

**Reorganization
of
the Global Automobile Industry
and
Structural Change
of
the Automobile Component Industry**

Koichi Shimokawa

Professor of TokaiGakuen University,
Emeritus Professor of Hosei University

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1. Introduction

The world automobile industry is witnessing an unprecedented scale of change in the 1990's. The end of Cold War structure, the rapid spread of the information revolution and the international economic globalization. The wave of globalization has directly affected the international automobile industry and has accelerated the global reorganization of it. First, the impact of globalization emerged in the financial and securities industries, which experienced the Big Bang in the 1980's. Then it spread to the fast growing information and communication's industries.

Now the automobile industry is no exception. The automobile industry was, especially in advanced countries, primarily a national industry, no matter how internationalized its business content developed. It has been a representation of a nation's manufacturing industry serving the best interests of the nation. Take trade disputes concerning automobiles for instance. It has been discussed as being related to the arguments of what should be the correct way to handle automobile trade, the balance of trade, and the job security for a countries labor force. The automobile industry also has a wide range of related industries such as the component or material industries, on which it has had a great impact at an entire national level. In this sense, the industry was the national industry. Because of this background, automobile manufacturers in advanced nations constructed their management strategies that centered on their own country. And their overseas strategies tightly connected to the domestic strategies and had a strong tendency to compliment them, no matter how heavily they depended on their overseas business and exports. Therefore car manufacturers' competitiveness was closely related to how superior their competitiveness is in their domestic markets.

Against this backdrop, especially in the 1980's, and before the 1990's when globalization rapidly developed, the automobile industries competed with each other at a nation-to-nation level. In addition to that, we still remember that the Japanese automobile industry was the one that grew rapidly by the so-called lean production method and which had grave impacts on the European and American automakers. We have to explicitly state that the lean production revolution ignited reforms taking place in the Western countries. Under the reforms, automobile manufacturers in those countries executed restructuring several times although their stance and approaches might be different. They carried out drastic reforms that ranged from their product development to production systems in factories and to the systems used for component purchases. This trend led to the globalization in the 1990's.

Needless to say, economic globalization means a free and rapid flow of management resources (people, goods, money and information) beyond national borders. Business activities expand beyond the framework of one nation and dynamically develop everywhere in the world as far as markets

exist. We can observe this trend in sections of the automobile industry such as; a) product development, b) supply systems including factory locations, c) systems to purchase from the suppliers of parts, components, intermediary material and raw material, d) production systems at factories, e) automobile sales and distribution systems although they may be different region by region. All of these are not contained within the framework of a country, but they have been developed into a global base. It must also be pointed out that they are integrated under a global management strategy. Therefore it is now possible to clarify the direction of global business.

This globalization of the automobile industry not only enables the business procedures stated above to take place, but also makes them necessary conditions for the automobile manufacturers to survive in the international arena whether or not they conduct mergers or amalgamations. It is because the economic globalization has made human and financial resources global as well.

Against this very background, the recent reorganization of the global automobile industry is developing. Some processes of reorganization are putting major focus on scale economy at the global level and attracting public attention in cases like Daimler – Chrysler and Nissan – Renault. Other manufacturers like Honda are promoting their own global strategies by themselves. Therefore the directions of globalization are not necessarily monotonous. Regarding this phenomenon, there is often an argument that there will only be about 5 automobile manufacturers in the world who survive further development of the global reorganization. The argument points out that manufacturers who are not members of the so-called 4 million unit club, (which consists of makers producing 4 million units or more annually) probably will not survive alone. Considering this, there is a fundamental question for a simple argument dealing with scale merit as the only measure that can decide if your big enough or if your smart enough, to develop superiority in the automobile industry in the age of globalization.

Before studying the argument, I would like to clarify why global reorganization took place in the automobile industry in the first place. Then I will suggest that there is an alternative to mergers and amalgamation, which single-mindedly pursue scale merit. The way could be a network style tie-up among manufacturers while they maintain their own corporate identities. Furthermore, I will discuss the structural change of the automobile component industry that is directly affected by the automobile industry's global reorganization and environmental strategies of the automobile technology.

2. Global reorganization of the automobile industry and the □□□□ direction of the global strategy

In the discussion about the globalization of the automobile industry, it is necessary to focus on two incidents that have had a decisive impact on the direction of the globalization on a corporate level. One is the merger between Daimler and Chrysler that took place last year. They are powerful automobile makers representing Germany and the USA respectively. Another is Ford's global strategy, Ford 2000 aiming at the 21st century, which was announced in 1993.

Let us take a look at the mega-merger between Daimler and Chrysler. The impact of the merger on the automobile industries in the world was huge. We can see how large the impact was when understanding that the mega merger triggered a series of tie-ups beyond national borders. For example, the alliance type tie-up between Nissan and Renault, which was announced this year was directly triggered by the D-C (i.e. Daimler-Chrysler: the abbreviation will be used hereafter) mega-merger. This fact was revealed by an interview I had with the leaders of Nissan. After this merger, Ford snapped up the passenger car department of Volvo. We also witnessed the start of a tie-up negotiation between Fiat and Mitsubishi. (However, it has only reached partial cooperation for joint production using the partner's factories.) Even among manufacturers that already had joint relationships like Toyota-Nissan, Daihatsu, and GM-Suzuki, they all have increased their stock holding ratios, which is part of their corporate groups' global strategies. The D-C mega merger directly brings about this increasing tendency.

Now, what was the background that caused the D-C mega merger? It was unthinkable about 10 years ago that the major automobile manufacturers would merge beyond national borders. True, there have been buy-ups of automobile makers across national boundaries in the past. For example, Renault in France once bought up the number four U.S. manufacturers; American motors (although it was sold to Chrysler in 1987). Germany's BMW bought Rover, the only nationalistic manufacturer in the U.K. It was in 1989 when Ford bought Jaguar, a manufacturer of luxury cars in the U.K. However, those who were merged were niche makers producing only 300,000 cars per year at the most. The D-C mega merger was the first one in history that involved 2 huge players producing from 1.2 million to 3 million cars annually.

Then what was it that enabled such a mega merger to take place, the unthinkable 10 years ago? I must point out here that many research organizations expected from the early stages that automobile manufacturers of the world would take the path of reorganization. In fact, France's ministry of economy and industry stated in 1982 that the almost 30 automobile makers in the world at that time would be converged into 6 companies within 10 years ⁽¹⁾. It was proven wrong in the past 10 years

because of the emergence of some new aspects in the automobile industry's competition, which could not be judged by simple scale merit in the 1980's. First of all, the Japanese automobile industry began to push its international competitiveness by using the lean production revolution in the 1980's. Because of the lean production revolution, the reorganization of the existing 11 automobile manufacturers was put off. At the same time, European and American automobile companies learned from the lean production revolution while they strove to restructure themselves. The situation did not offer any conditions for the companies to begin to think about mergers or amalgamations. Ten years ago we saw the peak of such a movement. Not only Japanese manufacturers but also Western counterparts were making all-out efforts to survive independently by reforming their corporate characteristics. They had no intention to embark on any mergers or amalgamations.

As we have discussed, there were some changing aspects in the competition of the 80's. This does not mean that competition in those days was global, crossing national boundaries as it is now. It was international competition of the automobile industries based on their own nation or region. However, swift progress in the economic globalization provided a decisive condition where globalization strategies were established. Under these strategies, the automobile industry pursued product development and component purchases at a global level. It also aimed at arranging factory locations and supply systems in a global scale. In addition to the movement, several other factors have underlined the necessity of global strategies toward the 21st century. These factors include; a) expansion of middle and eastern European automobile markets due to the end of Cold War, b) Asian population super powers, China and India joining in the global market economy, c) emerging automobile markets in such regions as Asia, Central and South Americas ⁽²⁾.

The Asian automobile market is temporarily suffering from a dramatic plunge in demand due to the economic crisis that started 2 years ago. Despite the harsh situation, the dormant market has a large potential, which makes it indispensable for automobile makers to come up with an Asian strategy from a global point of view. In any way, new global strategies to cover emerging markets such as Asia have drastically changed the existing approaches. Those past approaches in the 80's put emphasis on the markets in advanced nations and were more concerned about the regions and the nations where automobile manufacturers were located.

Through this process, linkage between advanced nations' markets and emerging markets has shown progress thanks to emerging markets' entering into the international arena. What is important is that the automobile makers of the world don't have a chance to survive in the future if they function only within one country acting as a regional maker. A manufacturer can maintain stable conditions when it grows from a regional maker into a global one. This is possible only when the manufacturer

establishes a comprehensive global strategy keeping sight of Asia, Eastern Europe, and other European regions, North America, Central and South American; in short all the markets on earth. It is because supply and demand trends of automobile markets differ from region to region and offset each other. The companies balance the profits throughout these markets by compensating for losses and fluctuating exchange rates.

Figure 1 shows comparisons between the worlds major regions', production capacity and their utilization per region. The figures change at different points of time depending on the region.

The D-C mega merger was the very phenomenon-taking place against the backdrop stated above; where automobile markets and the conditions of competition became global.

