Chapter 7

Autos and Parts

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SUMMARY

Mexico has an automobile industry today as a direct result of government policies that forced companies to produce in Mexico in order to sell there. General Motors (GM), Ford, Chrysler, Nissan, and Volkswagen (VW), the major firms in the Mexican industry, viewed their original investments as the price of admission to Mexico's market. Because sales were too low to support efficient plants, the companies would have preferred to supply Mexico through imports. But today all five operate engine and assembly plants oriented to both the domestic and export markets.

Most of the companies have assembly plants near Mexico City that primarily serve the domestic market. Historically, these have been profitable only because of trade barriers; if a North American Free Trade Agreement (NAFTA) sharply lowered those barriers, these plants would have to reduce their costs and improve their productivity to remain viable. Newer export-oriented plants have good to excellent performance records. The automakers now view them as part of their continental production base. In contrast to engine and assembly plants, most *maquiladora* investments for assembling wiring harness, electrical and electronic parts, and seats would have been made regardless of the Mexican Government's auto decrees.

In the highly integrated U.S.-Canadian industry, trade friction and the threat of protection by the United States accelerated investments by Japanese automakers in U.S. ' 'transplants. " These, along with imports, have permanently altered the dynamics of the industry, for GM, Ford, and Chrysler-the Big Three-and for the independent firms that supply them with parts (box 7-A).

Transplant assemblers, and the transplant suppliers that sell to them, have significant cost advantages over their U.S.-based rivals; even if they pay similar wages, their benefit costs are much lower. Independent U.S. suppliers will come under severe pressure in the next few years. Some may see their hope for survival in moving to Mexico.

A NAFTA that forced Mexico's Government to abandon its protectionist policies would leave automakers free to locate plants in Mexico based on the same criteria they use in the United States and Canada. But Mexico offers limited strategic options for the Big Three: while direct production costs are sometimes lower in Mexico, shipping can eat up the savings and then some. Only for engines and labor-intensive *maquila* parts production do low labor costs consistently outweigh the additional costs of operating in Mexico. Thus, OTA finds little reason to believe that *existing* efficient capacity with a high utilization rate in the United States or Canada would be closed and replaced by production in Mexico. But plants with old equipment, poor productivity/qualiy records, or low utilization (e.g., because they make vehicles whose sales have declined) will be at risk regardless of a NAFTA.

Companies that need *new* capacity in North America will find Mexico more attractive as they continue to gain experience there, as the Mexican market grows, and as local suppliers become more numerous and capable, So far, a weak Mexican supplier base has made it difficult for automakers to meet existing local content requirements. Mexican-owned and operated parts firms can rarely match their U.S. and Canadian counterparts in terms of cost or quality, much less engineering capability; small size, low productivity, and poor management offset their low labor costs.

In the short term, then, neither the Big Three nor transplant assemblers can expect to substantially improve their competitive positions by moving production to Mexico, Some parts suppliers can do so, particularly if they have labor-intensive production processes. Parts firms are putting more sophisticated production into Mexico, and Mexican suppliers are entering strategic alliances with U.S. and European firms to improve their own capabilities. Even so, the overall risks to U.S. jobs and job opportunities in this industry stem more from contraction and restructuring by the Big Three and their independent suppliers, who have not only lost sales to transplants and imports but must improve productivity to achieve and maintain profitability. As these companies become leaner, they need fewer workers. Meanwhile, most of the transplants have located in different parts of the country than the

Box 7-A—North American Auto Production: An Overview

A car **or truck has thousands of parts made by many different companies. The industry can be viewed as a pyramid consisting of assemblers, their internal or captive suppliers, and independent** suppliers in several tiers. The assemblers sit at the apex, designing, developing, assembling, **marketing, and distributing vehicles—which today include a wide variety of light trucks (e.g., vans and jeep-like utility vehicles), as well as passenger cars (1991** U.S. sales **included 5 million light trucks, along with 9.5 million cars), typically, the assemblers make most major components themselves--engines, transmissions, and large stampings (fenders, hoods, body structure). But they** buy other parts, components, and subsystems, ranging from brakes and engine electronics to seats and window glass.

