

APR 15 12 39 PM '86

FEDERAL RESERVE
BANK OF CLEVELAND

ECONOMIC COMMENTARY

American Automobile Manufacturing: It's Turning Japanese

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cost of inventories was a remarkably low \$74 per unit produced.¹⁰

Despite the gradual U.S. adoption of Japanese-style production techniques and labor relations, there still existed a significant production cost differential between U.S. and Japanese automaking. In 1985, Honda estimated that new cars assembled in Ohio cost \$450 to \$500 per unit more than similar cars produced in Japan and shipped to the U.S. This cost difference translated into a U.S. production disadvantage of roughly 5 to 6 percent for the Ohio-based facility.¹¹ However, recent depreciation in the dollar relative to the yen has probably eliminated Japan's production cost advantage, and may now favor Honda's U.S. assembly plant.

Cardboard Buildings?

Although American-made Japanese cars are assembled domestically, a frequent criticism is that the materials and basic manufacturing largely originates back in Japan. In terms of domestic employment, the supply network in the automobile industry is probably more important than the assembly plants themselves. Indeed, every job at the assembly level of production in the U.S. automobile industry traditionally supports about six additional jobs at earlier stages of production.

Clearly, the Japanese made-in-America cars rely less heavily on U.S. suppliers than their American-owned competitors. For example, in 1983 approximately 95 percent of a U.S.-made American car's value was produced domestically, and only 5 percent of its value was imported. The so-called "domestic content" of U.S.-made new

cars was thus about 95 percent. By comparison, the domestic content for the U.S.-made Japanese cars ranges from only 40 to 50 percent (table 1).¹²

However, the domestic content of U.S.-made American cars has been shrinking, and this trend is likely to continue.¹³

Yet, as domestic new-car producers have tended to lower the domestic parts content of cars in recent years, the Japanese have tended to increase the U.S.-made parts content of their cars by developing a JIT-type supply network.

The intricate JIT inventory network has taken years to establish in Japan and will likely develop very slowly in this country as well. The supply network surrounding Japan's U.S. plants, however, is gradually developing. We can identify at least nine Japanese and 11 non-Japanese suppliers, located in the region that services the Honda-Marysville assembly plant. In 1982, the domestic content at Honda-Marysville was about 40 percent. This year, the domestic content at Marysville is closer to 50 percent and, with the establishment of an engine manufacturing facility in nearby Anna, Ohio, domestic content on some Japanese vehicles made in Ohio should increase to nearly 60 percent.

Conclusion

Japanese automakers have begun to relocate in the United States because this market is now at least as important to them as their home market, especially for the smaller Japanese automakers. Moreover, the U.S. auto market is more lucrative.

Although Japanese automakers may lose some production advantages by relocating some facilities here, they are attempting to maintain labor relations

and production organizations similar to those that exist in Japan. Indeed, the relocation of Japanese auto production here in the United States is already altering traditional labor relations and production methodology of U.S. automakers. In light of rather sharp declines in the value of the dollar relative to the yen, production costs may now favor Japan's U.S. assembly plants. Finally, Japan's involvement with U.S.-based suppliers should continue to grow as the JIT inventory process in this country develops.

Perhaps the most difficult obstacle Japanese automakers in the U.S. will face is the threat of more protectionist legislation, based on the popular impression that Japan's American-based facilities are still "Japanese." However, such nationality distinctions are rapidly being blurred in the world auto market.

The Ford Motor Company, for example, is a major shareholder of Mazda, with a 25 percent equity interest. Likewise, General Motors has a 38.6 percent interest in a Japanese auto manufacturer (Isuzu), and Chrysler controls a 24 percent interest in Mitsubishi. American Motors reverses the role, however, and is owned by the French company, Renault.

Protectionism continues to have strong appeal among some groups in our society. Occasionally, the sentiment to protect an "American" industry is founded on economic rationale. However, a thorough examination of the issues oftentimes suggests that these appeals are based on misguided patriotism or on shortsighted special interests.