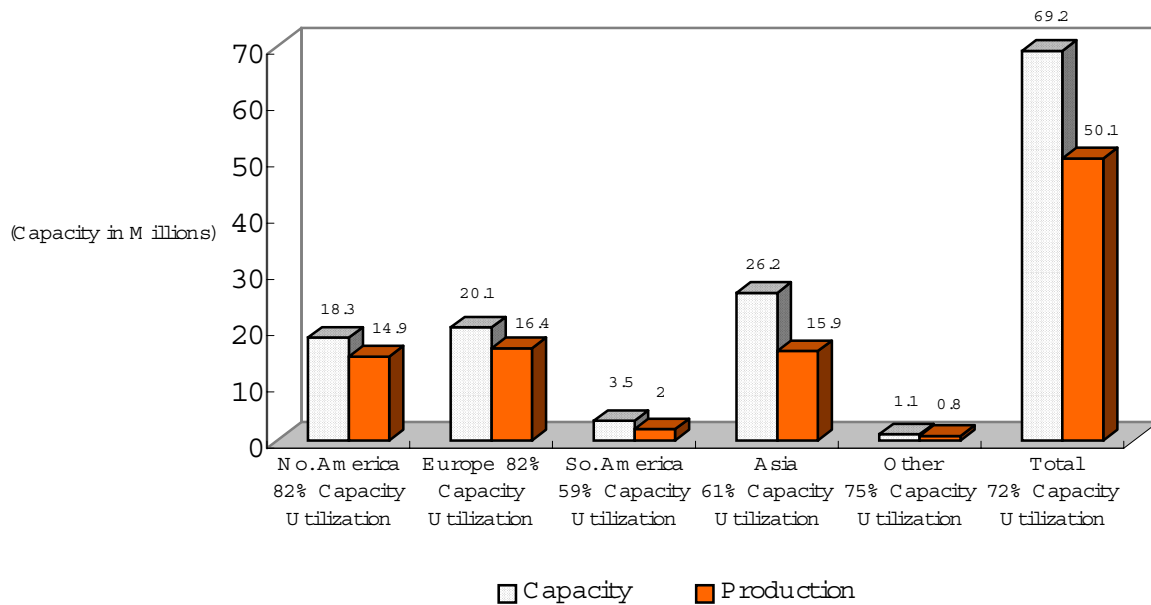


Figure 1 Industry Structure: Global Overcapacity

Capacity vs. Sales by Region □ 1998

Source: J. D. Power & Associates Estimates

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Amid this background, both Daimler and Chrysler can be said to have aimed not at a global strategy of making themselves into global auto-makers, but instead at entering into a mutually beneficial alliance that made the best use of each company's strengths. Both companies realized

that being an independent global automaker included a lot of risk. Chrysler, a large-scale regional manufacturer centered in North America, is dominant in the under \$23,500 per unit passenger vehicle segment which includes mini vans and SUVs. On the other hand, Daimler is known as a medium-scale niche manufacturer ⁽³⁾ with a worldwide reputation for its luxury vehicles. However, in terms of market and production bases, Daimler is a regional manufacturer centered in Europe.

Thus, the natural conclusion was that neither of these manufacturers alone would have faced numerous hardships as global competition rapidly heated up. Especially for Chrysler, even as a regional manufacturer in North America, it would have been necessary to strengthen production capacity to 10 million units And to begin to make huge new investments in engines and components ⁽⁴⁾. Competing as a global auto maker through building the weak European, Asian and South American markets while at the same time shouldering the risk of huge investments that would have been no easy matter. At the same time, Daimler could not have become a global automaker in the growing Asian, Central American and South American markets solely on the strength of the worldwide brand image of their luxury vehicles. This is even truer for the North American market. It would have been indispensable to add both economical passenger cars and mini vans/SUVs to their line up.

In this way, these two manufacturers with very different values, cultures and characteristics took action to become part of a large-scale cross-border alliance in order to survive in the face of stiff global competition. This was the end of the age of single-country mergers and reform, which had been taking place over and over again in Europe. Figure 2 shows the mutually supportive effects of the Daimler and Chrysler alliance. Figure 3 shows the average price range and transitions in production volumes for passenger vehicles before and after the merger. Figures 4, 5 and 6 show the ratio of light vehicles sold by region for each company before the merger and together after the D-C merger.

One more aspect, which we shouldn't overlook, is the existence of a global financial system, which makes large-scale global alliances possible. With the big bang proceeding in the financial and stock markets, automakers and other companies, which act globally, do not need to rely on domestic bank investments, bonds and stocks to raise funds. These days, instead they aim to raise funds through global financial institutions and stock markets and systematically boost the public estimation of the company through high cash flow figures and EVA.

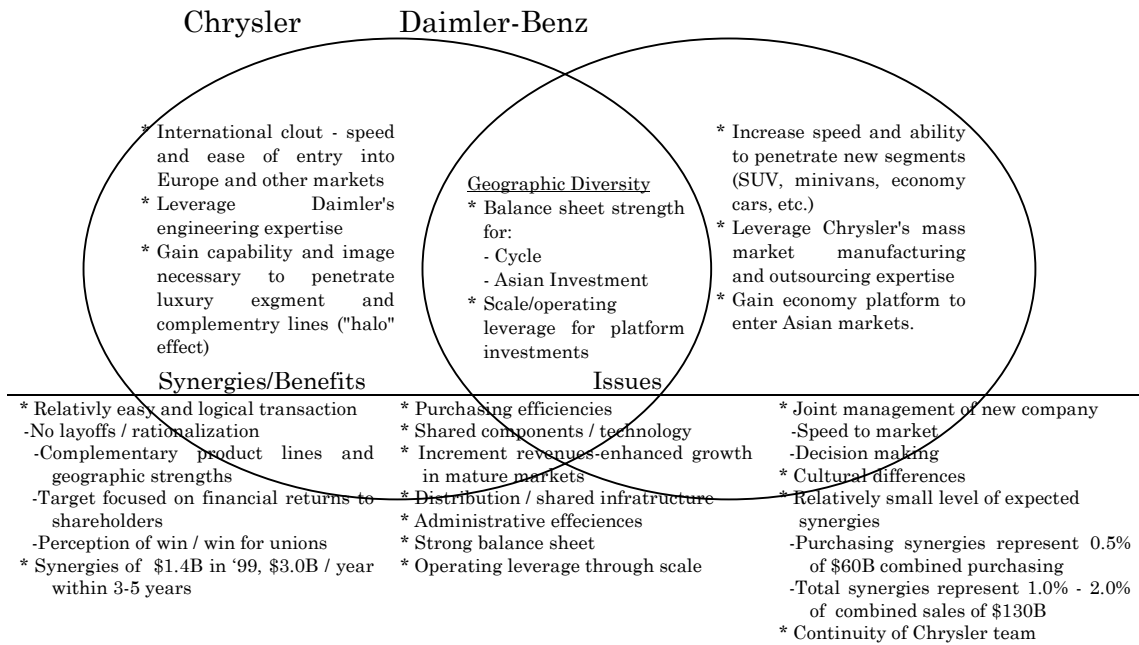


Figure 2 Implications of the DaimlerChrysler Merger

Source: J. A. Casesa and others: Schrodgers' DaimlerChrysler
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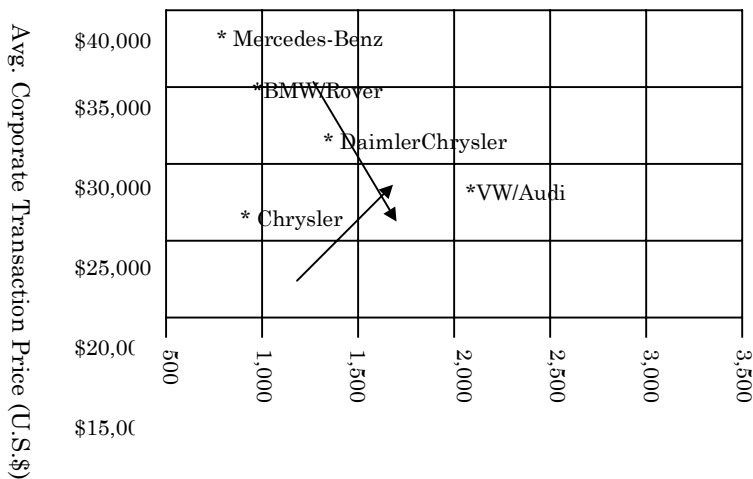


Figure 3 Passenger Car volume vs. Average Price

Source: Shreder's Report, p.5.