The 1965 auto pact with Canada led to the integration of the U.S. and Canadian industries and a single market for vehicles and parts. In addition, GM and Ford have extensive overseas operations, especially in Europe, while each of the Big Three has equity links and/or strategic alliances with automakers in the Far East. GM was and is highly integrated vertically, making many more of its own parts than Ford and Chrysler.

As Japanese automakers increased their sales in the United States, helped by superior manufacturing and organizational know-how (lately labeled "lean production") that enabled them to keep their prices low and their quality high, the Big Three lost market share and in some years lost money. Sales dropped (figure 7-l), they found themselves with more engine, assembly, and parts plants than needed, and began to close some. Continuing trade friction, exemplified by the long-running "voluntary" restraint agreements on imports from Japan, spurred investments in U.S. plants by Japanese automakers. As they began to assemble vehicles in the United States and Canada, many of their parts suppliers, often members of the same *keiretsu,* followed. At the same time, despite the intense rivalries among the major automakers, they have formed a growing number of joint ventures and cooperative marketing agreements.

Today, the U.S. industry employs about a million people. Some 600,000 work for assembly firms, about half in their parts operations, and 400,000 for independent suppliers. Roughly 100 first-tier suppliers-many of them large companies with such familiar names as United Technologies and TRW-sell to the automakers, sometimes in competition with captive suppliers like GM's Delco division. Thousands of lower tier suppliers and subcontractors sell to first-tier suppliers, to the automakers themselves, and in the aftermarket.

Over the last decade, Ford and Chrysler have cut back their internal parts production, seeking to reduce costs and increase flexibility by buying more on the outside, and relying more heavily on suppliers for technology. At the same time, they have streamlined their purchasing, reducing the number of suppliers they deal with directly. Transplant assemblers import many parts from Japan or purchase from transplant suppliers here, which has increased the overcapacity in the traditional supplier base.

plants being closed by U.S. firms, aggravating displacement problems.

MEXICO'S AUTO INDUSTRY

Policy decrees issued by Mexico's government have shaped its automobile industry since 1925 (box 7-B). Over time, the objectives shifted from import substitution through assembly of knock-down kits to, most recently, investments by multinational auto firms in world-class assembly and engine plants that would export to the United States and elsewhere. Today, Mexico produces almost as many cars for export—mostly to the United States—as for domestic sale (table 7-l).

Assembly

Because of the policies summarized in box 7-B, automakers operate two types of assembly plants in Mexico-those supplying the domestic market, and those producing for export, primarily to the United States. With Mexico's economic upturn, domestic sales more than doubled from 274,000 passenger **cars** and trucks in **1989** to 643,000 in 1991. OTA's interviews suggest that sales could reach a million units by 1995. Because trade barriers remain in force, imports take less than 2 percent of the market.

For many years, sales in Mexico were relatively low. Plants were small, built mostly in and around Mexico City. Today these plants are old and difficult to expand because they are in locations that have

