restructuring. This paper focuses on the assembly end of the industry, because it is the most visible, but also because it is the main driver of change. Tracing the evolution of the parts manufacturing and sales and distribution ends of the industry must await further data collection.

Looking Forward: Corporate Strategy

By 2010, a revolution in propulsion plant technology will be apparent. Hybrid cars will no longer be limited to a handful of vehicles for which trendy urban consumers must pay a premium price. Furthermore, fuel cell electric vehicles should be entering mass production. Looking forward requires an assumption that within this time frame no firm makes a technology breakthrough that allows it to dominate the industry. In the interim, however, the new global “platform” strategy will be implemented. That promises to increase competition in most market segments and markets, to the detriment of profits. This is visible in the US, where new entry is eroding the formerly large profits in the light truck / minivan / sport utility segment, and will be replicated in all other markets. Indeed, the shortening of product cycles will make life difficult even for firms that have relied on “niche” rather than full-line strategies, including those that focus on luxury niches (such as BMW).
On the international front, much depends on the success of the platform strategy. The viability of smaller and emerging producers (Turkey, Poland, Thailand, Korea and Brazil at the country level; Mazda, Mitsubishi, Fuji and Suzuki in Japan) will depend on producing and exporting unique versions of “platform” cars that in most markets target segments too small to support efficient local production. Hence GM-Isuzu, Ford and Mitsubishi are using Thailand as the source of one-ton pickups for markets outside NAFTA, and Honda is also shifting all its smaller pickup operations there, while Fiat and Renault are sourcing versions of cars (such as the Megane’s wagon) only in Thailand; similar examples can be found in Turkey and a handful of other well-situated countries. On the other hand, the industry’s impetus for over a century has been to build where you sell. Trade then will be of complementary vehicles – exporting some, importing others, with low volume overall. Production inside Japan will not benefit much from this process.

In the past, the centralization of vehicle development that is inherent in the platform approach tended to produce vehicles that were well-suited for no market, or did well in one or two but not others. In principle the new IT capabilities will allow input from disparate parts of the globe. But internal organization needs to be adapted to take advantage of this. Inevitably one or two of the larger vehicle groups will prove inept, at least in comparative terms. Given the poor performance of Ford and GM in the EU, it is tempting to suggest they will suffer in this regard. From this perspective, the value of alliances in Japan is that they provide the engineering capabilities to do a platform spin-off independent of the central engineering facilities back in the US and the EU, and thus potentially provide a built-in “voice” to offset centralizing tendencies. Alternatively, they can be used for certain small-vehicle platforms, with the advantage of distance lessening the headquarters effect. In contrast, Toyota and Honda have expanded internationally without resort to mergers and acquisitions. It would be useful to know how they integrate feedback from distant markets, and the extent of autonomy they grant regional operations.

In any case this will neither alleviate long-run pressure on margins, nor will it help operations inside Japan. Globally the automotive “Big Six”\(^\text{29}\) will be able to respond to trends in local markets that will make it hard for any company to earn a comfortable return. The final question is how this pressure will affect parts producers. To date, the realignment of the large “Tier I” suppliers appears to be
generating smaller numbers of larger firms, with 3-4 players outside of Japan for a given module or system, in other words, a smaller number than that of car companies. (That could produce interesting dynamics!) For the time being, however, the investment needed to consolidate individual firms and integrate them into the whole will weigh heavily on supplier profitability, as will the costs required to develop the engineering capability for developing modules, a far more difficult task than developing individual parts to customer specifications. In general, parts are far easier to transport than vehicles, and at the level of an individual parts plant, the range of requisite managerial and technical skills likewise makes location less important. Furthermore, while assemblers everywhere are prone to high labor costs, Japanese domestic parts production has higher labor costs than in the US, and much higher costs than in Korea, China, or ASEAN. My own judgement is that the shift of parts production from Japan is well underway, and that the current depreciation of the yen is far too modest to reverse that process, though I have no data at present to verify that.

**Conclusion**

Has the Japanese auto industry hit the end of the road? No, but they have run out of pavement, and the sorts of flexibility built into their organizations and strategies – adjusting hours, holding down bonuses, attrition – are inadequate. Given the corporate pressures to do more better first, and try new things second, delay in rethinking strategy and reshaping organizations is understandable; the former status quo approach will, after all, eventually bring capacity in line with demand, whereas the latter may not work. The long planning horizon of the automotive industry, combined with interfirm variation and several intermediate upturns in demand that encouraged corporate leaders to procrastinate in the hope that the worst was over exacerbated the delay. In the past 3 years, however, the industry has changed rapidly at the assembler level, and this ought to be visible in another year in industry statistics and should be fed down to suppliers, which are already under volume and price pressure. As more data become available, that should enable a comparative study of corporate change, with the development of useful typologies on how best to characterize change, and stylized facts on which margins of change are most readily managed.