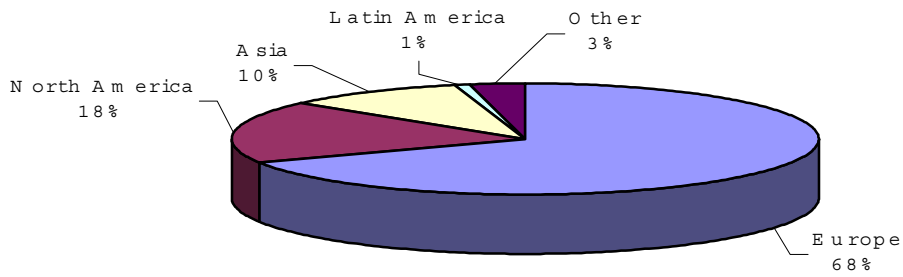


Figure 4 Mercedes-Benz 1997 Light Vehicle Unit Sales By Region

Source: Shreder's Report, p.5.
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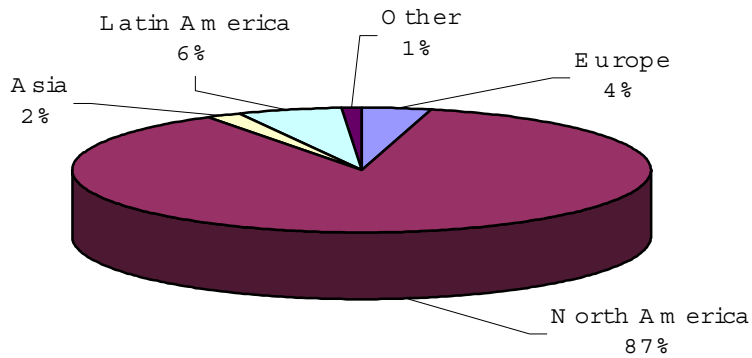


Figure 5 Chrysler 1997 Light Vehicle Unit Sales By Region

Source: Shreder's Report, p.6.
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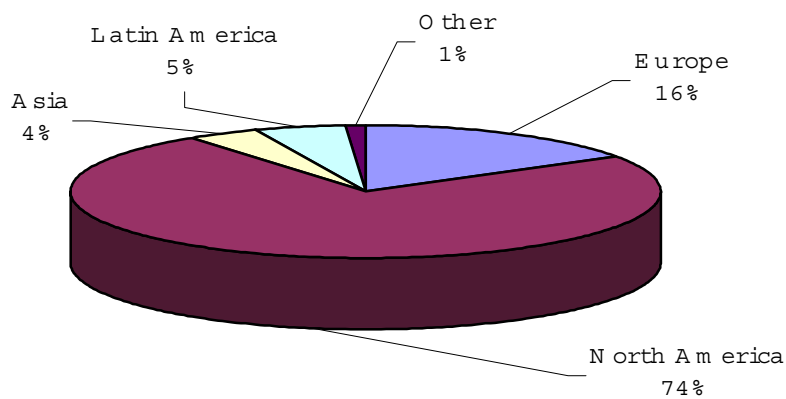
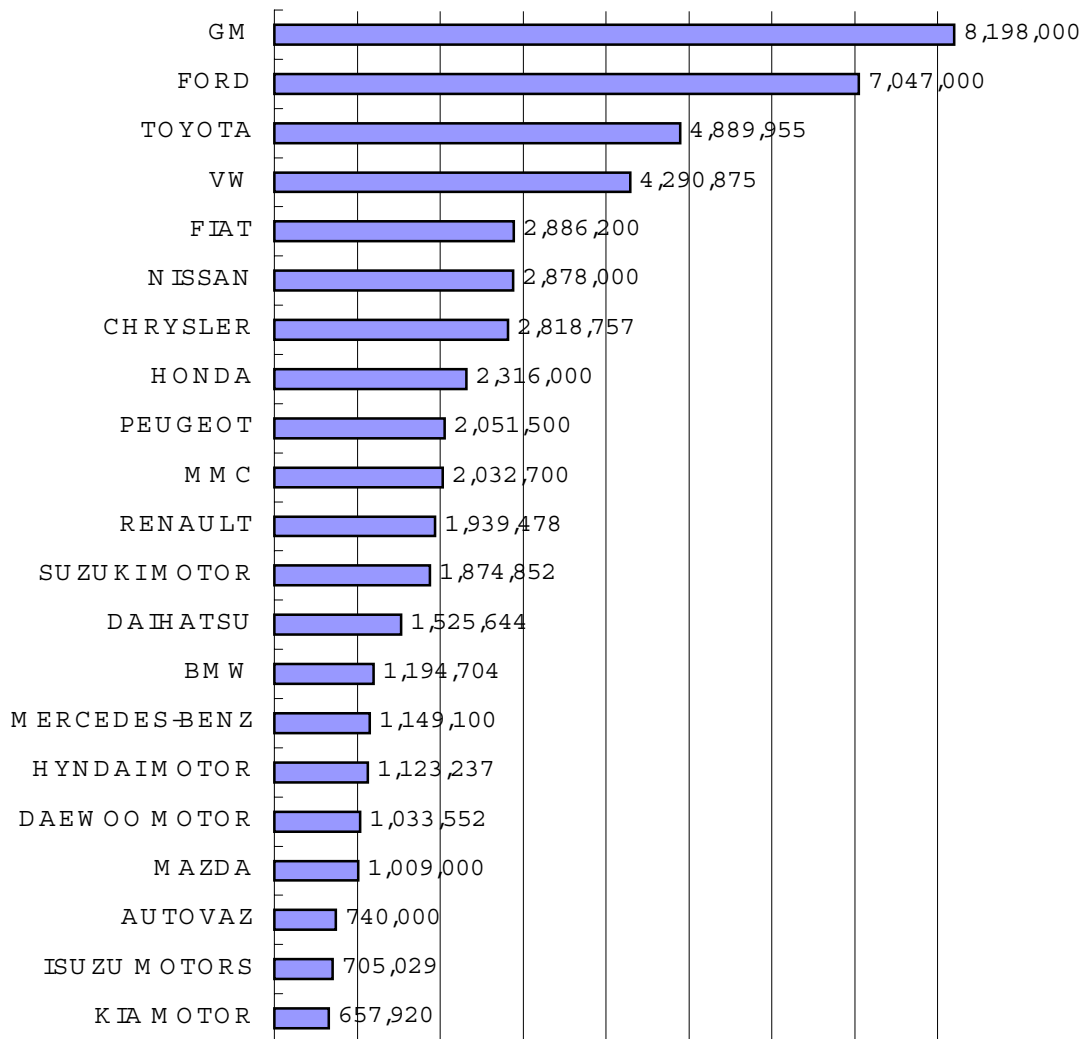


Figure 6 DaimlerChrysler 1997 Pro Forma Light Vehicle Unit Sales By Region

Source: Shreder's Report, p.6.
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As we can see in figures 7 and 8, the production and cash flow rankings for automakers around the world, a wide gap has emerged in cash flow among the main manufacturers. Even manufacturers high on the production list



have rather low cash flow.

Figure 7 Global Production Ranking, 1997

Source: Automotive News Yearbook
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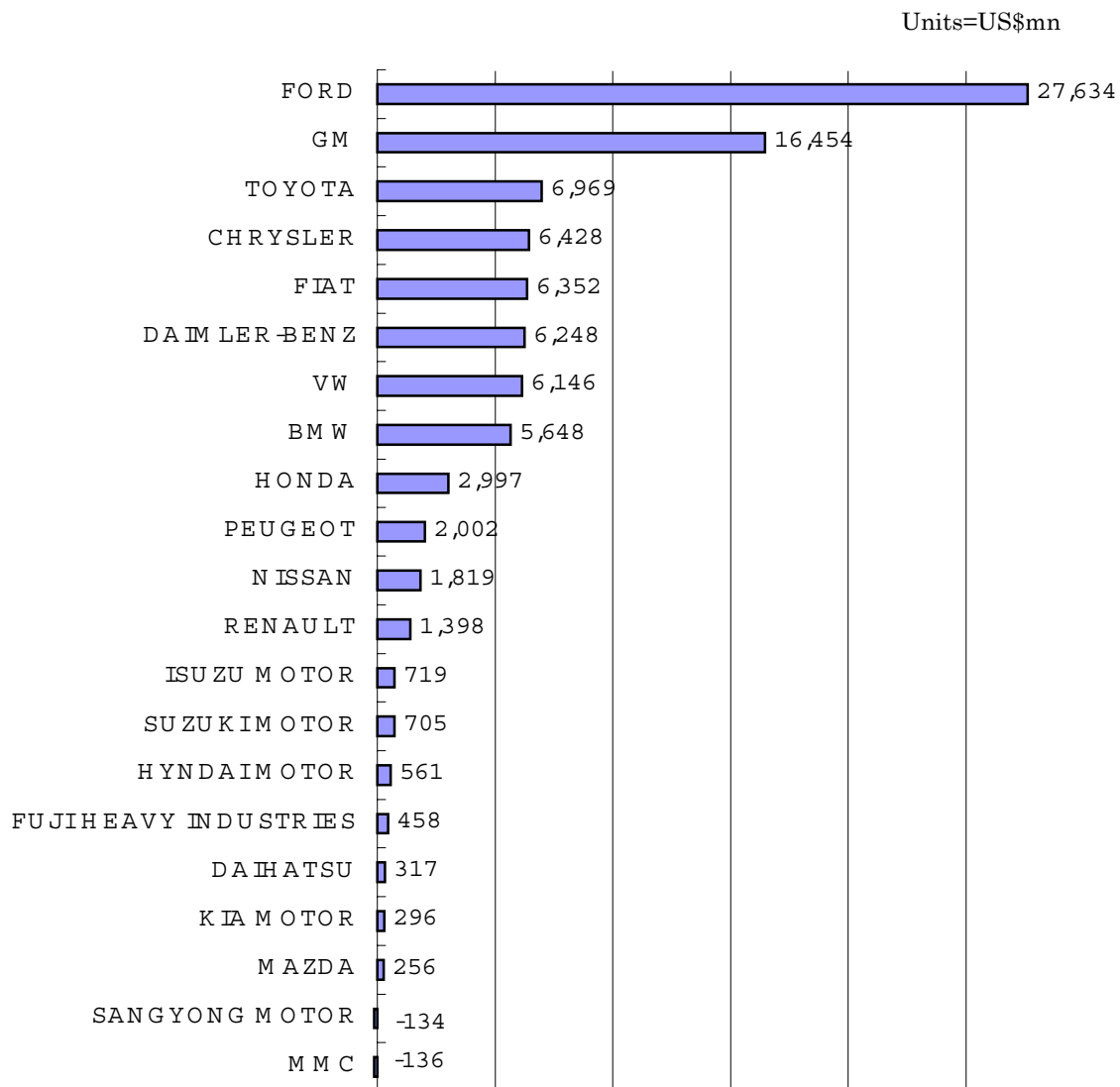