Figure 7-I —U.S. Production and Sales of Passenger Cars and Trucks

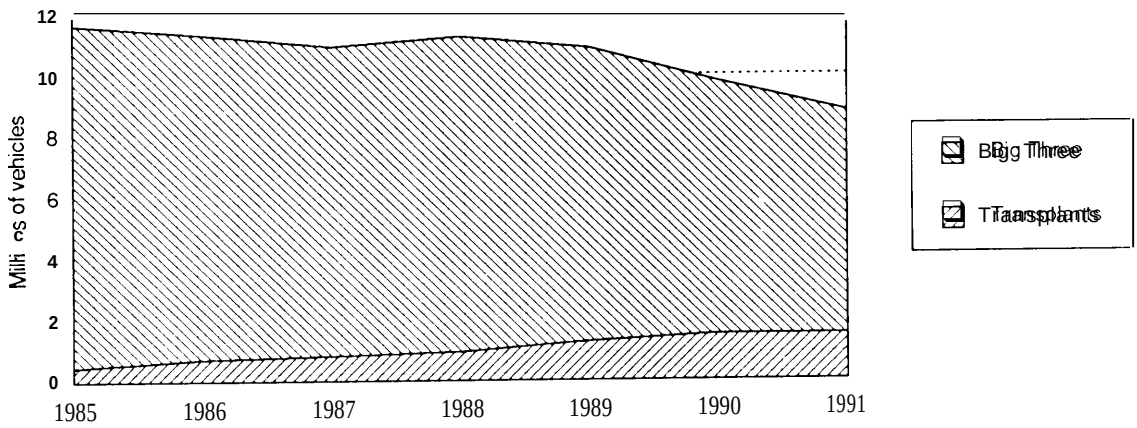


Figure 7-1 (a)—Production

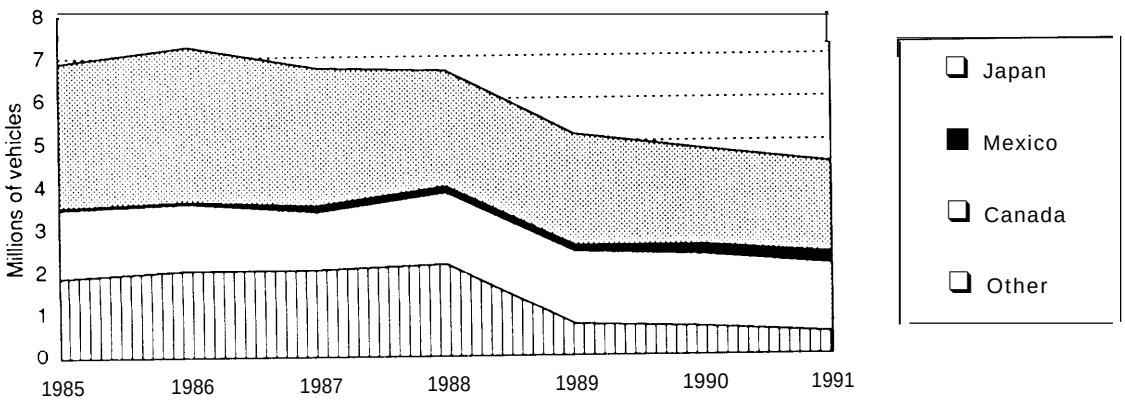


Figure 7-1 (b)-Imports

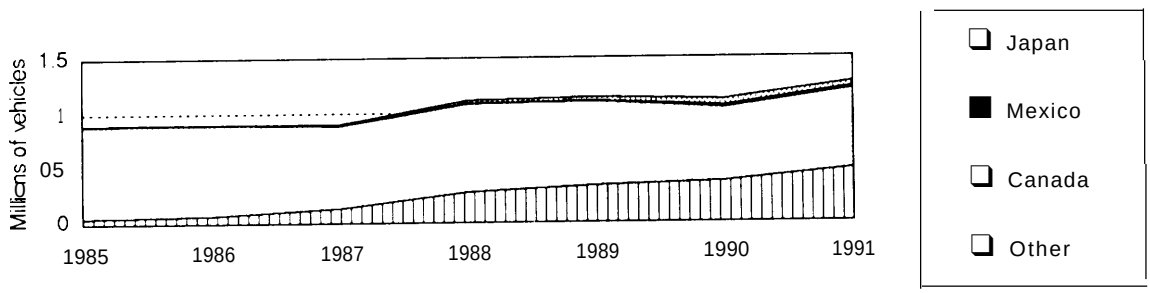


Figure 7-1 (c)—Exports

SOURCE: U.S. Department of Commerce, Office of Automotive Industry Affairs.