10. *The Competitive Status of the U.S. Automobile Industry*. National Academy Press, Washington, D.C. (1983).

11. Assumes Honda car value of \$8,845. Cost data is available from American Honda Manufacturing.

12. Content calculations include labor costs.

13. See "Cars and Competition: Manufacturing Strategies." Arthur Andersen & Company (1985).

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In the last 10 years, the world auto market has been undergoing possibly the most dramatic transformation since assembly line production was introduced in 1913.

Sparked by rising gasoline prices, the industry has developed and introduced new engineering materials and technology in an effort to produce smaller, lighter, and more fuel-efficient vehicles. This environment of change has also seen the emergence of foreign manufacturers as major competitors in the U.S. new-car marketplace.

The auto industry plays a major role in the U.S. economy. In 1985, it represented about 5 percent of real U.S. gross national product (GNP), and accounted for a comparable proportion of national employment. Given the importance of the automotive sector in the United States, the continuing worldwide changes in the industry could have profound impacts on our economy.

This *Economic Commentary* discusses a recent development that has important implications for the auto industry, especially in the Fourth Federal Reserve District.¹

Japanese automobile production is relocating to the United States at a fast pace. Before the end of this decade, seven or more Japanese-owned assembly plants will be located in the U.S. and at least two will be in the Fourth Federal Reserve District. It can be conservatively estimated that Japanese-owned new-car production facilities will have a capacity of at least 1.4 million units within the next four years. Given current auto sales estimates, this could represent more than 10 percent of the total U.S. new-car market.

Collectively, the Japanese could easily become the third-largest automobile producer in the United States before the end of this decade.²

Made in America

Last year, Japanese manufacturers operated three assembly plants in the United States (table 1). The largest, and the first, is Honda's plant in Marysville, Ohio, which began producing cars in 1982. Within a year of starting operations, Honda was America's fifth-largest car manufacturer, outproducing Volkswagen of America. In 1985, with a production of slightly over 145,000 cars, Honda surpassed American Motors as the fourth-leading U.S. auto producer. Honda captured 5 percent of the U.S. new-car market in 1985; about 36 percent of its sales were of cars actually made in Ohio.

Since 1983, two additional Japanese-owned auto plants began producing cars domestically—Nissan, located in Smyrna, Tennessee, and the New United Motor Manufacturing (or NUMMI) in Fremont, California.

Nissan primarily produces small trucks in Smyrna but, in 1985, the Tennessee plant started production of the company's most popular U.S. car (the Sentra) with a production capacity of about 125,000 units. Nissan's investment in its Smyrna operation is around \$660 million.³

NUMMI is the joint General Motors-Toyota enterprise that operates out of a renovated GM factory. Next year, this plant may also begin producing a car marketed specifically for Toyota. The

production capacity at NUMMI is currently around 200,000 units, with a total investment of about \$450 million.

Three more Japanese plants have recently begun development, but are not yet producing automobiles. Mazda, a Ford affiliate, will soon open an assembly plant in Flat Rock, Michigan. Two models will be made there—one will carry a Ford label and the other a Mazda label. Total capacity in Flat Rock is estimated at about 240,000 units annually. The Diamond-Star Corporation, a Mitsubishi-Chrysler affiliate, will soon locate in Bloomington, Illinois, with an estimated production capacity of 180,000 cars, and at a cost of approximately \$500 million.

Most recently, Toyota announced it will begin production of a luxury car in the central Kentucky city of Georgetown. Toyota-Georgetown, also in the Fourth Federal Reserve District, will cost an estimated \$500 million and have an annual capacity of about 200,000 units. Production at the Georgetown assembly plant is unlikely before the 1988 model year.

Finally, Fuji (Subaru) has been studying the possibility of locating an assembly plant somewhere in the U.S., although details are incomplete.

By 1989, a very conservative estimate places total output at these seven Japanese plants at about 1.4 million units annually, representing an investment valued in excess of \$3.5 billion.