Figure 8 Consolidated Cash Flow Ranking

Note: Includes categories other than automobiles

Source: Prepared by ING Barings Securities

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Especially prominent are Japanese manufacturers such as Nissan and Mitsubishi. This is due mainly to the combined effect of the domestic recession in Japan and the economic crisis in Asia, with the collapse of the Japanese financial system, especially the stagnation of the main banking system, which is also contributing to the problem. In contrast, cash flow for GM, Ford and Chrysler are all high. However, this amount includes revenues from their respective finance companies, which manages huge amounts of capital and reserve funds for employee health insurance. Differences in accounting systems are also responsible for the wide discrepancies between Japan and the US.

Regardless, one important factor here is the symbolism involved with GM, who pride themselves on being the number one automaker in the world, and being surpassed in terms of cash flow by Ford. With the expansion of globalization, shifts in competitive power ranking from the point of cash flow have intensified in comparison to that of car production, sales and even market share, with unexpected changes occurring to the ranking system. Competitive power in terms of cash flow is undoubtedly affected not only by domestic competitive power but global competitive power as well.

It is easy to see that manufacturers such as Ford and VW with increased levels of cash flow have discernible global strategies, which have been working effectively. In this way, the importance of global strategies has been highlighted, regardless of participation in alliances or mergers, and survival among automakers in the 21st century will depend even more heavily on effective skills in designing global strategies. However, the economy of scale theory is still often used in discussions concerning cross-border alliances and tie-ups.

Here, we would like to consider the background of the quick move toward large-scale international alliances and mergers. Foremost was the introduction of innovations based on digital design, which facilitated the sharing of global platforms as computer assisted engineering (CAE) and digital CAD/CAM came into common use. The number of platforms, traditionally different for each model, could be reduced and the industry unified, thus lowering the barriers between manufacturers. This reduction in the number of platforms and increased common sharing is not new. Some manufacturers in the west had already embarked on this path as early as the first half of the 1980s, with some Japanese manufacturers starting in 1992 or 1993 during the second big strengthening of the yen and restructuring period that followed the collapse of the bubble economy. Today, reduction of the number of platforms has become a common trend worldwide.

For example, GM reduced its more than 36 platforms by half and is aiming at 8 platforms for the near future, and Toyota and Nissan plan to reduce their more than 20 platforms to 8 platforms. Honda, which forestalled introducing common platforms, is aiming to unify product development with a flexible world platform. Comparing current production numbers per

platform in North America, small trucks and mini vans manufactured by the Big Three occupy the top 8 positions. Two basic types of small trucks account for the highest production number per platform at more than 1 million, and even the lowest production number is up around 450,000.

As for Japanese cars in North America, the Honda Accord and Toyota Camry rank 9th and 10th respectively. Production is 440,000 and 430,000 per platform. A simple comparison reveals that small trucks, one of the American manufacturers' strong points, hold double the scale merit compared to Japanese passenger vehicles. This is a source of high profits, now at around five or ten thousand dollars per unit. (Refer to Fig. 9)

Therefore, unification of platforms brings a rise in production numbers per platform and a reduction in costs as the scale merit goes up. Taking this one step further, big mergers will bring increased scale merit by establishing common platforms between the manufacturers involved.

Moreover, there is a movement to unify basic components such as engines and transmissions in addition to the unification and spread of common platforms. For example, Ford is developing a global engine series with annual production of over 2 million. This tendency is also part of the scheme or concept in which mergers or alliances are being promoted.

Companies	Main Model	□	Production Unit	□□	0	500,000	1,000,000
1	GM	Chevrolet C/K truck, Other	6	1,125,755	187,626		
2	Ford	Expedition, Other	3	1,088,229	362,743		
3	Ford	Rabgler, Other	4	858,918	214,730		
4	GM	Buick Regal, Other	7	739,446	105,635		
5	Chrysler	Dodge Caravan, Other	5	627,112	125,422		
6	GM	Chevrolet S10, Other	5	596,428	119,286		
7	Ford	Taurus, Other	2	495,734	247,867		
8	GM	Chevrolet Cavalier, Other	2	454,986	227,493		
9	<u>Honda</u>	<u>Accord/Acura CL</u>	<u>2</u>	<u>446,829</u>	<u>223,415</u>		
10	<u>Toyota</u>	<u>Camry/Avalon/Sienna</u>	<u>3</u>	<u>431,811</u>	<u>143,937</u>		
11	<u>Honda</u>	<u>Civic</u>	<u>1</u>	<u>355,633</u>	<u>355,633</u>		
12	GM	Pontiac Grand Am, Other	3	345,980	115,327		
13	<u>Toyota</u>	<u>Prizm/Corolla</u>	<u>2</u>	<u>318,831</u>	<u>159,416</u>		
14	GM	Buick LeSabre, Other	3	300,759	100,253		
15	Ford	Windstar	1	292,687	292,687		
16	Chrysler	Jeep Grand Cherokee	1	278,453	278,453		
17	Ford	Escort/Mercury Tracer	2	277,454	138,727		
18	GM	Chevrolet Malibu, Other	2	273,449	136,725		
19	GM	Saturn SL/SC	1	271,471	271,471		
20	Ford	Crown Victoria, Other	2	228,616	114,308		
21	Chrysler	Cirrus, Other	3	226,977	75,659		
22	GM	Chevrolet Venture, Other	3	222,483	74,161		
23	Chrysler	Dodge Ram	1	212,955	212,955		
24	Chrysler	Dodge Neon/Primos Neon	2	205,448	102,724		
25	Chrysler	Eagle Vision, Other	4	203,988	50,997		
26	Ford	Econoline/Club Wagon	2	200,509	100,255		
27	Chrysler	Dodge Dakota/Durango	2	200,174	100,087		
28	Chrysler	Jeep Cherokee	1	184,888	184,888		
29	Ford	Contour/Mercury Mistoque	2	179,830	89,915		
30	GM	Chevrolet Astro/GMC Safari	2	170,804	85,402		

Note: * Number of models ** Units produced per model

In the North American market, production capacity per platform exceeds one million per year for GM's C/K Pickup, Sierra and Suburban and Ford's F-series Pickup and Expedition. These models have the same base as full-sized pickups and are representative of the SUV segment. This is more than double the scale merit of Honda's Accord and Acura CL at 447 thousand units and Toyota's Camry, Avalon and Sienna at 432 thousand units. Thus, it is said that profits per unit have reached about 5,000 for pickup trucks and 10,000 for SUVs.

After the success with chassis', GM and Ford are expanding scale merit through unification of product variation in the field of basic components such as engines and transmissions. For example, Ford is developing a global engine series that will exceed 2 million units per year after 2000 and GM is planning to unify its power train on a worldwide basis.