Finally, what does this study of a single industry imply for the economy as a whole? For Japan this transformation must be multiplied across many industries, and I am optimistic that that is in fact
occurring. That does not mean that the overall economy will grow; after all, the problems the auto
industry faces are as much secular as they are the aftermath of the “bubble.” Manufacturing as a whole
may never grow again, but that is not necessarily a bad thing for the economy, for the demographic shift
already underway demands an expansion of healthcare and other services. At some point, “hollowing
out” is required to enable that. In the meantime, the economy will continue to be buffeted by the massive
divergence between financial claims and real wealth, a joint product of the “bubble” and the aging
population. Until a political resolution can be obtained on how to allocate losses – the problem is not
merely one of restructuring the financial system – uncertainty will remain high, hampering adjustment
elsewhere.
This research has been supported by a series of summer Glenn Grants from Washington and Lee University, and sabbatical funding during Fall 2001. I also thank the participants of the JEI-Georgetown University conference on “Restructuring Japan,” where I was able to air my initial thinking in January 2000.

1See Automotive News for data, and for general articles on Japanese producers. In Japanese, the automotive pages of the Nikkei website (http://www.nikkei.co.jp/car/) and the daily “Kitada” newsletter archived at http://backno.mag2.com/reader/Back?id=0000000772. Other useful sources include www.just-auto.com and www.auto-asia.com, both of which also have email newsletters.


3In the 1980s the French industry, personified by Calvert of PSA, was famously paranoid about competition from Japanese makers.


5Toyota and Nissan opened new plants in Fukuoka, while Mazda set up one in nearby Yamaguchi in Honshu; Honda already had a facility in Kyushu, outside Kumamoto.

6Author’s interview at JADA, summer 1992, and at Nissan. An interview at Mitsubishi Motors produced a different reaction. The official there had lived and worked at MMC’s main engineering and assembly complex in Okazaki City, Aichi Prefecture until 1991. While he frequently had traveled to Tokyo, that was his first experience living there. After experiencing firsthand the magnitude of traffic congestion in the metropolitan region, where a fifth of Japan’s population resides, he could only conclude that there was no future in selling cars. Nissan’s 1996 Annual Report also trumpets market recovery.


8Of the 4 truck producers, two – Mitsubishi Motors and Isuzu – also produce cars. However, Isuzu turned out only 13,000 units in 2001, and will cease production entirely in 2002; at that point only 8 car producers will remain. However, some 40% of “Toyota” vehicles are assembled by affiliates such as Toyoda Automotive Loom or Kanto Automotive Works. Others have similar affiliates – Nissan Auto Body and Aichi Machinery both assemble vehicles under contract for Nissan, and Gifu Auto Body does the same for Mitsubishi Motors. In general, Japanese auto companies used them for niche products such as sports utility vehicles and minivans. Ironically, in the 1990s these relatively unknown firms ended up making the most profitable products in the industry, while their parent firms, focused on the volume compact car segment, suffered.
DaimlerChrysler, for example, spent $1.8 billion on environmental problems in 1998, and investing $850 million just on emissions and fuel cells; in FY1998, Toyota likewise invested ¥88 billion on “environmental problems.”

The definition of “platform” varies from company to company, but in general refers to a common frame - suspension - braking - drivetrain – engine system, to which a variety of body types can then be fitted at relatively low cost. Use of a platform thus saves on engineering costs, and because the structure of the platform is the dominant influence on crash performance and emissions, it also lets designers develop vehicles that will pass various regulatory hurdles without the need for extensive testing and redesign. Platforms thus speed the development cycle, an obvious concern from both the standpoint of costs and of responding to market shifts.

I do not know how this works out in practice – any references would be appreciated!

GM went to the opposite extreme, demanding extensive use of consumer clinics up front, which in practice meant that their products ended up bland, and they always lagged competitors in responding to shifts in tastes. That system was scrapped almost instantly, following the departure in 2002 of Ron Zarella, the outside executive hired to bring modern “brand management” techniques to GM.

Not that BMW did not try! – it however failed in its attempt to take over Rover, a mass-market British producer, and has retreated to its historic core high-end operations. On occasion rumors have swirled around Honda, so it may be different from the rest of the industry only it that it was unsuccessful in finding partners. Other marques such as Volvo are profitable, but are no longer made by independent companies; Volvo, for example, is part of Ford’s Premier Automotive Group.