These U.S.-based, Japanese auto assembly plants have not demonstrated very uniform characteristics. For example, no geographic concentration has yet developed, and it would appear that tax/subsidy arrangements at the state

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The views stated herein are those of the authors and not necessarily those of the Federal Reserve Bank of Cleveland or of the Board of Governors of the Federal Reserve System.

1. The Fourth Federal Reserve District includes Ohio, Western Pennsylvania, Eastern Kentucky, and the panhandle of West Virginia.

2. These estimates assume total U.S. new-car sales of 12.5 million units in 1989. From Data Resources Long-Term Projections (Fall, 1985).

3. Includes truck-producing capital.

Table 1 Japanese-Owned U.S. New-Car Production Facilities

Firm	Location	Model (year)	Investment (millions)	Capacity (thousands)	Employment	UAW	Domestic content ^a
Honda	Marysville, OH	Accord (82)	\$250	150	3100	NO	50 pct.
		Civic (86)	\$240	150			
Nissan	Smyrna, TN	Sentra (85)	\$745 ^c	120	3000 ^c	NO	50 pct.
NUMMI	Fremont, CA	Nova (85)	\$450 ^b	200	2500	YES	50 pct.
Mazda	Flat Rock, MI	n.a. (86)	\$450	240	3500	LIKELY	50 pct.
Diamond-Star Motor	Bloomington, IL	n.a. (87)	\$500	180	2500	LIKELY	40 pct.
Toyota	Georgetown, KY	Camry (88)	\$500	200	3000	n.a.	50 pct.
Fuji (Subaru)	n.a.	n.a. (88)	\$400	150	2500	n.a.	n.a.
			\$3,535	1,390	20,100		

a. Domestic content estimates include labor costs.

b. Of the \$450 million, \$100 million each was contributed by both GM and Toyota; the remainder was acquired through loans.

c. Figures include both car and truck production.

and local level are a primary determinant of plant location. The Diamond-Star Motor Company, as an extreme example, received about \$250 million in tax-related benefits by locating in Illinois. Mazda is also expected to receive sizable tax incentives, valued in excess of \$80 million.

Union representation is also an undecided, and very emotional, issue. Honda was the first major nonunionized automobile plant in the U.S. in over 40 years; currently Honda employs 3,100 workers in Ohio. To date, only NUMMI has been organized by the United Auto Workers (UAW), although UAW representation is almost a certainty at Mazda, and is probable at Diamond-Star. Honda and Nissan, however, have remained independent.

America the Bountiful

Auto manufacturing is Japan's largest industry, both in terms of output and employment, and the U.S. market is a vital source of its revenues. The U.S. market is quite lucrative, particularly when compared to Japan's domestic car market. As a rough example of the proportionally higher profits enjoyed by U.S. car sellers, the net income-to-sales ratio of the three largest American car producers (GM, Ford, and Chrysler) was 6.3 percent in 1984, compared with a combined income-sales ratio of only 3.5 percent for Toyota, Nissan, Honda, and Mazda.⁴

The car market in Japan is dominated by two major producers—Toyota and Nissan. Toyota, the largest, captured a 41 percent market share in Japan during 1984. Nissan, a somewhat distant second, captured 26 percent of the market that year. Both Toyota and Nissan have been manufacturing automobiles since the 1930s. Newcomers, such as Honda, Mazda, and Fuji (Subaru) have had only modest success in penetrating Japan's domestic market. For example, Honda and Mazda, the third- and fourth-largest producers, respectively, each had a mere 7 percent of Japanese new-car sales in 1984. Price wars in Japan are not uncommon, and new cars occasionally sell at, and sometimes below, their production cost. As a result, ambitious Japanese producers have concentrated their sales effort in overseas markets, particularly in the United States.