Figure 9 Units Per Platform (North America)

Source: Prepared by ING Barings Securities from Automobile News
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Table 1 Component Procurement Strategies (Big 3)

	General Motors	Ford	Chrysler
Key word	"Best Worldwide Supply"	"FORD 2000"	"Greatest Minimized Costs in the World"
Reduced number of suppliers	5000~6000 main component manufacturers in 1988 were greatly reduced to 2500~3000 in 1990, with further reductions planned for 2000 and beyond. Demanding further development of module components	Aim at reducing the number of main component manufacturers from 2010 companies to 1000 in ten years. The reduction of the number of component companies in North America from 1500 to 1000 by the year 2000. From these, 180 manufacturers are to receive two-thirds of future component orders. Demanding further development of module components	Reduction from 1500 main component manufacturers at present to approximately 150 by the year 2000.
Goal of reduced component supply costs	Introduction of PICOS 30% cost reduction was achieved within three years of 1992. This program will continue into the future.	Requesting a 5% annual cost reduction and 20% overall cost reduction for the four years since 1995.	Introduction of the SCORE program since 1989. Cooperation with suppliers to reduce costs. A reduction of \$2.67 billion by 1996 and overall target of \$9.8 billion by 2001.
Goal of reduced development costs	PICOS was introduced with the aim of reducing costs by 30% within three years of 1992. PICOS was later made into a regular program. Requested improvements aimed at "zero defects " during the 1996 suppliers' meeting.	Aiming at cutting total costs for the year 2000 back to the 1995 level through a product development-led system concentrated at five vehicle centers. Shortening the development period from 33 months to 24 months.	25% reduction in preparation time for manufacturing through the introduction of the CAM system, accompanied by reductions in related costs. Aiming at zero annual defects per model.
Reduced number of platforms	Reduction from 25 at present to a total of 8. Reduced number of engine and transmission types	Reduction from 24 at present to a total of 16. Increasing model variations from five types to eight types per platform. Reduction from 30 basic engine structures at present to a total of 14 by the year 2004.	Integration of 7 or 8 platforms Expanding production per platform by integration of the platforms as well as increasing the production capacities.
Movement away from intra-company component operations	Delphi Automobile Systems was established following the detachment of GM ACG (intra-company component operations) in 1994. Delco Electronics was then taken over at the end of 1997. An increase from 30% in 1996 to 50% by 2002 is planned for sales percentages excluding GM North America Operations (NAO). It is also said that a public stock offering is highly likely in 1999.	Visteon Automobile Systems was established after intra-company component operations were detached in November 1996. Plan to increase reliance on sales outside of Ford from 10% in 1996 to approximately 20% between 2000 and 2002.	Promote out-sourcing except for main components such as platforms and power trains through the spin off and sale of Acustar (Intra-company component operations).

Source: Prepared by ING Barings Securities from Automobile News, etc. Reproduced in part by author

One more point related to global mergers and cooperation is that global component supplies make possible a reduction in costs for component supplies through narrowing down the number of component manufacturers. Unifying component supplies while advanced system unification also reduces costs by shaving the number of components and the manufacturing processes using module systems. Surely, a quick look tells us that mergers and cooperation bring about lower costs for component supply and promote module systems because of the resulting concentrated purchase of components and increased buying power.

Table 1 shows procurement strategies for The Big Three. Included are how the number of suppliers is being reduced, goals for reducing costs related to component supply and development, reduction of the number of platform types and separation of intra-company component operations.

In this way, a global system of vehicle development and component supply has become possible. This paved the way for later endeavors to establish a global system of production, supply, distribution and sales.

Moreover, further impetus to develop global strategies resulted from the increased importance of forming environmental strategies for handling such issues as CO₂ reduction and recycling, which will strongly influence competitive power in the automobile industry during the 21st century.

The above-mentioned development of global strategies and conditions which made this possible coincided with the background and timing of the Daimler-Chrysler large-scale alliance. However, full-scale global competition in the form of competitive strategies among automakers was set off by the announcement in 1993 of the Ford Project 2000, Ford's flagship global strategy. More than anything, Ford's Project 2000 signaled the start of an era of global strategies in the worldwide automobile industry and has played a leading role in global strategies with an eye on the 21st century.

Under President Trotman, Ford set out a bold global strategy, but the basis for this strategy was the recognition that the globalization of people, things, money and information was rapidly proceeding. The building of corporate culture recognition is ultimately necessary to keep up with the speed of change ⁽⁵⁾. Therefore, Ford promoted a strategic unification of the Ford family including Ford Europe, Mazda and Jaguar and infusing a common global vision. Details of this strategy are as follows: Global unification of automobile chassis' and platforms was promoted by carrying out worldwide unification of the development system. Then, related to this, a world car concept was established with the Mondeo and Mystique light vehicle series. This was the springboard for the debut of a basic world car, the recently announced KA series.

Also, overlap which had previously taken place in development of similar concepts in North America, Europe and Asia was ceased and five vehicle centers were organized and development functions concentrated as much as possible in Dearborn. A strategy was set forth to organize the division of labor and cooperation among North America, Europe and Asia under a

global development system. This was carried out mainly in development centers in North America with the introduction of common platforms, common components and the global engine series. Moreover, under Ford 2000, the global strategy for component supply shown earlier was set forth. Ford promoted the reduction and systematization of suppliers, establishment of module systems, independence of Visteon, the intra-company component operations and growth of global suppliers. In the process, bench marking was thoroughly implemented by setting up a database of supplier capacity (cost competitiveness, price competitiveness, time for delivery and technological/developmental ability). In this way, groundwork was boldly laid for global sourcing, referred to as the best locations and supply worldwide.

This global strategy of Ford 2000 was formed with farsighted vision and was very dynamic in nature. As you can recognize from the key words, "Think globally, act locally with agility," in planning their world car, Ford carefully considered the compatibility of products (compatibility to local market) while taking into account complications surrounding local market needs and numerous market changes.

At the time, Ford 2000 was considered too radical and bold a concept and specialist in the US criticized the project as being too futuristic and carrying too great a risk. Some people saw the plan as lacking in reality and being some sort of moral boosting tactic to spur on President Trotman's corporate culture reforms.

Additionally, various conflicts and confusion occurred within the company organization after the actual implementation of the strategy. The world car concept was reconsidered and the direction of development sharing was slightly altered with Europe. However, it later became clear that this bold global strategy would succeed when looking at increases in Ford's share of the world market, improved cash flow and reduction of costs related to development and component supplies.

In an interview at Ford headquarters, I discovered also that Ford Project 2000 was not aimed solely at strategic global preparations. In order to even out the bureaucratic organization and make Ford even more active, promoting reform of the corporate culture at Ford was aimed not only at reform of the mentality within the company but also at making the best use of information technology. These reforms ranged from full implementation of databases, to simplifying management procedures and organization. The main point of the project was to speed up business procedures and decision making ⁽⁶⁾. This type of advanced global strategy together with reform of corporate culture strengthened Ford's presence in the worldwide automobile industry and led to the establishment of global strategies by many other manufacturers such as VW and GM. In a way, this movement became the primer for worldwide reform as represented by the Daimler-Chrysler alliance and the Nissan-Renault merger.

3. The role of scale economy in the global reorganization and the production systems of various model in various quantities

We have studied the process of how the global reorganization took place. The global strategies that received all the attention, was the Ford example, Project 2000 which triggered the attention to global strategies. The global strategies have triggered the global reorganization and have now become the requirements for the survival of the future automakers worldwide. There are theories to follow regarding the global reorganization based on the scale economy. Thus, the word in the international automobile industry and among journalists is that only the few automobile companies with annual production of 4 million cars or more will remain in the future. If this annual production of 4 million cars is the magic number, merger fever is a natural phenomenon among many automobile manufactures and management. Still, the question remains if simply the scale of economy theory can explain the globalization of the worldwide automobile industry? Can the changing world automobile market really be explained so simply under the scale of economy theory?

If the future international automobile market continues to undergo complicated and diversified changes and movement in demand continues to roller coaster depending on the region and time without synchronizing such changes by region, there are theories other than a simple scale of economies. That is to say, other policies include lowering the break-even point for a limited production scale without sticking to the ideal of scale supremacy, developing creative products aimed at a specific niche market. The ability of building the power to develop dynamic new products one after another with a short lead-time, and flexible production systems which can be adapted for different types and quantities.

Currently, globalization of the automobile industry is proceeding in two directions. One is adopting a strategy based on scale of economies and the other is adopting a strategy of maintaining a flexible production system that can respond to any changes.

As seen in the previous chapters, expansion of scale merit through mergers and cooperation surely brings an increase in production number per platform and reduced costs for component supplies. The problem however is that these points are not always accompanied by increased development ability which guarantees improvements in product quality. There is also no guarantee that individual identity, as distinctive product architecture will remain after reducing the number of platforms. It is also possible for individual manufacturers with annual production of around 1 million to reduce the number of platforms and to adopt common platforms in their own way. Narrowing the number of component manufacturers and the move toward modularity can be carried out to meet demand through cooperation among networks of middle-sized automobile manufacturers even without

mergers. An excessive move toward modularity, i.e. large-scale sub-assembly, will weaken the attraction of products and make automobiles standard products like personal computers. The charm of the product will disappear.

Another consideration is the current diversification of needs and drastic changes in the automobile market. Competition in product development will heat up and quicker development will be required with the increased use of electronic information in automobile design architecture for environmental, safety and ITS countermeasures. In actuality, shortening development times is already proceeding, and recently, 12 to 18 months timeframe is in the picture. Thus a simple scale merit theory does not fully explain how this matches diversification and speed of change in the market. Competitiveness with superior quality products cannot be guaranteed by just increasing output ⁽⁷⁾. In order to correspond to market diversification and speed of change, new production systems which make flexible production and suitable quantities possible will be a key. Scale merit is not the only way. Flexible production can be seen in the just in time (JIT) system traditionally carried out by Japanese automobile manufacturers and shortening of the production line and appropriate use of production processes creates production lines which can correspond to changes of quantity as well as type.