Box 7-B—Mexico's Auto Decrees[1]

Mexico's first auto decree remained in force, largely unchanged, from 1925 until 1%2. This period featured the screwdriver assembly of knockdown kits behind a tariff wall. No more than 20 percent of parts content came from Mexican suppliers. Assembly plants proliferated, numbering 12 by 1%0, although the industry's annual output never exceeded about 60,000 cars. Most were built and sold by U.S. firms.

The 1962 decree called for 60 percent domestic content, requiring that powertrains (engines, transmissions) be made in Mexico. Foreign firms could continue to own assembly and engine plants but were limited to minority shares in parts producers. The government also prohibited all imports of finished vehicles. While a supplier base began to develop, the Mexican market was much too small for economic production of either vehicles or components. Output reached 188,000 units in 1970, well below the capacity of a single efficient assembly plant. Costs and prices were high. Mexico continued to import many parts, and ran a trade deficit in the motor vehicle sector.

Further decrees in 1969, 1972, and 1977 addressed the trade deficit by requiring assemblers to export in proportion to their production for sale within Mexico. Despite rising exports of engines, the trade deficit worsened. But by the end of the decade, U.S. automakers, under pressure from Japanese imports, began looking at Mexico as a possible site for low-cost production capacity.

In 1982, Mexican demand plummeted as a result of the economic crisis. A new auto decree followed in 1983. Given strong U.S. demand, the automakers, led by Ford, built a number of new export-oriented engine and assembly plants that proved to be competitive in cost and quality with those elsewhere in North America. Production in ***maquiladora*** parts plants also rose. At the end of the decade, Mexican sales resumed their upward climb (table 7-l).

The latest auto decree, issued in 1989 and still in effect, includes the following provisions:

- Foreign-owned assemblers are permitted 100-percent ownership of parts plants producing for export, but only 40-percent ownership in suppliers serving the Mexican market.
- Local content rules require that Mexican firms (defined as 60 percent Mexican-owned) provide 36 percent of the value of the components used in vehicles sold within Mexico.
- Assemblers must maintain a positive balance of trade.
- Beginning in 1991, finished cars and light trucks could be imported into Mexico, limited to a 15 percent market share in the first two years, rising to 20 percent in 1993. A further provision requires that exports counterbalance these imports in 2.5:1 ratio (1991), declining to 2:1 in 1992-93 and 1.75:1 in 1994. Tariffs on imported vehicles were set at 15 percent, with a 13.2 percent duty on parts. Imports of used cars and trucks continue to be barred.
- ***Maquila*** plants may sell some of their output within Mexico.

[1]For details, see *Douglas* C. Bennett and Kenneth E. Sharpe, *Transnational Corporations Versus the State: The Political Economy of the Mexican* Auto Industry (Princeton, NJ: Princeton University Press, 1985); Wilson Perez Nuñez, *Foreign Direct Investment And Industrial Development In Mexico* (Paris: Organization for Economic Cooperation and Development 1990), pp. 109-135; James P. Womack, "A Positive Sum Solution: Free Trade in the North American Motor Vehicle Sector,' *Strategic Sectors in Mexican-U.S. Free Trade, M.* Delal Baer and Guy F. Erb, eds. (Washington DC: Center for Strategic and International Studies, 1991), pp. 31-65. The decrees also covered heavy trucks and buses, subjects outside the scope of this chapter.

Table 7-l—Mexican Car and Truck Production, 1981-1991

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
	(thousands of units)										
Production for sale In Mexico											
Passenger cars	340	287	192	218	242	167	154	211	275	354	379
Trucks and buses	231	180	81	113	149	98	94	132	171	196	245
Production for export	14	16	22	34	58	72	163	173	196	279	366
Total	585	483	295	355	449	337	411	406	642	829	990

SOURCE: *World Motor Vehicle* Data, *1991 Edition* (Detroit, MI: Motor Vehicle Manufacturers Association, 1991); Automotive *News* 1992 Market *Data Book* (Detroit, MI: Crain Communications, May 27, 1992).