In addition to being relatively more profitable, the absence of local content restrictions, few rigorously enforced quotas, and low tariffs, make the U.S. car market more open than most other world auto markets.⁵ And, although all major Japanese car producers are heavily involved in overseas markets, exports are relatively more important for the smaller competitors, such as Honda and Mazda.

Comparing Japanese new-car production shares against the ratio of car

exports to production bears out this relationship. (See charts 1 and 2.) While Toyota represented roughly one-third of the total Japanese new-car output during 1984, less than half of its production was actually exported (45.3 percent). Honda and Mazda combined, on the other hand, represented less than 23 percent of the total Japanese car output, but each exported over 73 percent of their production.

A Question of Politics

Factory usage rates at auto plants in Japan are presently around 85 percent of existing capacity.⁶ In terms of output, the 15 percent excess capacity suggests that the Japanese can still expand production by as much as 2 million units annually. Given the accessibility of the U.S. market, why don't Japanese automakers continue to expand domestic production and simply export even larger percentages to the United States?

To begin with, Japanese automakers cannot wholly ignore the seemingly ever-present threat of greater protectionist measures by the U.S. government. Protectionist barriers have shaped the worldwide location of auto manufacturing since the early days of the industry, and have been used more than once in the U.S. to ease the threat of competition from abroad. Protectionist sentiment has been particularly strong in the

U.S. since 1980. At least 12 auto-related import restrictions have been introduced as potential legislation since then. Currently, there are bills in both houses of Congress concerning auto quotas, tariffs, and local content restrictions.

Interestingly enough, the most effective restrictions on Japanese car exports to the United States in recent years have been enforced by the Japanese themselves. Since 1984, the Ministry of International Trade and Industry in Japan (MITI) has regulated the number of car exports to the U.S.—enforcing quotas that have been set largely on the basis of sales shares established for the U.S. market in 1979.⁷

A Question of Costs

From an economic perspective, the growth in U.S. production facilities by Japanese manufacturers is more difficult to justify. Cars made in Japan seem to enjoy a large cost advantage over comparable U.S.-made Japanese autos. The actual cost advantage of production based in Japan is uncertain, but estimates range from \$560 to \$2,000 per car.⁸ It is therefore necessary to consider whether Japanese automakers are likely to lose a significant portion of that advantage by relocating here.

A primary reason for production cost differences between Japanese and U.S. auto manufacturers involves the cost and productivity of labor. In 1984, American transportation equipment workers earned, on average, about \$20 per hour, compared with an average of \$8 per hour in Japan. Moreover, the labor productivity of Japanese workers is roughly two-and-a-half times greater than in the United States, which is a consequence of important differences in management techniques, in labor relations, and in factory automation.⁹

Competitive pressures in the U.S. auto market have already forced some reforms in American automobile manufacturing. These reforms center primarily on introducing Japanese-style features into labor contracts, and factory automation.

Japanese-owned auto assembly plants are also struggling to establish Japanese manufacturing techniques in the United States. At NUMMI, wages and

Chart 1
1984 Japanese New-Car Output

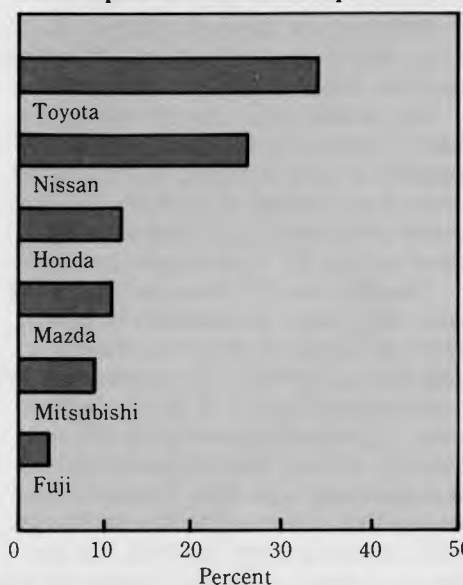
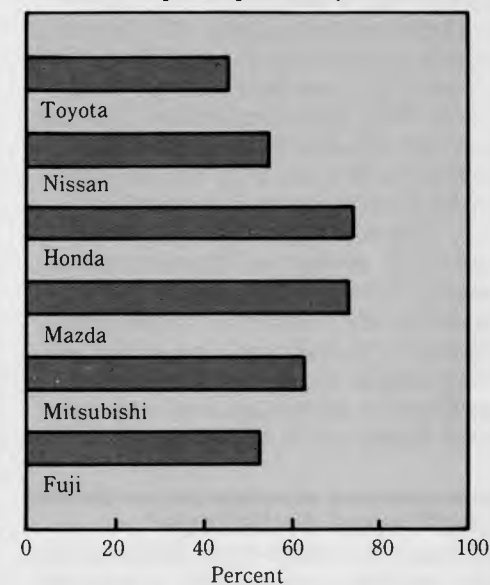