At present, reduction of supply capacity is proceeding and shortening of production lines is being planned. Japanese automobile manufacturers are pursuing flexible production and trying to create flexible production lines to adjust the rate of operations at plants or on production lines. The newest production lines at Toyota Shimoyama engine plant and Honda Suzuka plant are good examples.

As a case study, let's look at the new line at the Shimoyama Engine Factory ⁽⁸⁾. Toyota's Shimoyama engine plant was established as the main plant equivalent to the Kamisato Plant in 1975. Since then the plant has manufactured 25 million engines and now they support engine plants overseas in Britain, North America and Thailand. New challenges to manufacture a different line of engines is taking place at this plant by starting a new line to manufacture 30,000 ZZ-type engines per month at the Shimoyama Plant. The new challenge is to add flexibility and shorten the production lead-time for the lightweight fuel efficient engine production system. This engine uses a 4-cylinder, 1800-cc front intake rear exhaust and has an aluminum casting liner. Up to this point, flexibility meant to handle the variation changes within the same type of machine. The main characteristic of this new production aims to apply flexibility to handle design modifications as well as production fluctuations, in other words, flexibility to handle quantity.

Plant side explanations for this new challenge it is difficult to secure a stable amount of production due to the stagnant domestic demand, because engine manufacturing is being transferred overseas. Thus, they aim to

organize the process to absorb fluctuations as much as possible even if they cannot “just fit” production fluctuations. They promoted a “no more transfer machine” process and eliminated CIM (computer integrated manufacturing) processes that can handle the mass production but requires more than a certain amount of production to avoid the production being rigid.

To handle crank and camshaft processing, they lined up the general-use machines and adopted a single shaft NC, and to handle block and cylinder head processing, they used multiple lines, four lines for example. This means that the conventional CIM and production processes with transfer machines put weight on the increased production. Because this additional cost almost doubled the initial investment, they now try to absorb the effects by reducing the production amounts at the production lines to eliminate additional investment cost. In addition, by establishing multiple lines, they can handle the production amount fluctuations. By having multiple lines, they can terminate operations in extreme cases, maybe one or two lines, when they have only 70% of the total processing they can concentrate the operators to the remaining lines. This can shorten the assembly and process lead-time and improve operability.

The production engineering management department at the design development phase investigated establishment of the new lines. The plant side participated in giving suggestions that are reflected in the early design development phase regarding the reliability and assembly relative to the operations and processes.

In order to maintain high productivity with this process while still accommodating the production fluctuations and guarantee quality throughout the lines it is crucial to train and mature operators by this process rotation. Because this will enable them to be allocated to different processes and accommodate quantitative fluctuations. However, it is very difficult to rotate them through all the processes, thus they divide the process into three zones and learn different types of processes. These three zones are box related such as blocks and heads, shaft related processing such as cranks and rods, and assembly processing.

By implementing these mentioned methods, they are hoping to handle operability fluctuations at 70-100% levels by creating flexible lines that can handle design modifications and production quantity fluctuations. Thus, depending on the capacity, they may terminate equipment, such as presses as an example. They are also considering the possibility to establish a module structure of equipment, to use the terminated equipment for another purpose on another line. This type of line structure has also been adopted in other companies in Japan. Now Ford is participating in this challenge, which eventually will determine the direction of flexibility pursuit in the global competition.

This movement, to pursue production of various models in different quantities and process flexibility, is linked to the shortening of product development time and preparation time for mass-production as well as front

loading ⁽⁹⁾ (Solving problems in advance during the trial process). At the same time, there are some common aspects with limited small-scale production. Equipment investment will be less than that for existing production lines and yearly production limits will be established. This then unavoidably pushes manufacturers to work on plants and production systems which can make a profit even with annual production at 50,000, or even 10,000 when needed. Honda is now carrying out an experimental trial in Turkey.

Large-scale international alliances or entering the 4 million units-per-year clubs are not the only strategies for survival in the automobile industry in this global era. Even with these large-scale alliances, results depend on whether or not there is a true synergistic effect through making the best use of the partners brand value and manufacturing characteristics. Examples of unsuccessful endeavors in the past include the merger between BMW, Rover, and that between Renault and AMC. The conclusion is that the way to survive includes adopting flexible production systems while forming flexible and diversified networks of cooperation, even if the scale is small ⁽¹⁰⁾.

Such necessary global strategies are common for global automakers but substance and the methods of operation are not the same. Thus, pursuing scale economy by alliances and ventures just to match up numbers will not be sufficient to accommodate the rapid changes of the automobile technologies. There is a diverse and rapidly changing market to meet consumers needs. The capability to pursue the dynamic product development capability, flexible production systems to accommodate such development and possibly the production systems of various models and quantities is inevitable. Matching numbers of the scale economy does not develop global strategies that are sufficient enough to survive the global competition. Effective global strategies must include the capability with value contents to handle changes accurately and promptly. The founder of the modern global strategies, Ford, did not pursue only the scale merits to standardize the platform or to supply components globally. They rather progressed with their global strategies with careful considerations of global contents and the value side by focusing on the compatibility of the products in the community and agility of the business operations. It is not smart to pursue the scale for individual purposes. However, it is important to receive the scale merits as a result of the establishment of value contents such as product identity and capability to handle changes.

4. The direction of global structural change in the auto component industry

While assembler-level manufacturers in the automobile industry push forward with restructuring efforts and global strategies, that same wave of globalization and the structural changes that result from it are rolling through the automobile components industry where local business structures and systems differ from country to country. These structural changes are being caused in part by the expanded global outsourcing that automobile manufacturers have marked as a pillar move in their global development strategies. Another driving factor behind the structural changes is the globalization of the automobile components suppliers themselves who are integrating, merging and building network tie-ups on their own accord as well as stepping into the driver's seat with globalization strategies of their own. Then, there is the fact that these two trends are interrelated and fueling one another's evolution.

Though automobile components industries around the world are restructuring because of the expanded global outsourcing of automobile manufacturers in general, western automakers are leading the trend in reducing their herd of suppliers. Table 2 gives the sales ranking of the world's top component suppliers, but what should be noticed here is how much the rankings have changed from 1995 to 1997. Attention should also be given to the brisk activity in mergers and acquisitions amongst automobile component manufacturers (see Table 3), for the links they have to this sales ranking. This outsourcing squeeze appeared first in the west particularly because of moves from the Big 3, but the targets of the automobile manufacturers and the processes they used to achieve those targets have promoted mergers and acquisitions amongst components manufacturers and led to the emergence of global suppliers.

But, what exactly are automobile manufacturers targeting by reducing their number of suppliers and what kind of process are they using? It is well known that there were distinct differences between the components procurement systems historically practiced in the west and that of Japan. In America, most of the components were made in-house in what is referred to as one kind of internal vertical system. Europe, on the other hand, used few in-house components choosing instead a horizontal relationship in

Table 2 Worldwide Sales Ranking of Automobile Component Manufacturers

				Worldwide Sales		Regional Business Ratio '97			
				1996	1997	North America			
				(\$mn)	(\$mn)	a	Europe	Asia	Other
97	96	95	Company Name			(%)	(%)	(%)	(%)
1	1	1	Delphi Automotive Systems	26,000	26,600	75	15	5	5
2	2	4	Visteon Automotive Systems	16,400	17,000	85	15		

3	3	2	Robert Bosch Corp.	16,300	16,500	20	71		
4	4	3	Denso Corp.	13,000	13,104	18	5	76	2
5	5	19	Aisin Seiki Co.	7,790	7,790	9	7	82	2
6	9	16	Lear Corp.	6,249	7,343	68	26		6
7	8	17	Johnson Controls Inc.	5,942	7,280	68	29	1	2
8	7	5	TRW Inc.	6,493	7,032	50	42	3	5
9	14	14	Dana Corp.	5,450	6,217	80	12	2	6
10	20		Magna International	4,200	5,500	68	20		
11	12	6	Delco Electronics Corp.	5,350	5,350	81			
12	15	7	ITT Automotive	5,500	5,200	50	50		
13			Bridgestone Corp.	4,756	5,146	30	14	48	8
14	10	13	Valeo SA	4,600	5,000	22	74	3	1
15	6	20	Lucas Varsity Plc.	5,100	4,471	40	50	5	5
16	17	15	Mannesmann AG	4,153	4,332		82		
17			Magneti Marelli SpA	3,863	4,290	4	80		16
18			Bertrand Faure ECIA	□	4,000		95		
19	13	11	Groupe Michelin	3,620	3,980	32	54	8	6
20	21	12	ZF Fiedrichshafen AG	3,937	3,800		78		
21	25	24	Eaton Corp.	3,025	3,552	82			
22	23		GKN Plc.	3,423	3,381		66		
23			Goodyear Tire & Rubber Co.	3,370	3,360	50	24	12	14
24	19	18	Thyssen Budd Automotive GmbH	3,300	3,300	66	30		4
25			Meritor Automotive Inc.	3,100	3,300	40	45		

Source: *Automotive News* prepared by Bearing Holding Company
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US Big 3 have changed their purchasing strategies significantly since 1990. This movement is to select the primary component manufacturers to establish the supply chain without capitalistic relationships. This allows them to establish the system to expedite outsourcing, promote unit's process, develop, and deliver on global bases.