Table 7-2—Assembly Plants in Mexico

	Location	Annual capacity[a]	Target markets
Ford	Cuautitlan		
	cars	60,000	Mexico
	trucks	50,000	Mexico
	Hermosillo (cars)	160,000	U.S. and Canada
General Motors	Ramos Arizpe (cars)	100,000	U.S. and Canada, Mexico
	Mexico City (trucks)	60,000	Mexico
Chrysler	Toluca (cars)	120,000	Mexico, U. S., and Canada
	Mexico City (trucks, some cars)	75,000	Mexico, U. S., and Canada
Nissan	Cuernevaca		
	cars	80,000	Mexico, Spain, Latin America
	trucks	50,000	Mexico, Spain, Latin America
Volkswagen	Puebla		
	cars	200,000	Mexico, U. S., and Canada
	trucks	15,000	Mexico, U. S., and Canada

[a]Based on recent production levels and industry interviews.

SOURCE: Office of Technology Assessment, 1992.

become congested and are subject to stiffening environmental controls (table 7-2). With some exceptions, including a number of foundries and glass plants, neither assembly nor supplier facilities oriented towards the Mexican market could survive an immediate and complete elimination of protective barriers. The companies that built these plants to gain a place in the Mexican industry sought a lengthy post-NAFTA adjustment period to preserve their positions while they install more modern equipment and reorganize production to meet world standards of cost and quality. Both GM and Chrysler have announced plans to close assembly plants in Mexico City. Replacement capacity, when added, will probably be nearer the U.S. border or close to ports suited for shipping to the rest of Latin America,

Export-oriented plants are newer and larger. Until these plants came on stream, few industry executives were sanguine about Mexico as a potential site for any but simple operations. Modern assembly and engine plants with state-of-the art production equipment were viewed as risky investments that had to be made to satisfy the government and tap a growing market. The concern was that low productivity and quality would offset low wages. This view has changed with the success of modern, export-oriented Mexican plants. ' Even so, of the five assemblers with operations in Mexico, only VW and Nissan are adding significant capacity. Both are doing so to increase their exports to other countries in the Americas as well as to the United States.

The Mexican Parts Industry

The supplier industry can also be divided into plants that produce solely or primarily for the Mexican market and *maquiladora* operations that export products such as wiring harnesses to U.S. and Canadian assembly plants. Few Mexican-owned parts suppliers have achieved levels of cost and quality necessary to sell into the United States and Canada, largely because they have been unwilling to invest sufficiently in plant, equipment, and technology. Most would not be viable without protection. As table 7-3 shows, *maquiladora* plants buy only about one-quarter of their parts content from Mexican suppliers, even though the *maquilas* rarely engage in technologically demanding production.

Assemblers in Mexico report continuing difficulty in meeting local content requirements because they cannot get what they need from Mexican fins; some have made their own investments in Mexican

1 ' 'The Auto and Electronics Sectors in US-Mexico Trade and Investment, " report prepared for OTA under contract No. 13-1815 by Harley Shaiken, May 1992.

Table 7-3—Mexico's Auto Parts Market, 1990

	Value (billions of dollars)	Share of total (percent)
Consumption by assemblers		
Purchases from Mexican suppliers	$3,2	27%
Imported parts	2.9	24
Captive (self-supplied)	0.6	5
Consumption by *maqulladora* component plants		
Purchases from Mexican suppliers	0.4	3
Imported parts	1.0	8
Aftermarket sales		
Produced by Mexican suppliers	2,5	21
imported parts	1.0	8
Direct export sales by Mexican suppliers	0.5	4
Total	$11.9	100%

NOTE: Total does not add because of rounding.

SOURCE: Norman stoner, "The Mexican Automotive Parts Industry: Challenge and Need of Capital Expansion," paper presented at the 46th Annual Plenary Meeting of the Mexico-U.S. Business Committee, San Diego, CA, Nov. 22, 1991, figure 10, p. 20.

parts plants to earn required export credits.[2] Some Mexican firms have entered strategic alliances with U.S. or European firms to bring in new technology and management know-how (table 7-4). This trend suggests that, given a suitable transition period, a growing Mexican market, and outside investments, post-NAFTA restructuring could be relatively rapid.