Chart 2
Share of Output Exported, by firm



benefits are comparable to GM and Ford, but include a modest profit-sharing plan similar to the semiannual bonus payment system used by the major Japanese auto producers. NUMMI has dramatically increased labor involvement in the production process. Job classifications have been reduced from dozens, for traditional U.S. auto manufacturers, to just four classifications for NUMMI. And quality control circles—a group of four to eight employees with individual tasks, who work as a team on the assembly line—meet regularly to formulate solutions for quality and productivity problems. Theoretically, as workers acquire greater knowledge and flexibility in the production process, many layers of supervisory control can be eliminated, while simultaneously improving product quality.

Another often-cited explanation of the cost difference between U.S. and Japanese automakers involves the relationship between the assembly facilities and the parts suppliers. Since the early days of assembly line production, U.S. automakers adopted a *vertically integrated* production strategy. This approach maintains that inventory control and product innovation are best implemented when the manufacturer controls component production internally.

Japanese automakers, however, have developed an intricate system for outsourcing a large percentage of their parts. The Japanese have argued that using outside suppliers (outsourcing) is more labor cost efficient because the high wage rates that are characteristic of the auto industry are not necessarily forced upon suppliers.

For the outsourcing system to function properly, it needs a great amount of coordination among the manufacturer and the suppliers. In this regard, Japanese auto producers have pioneered a Just-in-Time (JIT) assembly technique designed to provide prompt, timely delivery of components from suppliers to the assembly plant. JIT assembly is designed to cut costs by avoiding inventory stockpiles. While JIT assembly requires an almost continuous flow of parts, more vertically integrated U.S. manufacturers depend on inventory build-up to ensure parts availability. The Japanese method is more cost-effective. In 1980, the average holding period of major U.S. auto components was three to five days, which added almost \$600 in inventory holding costs per vehicle produced. The typical holding period for similar Japanese components was merely a few hours, and the

4. These ratios include incomes earned from Japanese sales and operations in the United States.

5. Quotas have been in effect for Japanese cars since 1981, but their impact was largely insignificant until 1983. For a discussion of the cost of the voluntary restraint on Japanese cars, see Bryan, Michael F. and Owen F. Humpage, "Voluntary Export Restraints: The Cost of Building Walls." *Economic Review*, Federal Reserve Bank of Cleveland, Summer 1984, pg. 7-37.

6. See "Competitiveness of the U.S. Automobile Industry." Hearing, Subcommittee on Economic Stabilization. February 19, 1985. Serial #99-2. Pg. 66.

7. Since 1984, the export limit set by MITI has been 2.3 million units.

8. See Susan A. Loos, "The Japanese Cost Advantage in Automobile Production." *Economic Commentary*, Federal Reserve Bank of Cleveland (July 2, 1984).

9. See Fisher, Anne B. "Can Detroit Live Without Quotas?" *Fortune*, June 25, 1984, pg. 23. The 1984 compensation costs are available in MVMA Motor Vehicle Facts and Figures '85, and were calculated using the average 1984 yen-dollar exchange rate (237.4).