M&A among North American automobile component manufacturers continue. For example, a body and engine related component manufacturer, Dana, is planning a merger with Ericson in 2000 following the 1997 merger with Echlin. There will be a giant company exceeding 13 billion dollars. By merging with Ericson, which has the strong brand presence for the repair components, they can disperse the risk in the reciprocal market and stabilize the incoming cash flow.

Table 3 M&A of the Automobile Component Industry
Automobile component manufacturers are already in action.

Date	Country	Initiating Company	Description	Country	Non-initiating Company
94.5	USA	Foamex International	Acquisition	USA	JPS Automotive
95.4	Norway	Walbro Automotive	Acquisition	USA	Dyno Ind. fuel system div.
96.6	UK	Lucas Industries	Merger	USA	Varsity Corp.
95.11	USA	Tenneco Automotive	Acquisition	USA	Psefection Automotive Products
95.11	USA	Johnson Controls	Acquisition	France	Roth Freres S.A.
95.11	USA	Dana Corp.	Acquisition	UK	GKN
95.11	USA	Dana Corp.	Acquisition	Brazil	Rockwell do Brazil

95.8	USA	Lear Seating Corp.	Acquisition	USA	Automotive Industries Holding
95	USA	TRW	Acquisition	South America	Safety Transport Inter
96	USA	Borg-Warner Automotive	Acquisition	France	Societe de L'Usine de la Marque
96.2	USA	Dana Corp.	Acquisition	Argentina	Chassis, Piston ring
95.3	USA	T&N	Acquisition	France	Sintertech S.A.
95.3	Germany	Budd	Acquisition	USA	Resin Business of Complx Components
96.2	USA	Dana Corp.	Acquisition	USA	Business Department of SPX Corp.
96.2	USA	Dana Corp.	Acquisition	USA	Clark-Hurth Components
97.3	USA	Lear Corp.	Acquisition	Czechoslovakia	Acquired Empetek Autodily from ERPE
97.6	USA	Lear Corp.	Acquisition	UK	Acquired Dunlop Cox from BTR
97.6	USA	Lear Corp.	Acquisition	Germany	Automobile Seat Business of Keiper
97.7	USA	Dana Corp.	Acquisition	USA	Axle and Break Business of Eaton Corp.
97.8	USA	Lear Corp.	Acquisition	USA	Seat Components of ITT Automobile
97.9	USA	Eatin Corp.	Acquisition	USA	Clutch Business of Dana Corp.
97.9	Canada	Magna International	Acquisition	Germany	Plastic Interior and Exterior Decoration Department of YMOS
97.7	USA	GM Delphi	Acquisition	Poland	Febryka Amortyzatorow S.A.
97.8	USA	Lear Corp.	Acquisition	USA	ITT Industries
97.8	Germany	Siemens AG	Share increase	USA	Ford
97.8	USA	Lear Corp.	Acquisition	Germany	Keiper Car Seating GmbH & Co.
97.9	USA	GM Delphi	Disposal by Sale	To be determined	Spin off of the unprofitable department
97.9	USA	Magna	Partial Acquisition	USA	GM Delphi
97.9	USA	Micronas	Partial Acquisition	USA	ITT Industries
97.9	USA	Textron	Acquisition	UK	General Rubber Goods Department (Pirelli)
97.9	Canada	Magna International	Acquisition	Germany	Ymos AG's plastic products division
97.9	USA	Eaton	Business Transfer	USA	Dana
97.10	USA	Federal-Mogul	Acquisition	USA	T&N
97.10	USA	Tenneco	Acquisition	Argentina	Fric-Rot
97.11	USA	Delphi Automotive Systems		USA	Delco Electronics
97.12	France	Ecia (PSA Peugeot Citroen)	Acquisition	France	Bertrand Faure
98.2	USA	Walton Johnson Group	Partial Acquisition	USA	Delphi Automotive Systems
98.5	USA	Dana Corp.	Merger	USA	Echlin Inc.

Note: The indicated dates are when the related articles are published but not the accurate merger or acquisition date.

Source: *Ward's Automobile Report* and extracts from companies' press releases.

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supply and business with suppliers ⁽¹¹⁾. Though American and European automobile makers differed on the point of internal manufacturing ratios. They were similar in the fact that they both used numerous component suppliers and numerous miscellaneous components. Even American companies, which used a high percentage of internally manufactured components, far-outdistanced Japanese automobile manufacturers in the number of suppliers they retained. Take for example GM with 6,000 suppliers or Ford with 2,000 and compare that with the rough 200 primary suppliers of a Japanese company. The same goes for European manufacturers: they used many suppliers.

The components business of western automobile manufacturers emphasized more than anything else cost evaluation on a short-term tender base. Because of the competitive bidding, component suppliers were changing constantly. Also, with exception to fuel pumps made by Bosch or transmissions made by Borg-Warner, functional components and system components were completely designed, developed, tested and assembled by the automobile manufacturer himself, with no information being released outside of the company whatsoever. More than anything else, these practices have influenced the ongoing structural changes in the component supplies industry, meaning that the current outsourcing squeeze is the result of changes in traditional components business practices used in the west. In other words, western automobile manufacturers are changing their component procurement practices and are now asking suppliers to deliver components as systems and units. Moreover, manufacturers are evaluating suppliers for the design strength; development strength and engineering solutions needed to supply these systems and units, and additionally shifting their focus from inspected delivery to quality assurances from the supplier's end.

From our position, it looks to some degree like the west is copying Japan in hopes of infusing the stability of Japan's vertical pyramid and doing business through affiliations. However, it has cost conventional automobile manufacturers time and money to reorganize their purchasing departments and form cooperative groups. In any case, an information revolution has emerged on the tailwind of these structural changes. That is to say, because manufacturers are building a database of suppliers and a system for benchmarking quality, cost, delivery and engineering, they can at a glance know the capabilities and hidden potential of suppliers, a task that had left them groping around in the dark before. Hence, supplier integration and reduction have progressed a clearer policy. And, the database of suppliers and the benchmarking system are not just being built for a single country but on a global base ⁽¹²⁾.

These structural changes have naturally invited dynamic mergers between component suppliers around the world. But, what should be noted is that these mergers do not merely target expansion, but restructuring that can boost the suppliers' design and development strength and system-building capabilities. In essence, the restructuring we are seeing amongst components suppliers is not led by the automobile manufacturers but is the suppliers' own attempt at global integration.

When the term "global outsourcing" was coined, manufacturers were trying to solve the falsehood, that volume components of a car such as electronic components had to be procured and supplied on a country base ⁽¹³⁾. Whatever the conclusion, it came to be a core element of global outsourcing which everyone identifies with today that suppliers also (since development and engineering strengths were being stressed) have to be capable of exchanging CAD/CAM and CAF data on a global scale. They have to

incorporate their potential as the best location and best supplier in their own global strategy. What this means, as Ryoichi Hara has pointed out, is that suppliers not only require the design ability that allows them to participate in development under the approved country system. The ones the automobile manufacturers have laid down as their basic policies on development, but also the ability to propose basic development concepts. Things have turned out this way because automobile manufacturers need to focus development resources on advanced and basic technology in areas such as the environment and ITS ⁽¹⁴⁾.

As restructuring continues along these lines in the global component industry, modularization is becoming a keyword in global components. Modularization was originally introduced in Europe, especially by German automobile manufacturers, as a means for overcoming the high cost of labor and procurement that their own horizontal supply business created with the numerous number of components they had to deal with. The actual beginning came with model plants that these manufacturers built in developing countries of Eastern Europe and Latin America, where modularization was first adopted. Watching this, global suppliers like Boost, Delphi and Visteon, who had their targets set on global business expansion, jumped on the design and development bandwagon and came up with a proposal to strategically use modular components. This constituted a completely different perspective of the assembler leadership that existed to date. One after one, western manufacturers constructively adopted this approach, and this marked the start of a link between so-called "global outsourcing" and components modularization.

Japanese automobile manufacturers were generally circumspect of the trend. This was because the procurement system they had with domestic component suppliers was viewed as the most efficient in the entire world. They decided that there was no urgent need to promote modularization because primary suppliers were taking part in simultaneous engineering, modularization was progressing with procured competence and sideline delivery was becoming a custom with system components. They additionally pointed out that modular components would place restrictions on individual designs, for which they found it hard to put modularization before the vehicle.

Nonetheless, in the past few years, they have given modularization a second look and a trend can be seen in those actually trying to introduce it. One reason for this is that the growing need to introduce modular components came at an opportune time when manufacturers had to deal with recycling and low fuel-consuming vehicles for the sake of the environment, and develop a next generation vehicle based on ITS. Another reason why Japanese manufacturers are changing their stance is that effective results are starting to show from western manufacturers who constructively introduced modularization. Design restrictions are being lifted somewhat on the design work for modularization thanks to

improvements in the digital design techniques and advances in architectural design. Modularization is making it possible not only to reduce the number of component suppliers but also to greatly reduce costs, using inventions that divide and link suppliers and assemblers by their specialties.