THE U.S. INDUSTRY: ASSEMBLERS AND SUPPLIERS

Industry in Trouble

At the end of World War II, the U.S. automobile industry was an oligopoly dominated by a single firm, General Motors. By 1964, imports (excluding those from Canada) exceeded half a million vehicles—a market share of 6 percent. By 1991, the Big Three's passenger car market share had fallen to 64 percent. Japanese firms had nearly 30 percent of the market under their own names, plus another 5 percent through cars sold under Big Three nameplates (and included in the Big Three's 64 percent) that were built in Japan or by transplants.[3]

Japanese automakers broke into the U.S. market by designing and developing vehicles that appealed to U.S. consumers through styling, functional performance, and long-term reliability as well as initial quality.[4] They differentiated their products, developed highly efficient manufacturing systems and extensive dealer networks, and now command levels of brand loyalty that often exceed those of the Big Three, especially among younger consumers-in large measure because of perceived advantages in quality.[5]

[2] Managers in one firm visited by OTA reported that they had recently begun to purchase steel tubing locally. The Mexican supplier had achieved competitive quality. Prices were 15 percent higher than in the United States, a difference less than the tariff and transportation costs for bringing in tubing from the United States.

Ford buys from about 250 suppliers in Mexico, GM from about 150, and Chrysler from 120. Nissan and VW buy from fewer than 100 each. *The ELM Guide to* Mexican Auto Sourcing (East Lansing, MI: ELM International, 1992), pp. C1-C14.

[3] U.S. firms retain more than 80 percent of the light truck market. VW, which opened the first transplant, ceased U.S. manufacture in 1988, and now supplies low-end vehicles from Mexico. European firms accounted for 4.1 percent of 1991 U.S. passenger car sales. *Automotive News 1992 MarketData Book* (Detroit, MI: Crain Communications, May *27, 1992),* p. 17.

[4] *U.S. Industrial Competitiveness: A Comparison of Steel, Electronics, and Automobiles (Washington* DC: Office of Technology Assessment July 1981).

While Japanese auto firms benefited from lower wages during the years in which they began exporting to the United States, today total compensation (wages and benefits) in Japanese assembly plants is about 96 percent of the U.S. level. Kevin Done, "Japanese Earn Highest Motor Industry Pay," *Financial Times,* Feb. 22, 1992, p. 4.

[5] Fred Mannering and Clifford Winston, "Brand Loyalty and the Decline of the American Automobile Firms," *Brookings Papers On Economic Activity: Macroeconomics,* 1991, pp. 67-103.

Table 7-4—Mexico's Major Auto Parts Manufacturers and Their Strategic Alliances

Firm	1990 Sales (million of dollars)	Principal products	Partners
Spicer.	$480	Engine parts, clutches, transmissions, axles, universal joints, gaskets, electrical parts	Dana, Kelsey-Hayes GKN, Perfect Circle, TRW, many others
Vitro Crinamex.	256	Auto glass	
ICA Autopartes.	250	Manual transmissions, clutches, brakes	Clark, Budd, Borg Warner
Condumex.	170	Wiring harnesses, shock absorbers, pistons, piston rings	Sealed Power, Packard Electric, Maremont
Proez/Metalsa.	120	Stampings, chassis parts	A.O. Smith, Solvay Automotive
Grupo Rassini.	100	Springs, seats and upholstery	NHK, Lear Seating
Grupo Tebo.	80	Brake and steering parts	Alfred Teves, TRW
Cifunsa. , ...	80	Iron castings	Teksid
Nemak.	71	Aluminum castings	Ford, Teksid

SOURCE: Norman Stoner, "The Mexican Automotive Parts Industry: Challenge and Need of Capital Expansion," paper presented at the 46th Annual Plenary Meeting of the Mexico-U.S. Business Committee, San Diego, CA, Nov. 22, 1991, table 4, p. 22.