In addition, firms were reluctant to add to the membership of their militant unions; turning to outside firms allowed them to reallocate labor to assembly and other core tasks, so that firms were able to expand. See Michael Smitka, *Competitive Ties: Subcontracting in the Japanese Auto Industry*, Columbia University Press, 1991 and Chapter 4 of Takahiro Fujimoto, *An Evolutionary Theory of Production Systems: Organizational Resources and Innovative Processes at Toyota*, University of Tokyo Press, 1997. (In Japanese)

At Delphi this already has led to internal restructuring of development and engineering along a “system” or “module” basis. That is visible in their applications to the PACE “Supplier of the Year” competitive (sponsored by *Automotive News* and CapGemini Ernst & Young), which include increasingly sophisticated traction control and now stability management products that are only possible through the integration of steering, torque / transmission, engine control and braking systems.

There is, of course, substantial variation at the firm level, with a few firms growing throughout the entire period. Furthermore, several good performers - Honda, Suzuki - are not in the data set, though Mazda, a poor performer, is also missing. The only large firm to be significantly better than average was Denso, with flat revenue.

It is not clear whether the *Census* and the *MKT* capture contract employment. If not, then they likely underestimate the magnitude of the employment decline. The *MKT* collected data on part-time labor from 1995; levels increased thereafter but the change is small, and I have not tried to reflect it in my analysis.

For a set of 31 firms for which total wage data were available for FY1996-1998 (1997.3 through 1999.3), wages rose 1.6% in 1997 and then fell 3.7% in 1998, for a net change of -2.1%. However, at the firm level, 12 firms or 39% of the sample showed double-digit declines; one showed a double-digit increase. But the largest firms - Toyota, Denso and Nissan - showed increased or unchanged wages, and this dominated the effect of smaller firms.

Flawed data may account for this; movements of end-of-year data do not parallel start-of-year figures.
For this section I utilized notes drawn from several years of clippings from Japanese newspapers and from automotive industry reports. I have refrained from inserting footnotes for each sentence, but am happy to supply my sources for individual items.

In 2001 Toyota production was 860,000 units below its 1990 peak. In addition, it was one of the firms that aggressively added to capacity in 1991-92. I believe that it has quietly idled 2 assembly lines (both were in multi-line plants, so did not get the publicity that a plant closure receives). Even so, it has close to 1 million units excess plant capacity, even if its staffing levels are currently more in line with output.

It is thus too early to see whether the Census and other statistical sources will pick up these changes.

The shuttering of the Murayama plant in Tokyo accounts for 2,000. Interestingly, of that group, 700 had been transferred from the Zama plant when it closed in 1995; employment guarantees were still honored through the mid-1990s. Indeed, 300 older workers are to be kept on until 2004. Consistent with this, when the plant closed in March 2001, only 470 workers had opted for early retirement, while 1700 were to be transferred to other plants.

Toyota also owned its main Tokyo dealership. In Japan, the new vehicle registration process historically led to separate dealership in each prefecture, with multiple outlets per dealership.

Toyota paid a subsidy of $200-$500 per car to its Tokyo dealership so that it could stay in the black. At Nissan there also appeared to have been a disconnect between dealerships and company headquarters. The firm was slow to cut production when sales declined in 1994, and inventories expanded by about 20 days’ sales, a large swing. Not only do company stores with a salaried workforce have a hard time motivating salesmen, but they also apparently have a hard time saying “no” when the factory pushes product at them. Independent dealerships should be able to stand up better to headquarters, and refuse to buy vehicles they do not need. Those problems are not unique to Japan. Producers in the US shunned a company store framework, later reinforced by franchising law in many states. Under the leadership of Jacques Nasser, Ford tried to reinvent the company store, and failed expensively, ultimately selling dealerships in the Kansas City area back to their original owners.

The news coverage implies, but does not state, that it is profitable; it sold 173 cars in less than 3 months of operation and attracted 200,000 visits, both well above target. One reason for the store is that zoning and environmental concerns made it impossible to sell the Zama site for housing, while the largely residential neighborhood that now surrounds it – and the generally bad business proposition of running a factory in the high-cost Tokyo area costs – made it equally unattractive to manufacturers who might be wanting to relocate.

I have not been able to compile trade data on auto parts. The summary statistics that are readily available include data on auto parts exports but not imports.

Firms are only just putting test fuel cell vehicles on the road; first-generation production vehicles (other than buses) are likely 6-8 years away. Toyota and Honda are coming out with their 2nd-generation hybrid cars, and DaimlerChrysler with their first. For these to be extended to mass-market cars and light trucks will require six or more years. In any case, such vehicles will still comprise a minority of total sales in 2010.

The Big Six – GM, DaimlerChrysler, Ford, Toyota, VW and Renault-Nissan and their affiliates – account for over 80% of world vehicle output.