Japanese manufacturers are today promoting modularization by helping suppliers design doors, internal panels and other components, while providing them with technical guidance along the production line. At the same time, they are promoting modularization in the design stage. As topics, what they need to do more than anything else is to improve their design capabilities and strength ⁽¹⁵⁾.

On this point, Masataka Ikeda feels that Japanese automobile manufacturers are greatly interested in modularization on the development level "as a wider range of development outsourcing". He cites the following reasons: [1] large cost reductions and the creation of added-value from business that is done on a modular base, [2] reduced development burden for the assembler, [3] the possibility of coming up with something innovative despite the fact that Japan is behind the west in modularization, and [4] the necessity to prepare for the eventuality that Japanese components manufacturers will be unable to participate as suppliers as western automobile manufacturers shift from ordering components to ordering modules. Ikeda adds that, at the present time, European component suppliers outperform their Japanese cohorts in their ability to propose modular products. This should come as a warning to Japanese component manufacturers. It will determine both whether they need to form strategic alliances and whether they can ⁽¹⁶⁾.

The Japanese suppliers, who have enjoyed the advantages of traditional subsidiary business, are affected by this structural change in the global automobile industry. The global sourcing development has brought the same type strategies to the automakers. Two trends can be seen among the automakers. One is to strengthen the relationship with their subsidiary suppliers. The other is to evaluate suppliers based on the systems integration and the ability for a modular structure to go beyond subsidiary relationships and their ability to aggressively propose technologies. These two movements are not necessarily one or the other; but rather the suppliers are expected to be global suppliers with high technological abilities. As an overall trend, global subsidiary businesses are becoming networked businesses and the business structure is changing to be more dynamic, actually free from nationalities. Among these movements, Japanese suppliers are in the middle of deciding to be primary global suppliers or secondary global suppliers utilizing the own technologies. This suggests that the future changes of the initiative taking be in the subsidiary businesses, such as global module trends, assembler-initiating reorganization or global supplier-initiated reorganization.

5. Conclusion

Automobile and component industries worldwide have gotten into the global age. By the D-C alliance and the global alliance between Nissan and Renault these have created a common view that suggests that the alliance era for the worldwide automobile industries are aiming to join the 4 million-unit club. But the actual point is that the global strategies have been put in the spotlight in the global era, and pursuing the individual purposes by joint ventures and alliances for scale advantage is not everything in a global strategy. Joint ventures and alliances are not the only absolute choice for global strategies, or the final answer to the global automobile industry reorganization. They must keep in mind, that the joint venture to merely match numbers will possibly create the risk of being larger scale rather than larger number scale advantaged. In the case of the D-C alliance, they considered the survival risk in this global era and stressed mutual support by product and region. They cannot expect a standardized platform, which could be expected after the analysis of the economical advantage by global sourcing. What is important is not to stress only the scale in numbers but the ability to develop products that play a core role in this competition. The competition among automakers is centered on the production systems and components supply strategies that handle the developed products, and also the creation of brand identity through marketing. The pursuit of valuable competitiveness can be brought about in their ability to plan daring and dynamic product architectures. The ability to create a product identity, pursue the production systems, components supply systems and production systems of various models in different quantities to accommodate the rapid changes of the social environment and to market these needs promptly and with flexibility.

In Ford's case, it has made the first move among the worldwide automakers in the planning and implementation of a global strategy. They did not start by merely matching numbers but stressed the flexible and prompt handling of the local market changes and differences while advocating a world-car plan. Ford implemented platform standardization and a world engine series in module production for Ford North America, Ford Europe, Matsuda and Jaguar for the pursuit of an economic advantage. On the other hand, each company within the group is trying to pursue an economic advantage based on an operational focus. Matsuda is working on its ability to produce various models in different quantities, but Matsuda's hardest job will be to secure its product identity. It is necessary to focus on the fact that it is not merely matching numbers. We must remember that platform integration and global components supply would be meaningless unless the product value comes along with it.

Japanese auto and component makers have provided us with lessons for the production of various models and quantities. There are many Japanese automakers, why not start joint ventures to match numbers. Because even

the manufacturers with annual production levels of about 1 million units, have their own products and identities of their production technology. The joint ventures for the purpose of number matching without a certain level of identity of the design and the production ability, which creates the niche markets, are meaningless. The qualitative gap of such management systems and product identity of individual automakers suggests that the possibility for a network type alliance. For example, utilizing each product identity but still using global collaborative ordering of parts and components is not just a dream. All of these things are depending on the collaborative development and mutual use of platforms and components with overseas manufacturers and the progress of the module structuring. It does not have to be in the form of a joint venture to pursue economic advantages, but through network type alliances with core abilities for development and product identity.

There are some discussion points raised for the structural change of the global components industry. Expansion of the global sourcing by automakers and the integration of the global suppliers to accommodate this expansion seems to be expecting the economic advantage. When we think about the dynamic changes such as environmental compliance by the automobile component technology, from electronic to information system integration, fuel cell and ITS handling, the important point is how to utilize the element technology and the unique core technology of the suppliers. Once again, the ability for the development, proposal of technologies and dynamic system integration to utilize such abilities is questioned. We must remember that the pursuit of the economic advantage from the M&A and joint ventures themselves without the value contents are not sufficient as a competitiveness of suppliers in this global age. Reconstruction of the components industry does not proceed by merely matching numbers by joint venture reorganizations to reduce the number of suppliers. Creativity to develop architecture of component designs and independence to supplement areas they are lacking. Strategic and network alliances will be required of the suppliers. We must focus on the fact that the structural changes of the global components supply and supply systems proceeds with a dynamic change in value beyond economic advantages, subsidiaries relationships and national borders

Notes

- (1) Shimokawa, Koichi, *Automobile Industry, Out of the Maturity Age* in Japanese, Tokyo: Yuhikaku Publisher, 1985, pp.131-132
- (2) For the future prospects of the Asian market, optimism was seen due to the size of the population that will be introduced by the participation of China and India in the global market. There are stronger views to more careful and accurate prospect for the economic crisis of southeastern countries since July 1997 and the possible environmental issues raised along with the increase in car owners.
- (3) However, we must remember also that Daimler (Mercedes Benz) is the world's biggest large-size truck manufacturer, manufacturing 1,837,462 truck units. (*Japanese Automotive News Automobile Industry Handbook* in Japanese, 1999, p.191)
- (4) According to the announcement made by Chrysler, they have a 5-year plan, in which they plan to invest 4 billion dollars to keep the plants up to date and 4 billion dollars into drive and engine related component plants. (*Japanese Automotive News Automobile Industry Handbook* in Japanese, 1999, p.182)
- (5) Ford Motor Company, Press Release; *Ford 2000*, Oct. 1994, Shimokawa, Koichi, *About the Ford 2000 Project* in Japanese, Japanese Automotive News 1999
- (6) Interview at the Ford Headquarters, September 1997.
- (7) Fujimoto, Takahiro, *Automobile Industry, 'Quality' First* in Japanese, Nippon Keizai Shinbun, Keizai Kyoshitsu (Economics Class), April 19, 1999 Issue.
- (8) Shimokawa, Koichi, *Impressions of the New Line at the Toyota Shimoyama Engine Plant* in Japanese, Japanese Automotive News, March 19, 1999 Issue.
- (9) Fujimoto, Takahiro, *Shorter Product Development Period with Front-Loading Method Problem Solving* in Japanese, Economics Research Section of Tokyo University Graduate School, International Japanese Economic Collaborative Research Center, Discussion Paper CIRJE-J-1, April 1998
- (10) Shimokawa, Koichi, *Global Amalgamation and Flexible Production Systems* in Japanese, Japanese Automotive News, May 15, 1999
- (11) Wormack, J., D. Ross and D. Jones, *The Machine Changed the World*, 1999, pp.193-206
- (12) Harada, Ken-ichi, *Strategies for the Rapid Progress of the US Automobile Industry* in Japanese, Industrial Research Association, 1995, page 106 - 109.
- (13) During the author's annual US research, in May 1995, purchasing personnel at Chrysler and Ford expressed the importance of global supply. On the other hand, Japanese purchasing personnel at local factories and development centers, expressed their view of the global

sourcing as skeptical and mid to long-term issues but cannot be implemented immediately. The views of purchasing personnel in two countries were very different.

- (14) Minami, Ryoichi, *Globalization and Issues of the Automobile Components Industry* in Japanese, Japan Automobile Manufacturers Association, Automobile Industry, August 1999 Issue, page 11.
- (15) Shimokawa, Koichi, *New Trend for Component Modules* in Japanese, Japanese Automotive News, April 1, 1999.
- (16) Ikeda, Masataka, *Japanese Automobiles and Automobile Component Industry* in Japanese, Japan Automobile Industry Association, Automobile Industry, August 1999 Issue, pp.7 - 8.