Perceived quality commands a substantial price premium in the U.S. market. The pricing policies of Japanese automakers reflect this: they rely less on rebates and find it easier to raise prices. As table 7-5 shows, Big Three rebates averaged $380 more than those for Japanese vehicles in 1991. Between 1985 and 1991, Japanese automakers were able to raise their prices by an average of 43 percent, while the Big Three could raise prices by only 25 percent.[6] These differences have had huge impacts on profits and losses.[7] For the Japanese fins, premium pricing in the United States has helped offset the losses inherent in rapidly developing a large-scale North American manufacturing base. In 1990, Japan's automakers earned an average of about $1,300 for each car sold in their home market, while losing about $1,100 per vehicle sold in the United States.* Although their profitability at home has fallen since 1990, the major Japanese automakers have more latitude for reducing prices in the United States than the Big Three.

Table 7-5—Retail Incentives in the U.S. Market

	1986	1987	1988	1989	1990	1991
Big Three average. . . .	$300	$490	$485	$760	$990	$910
Japanese average.	—	—	—	355	370	530

SOURCE: "Statement of Ronald R. Boltz, Vice President, Product Strategy and Regulatory Affairs, Chrysler Corporation, Before the Joint Economic Committee," Dec. 10, 1991, chart 7.

6 "S@tement of Ronald R. Boltz, Vice President, Product Strategy and Regulatory Affairs, Chrysler Corporation, Before the Joint Economic Committee," Dec. 10, 1991, chart 6.

7 In 1991, GM had a net loss of $4.5 billion and an operating loss in automotive products of $3.5 billion. According to its annual report, the company lost $7.1 billion in the United States, made $600 million in Canada, $1.8 billion in Europe, and $460 million in Latin America, while losing $150 million in other parts of the world. North American losses came to $1,800 per car sold; GM spent an average of $1,100 per car for dealer and retail incentives. See Frank Swoboda and Warren Brown, "GM's Wrenching Trek: Remaking Itself, " *Washington Post,* Feb. 26, 1992, pp. G-1, G-2.

Ford lost about $2 billion in 1991, a year in which it paid out $6 billion in rebates. Ford's chairman has stated that 'as long as there is excess capacity there will be rebates. " Kathy Jackson, "Foreign Operations Put Ford Deep in the Red, " *Automotive News,* Oct. 28, 1991, pp. 6, 41; Kathy Jackson, "Rebates Here for Long Term, But Ford May Spend Less,' *Automotive News,* Jan. 20, 1992, p. 19.

8 "Statement of Ronald R. Boltz," op. cit., footnote 6, chart 9. The leading Japanese automakers all experienced declines in profitability in 1991. OTA'S interviews suggest that one result may bean extension of product life cycles from about 4 to 6 years. This would save the companies large sums in engineering and startup costs.

Table 7-6—U.S. Passenger Car Sales by Nameplate and Location of Production, 1991

Nameplate	Location of assembly plant: United States	Canada	Mexico	Japan	Other	Total
	(thousands of units)					
General Motors	3,609	550	35	91	35	4,320
Ford	2,329	370	105	—	63	2,867
Chrysler	999	295	144	70	—	1,508
Toyota	299	36	—	676	—	1,010
Honda	409	74	—	321	—	803
Nissan	175	—		409	—	584
Mazda	89	—		255	·	344
Mitsubishi	70	—	—	121	—	191

NOTE: Totals may not add because of rounding.

SOURCE: *Automotive News*, Mar. 2, 1992, p. 3.

No longer do Japan's automakers rely almost entirely on manufacturing cost advantages and a reputation for making small cars with high quality. They have moved steadily up-market, established new nameplates, and taken the lead in many aspects of product engineering. One way or another, it seems the United States will have to become comfortable with a substantial Japanese presence in this industry through transplants and strategic alliances, as well as imports. Three factors underlie the emerging structure:

1. A growing number of market niches (minivans, new luxury nameplates).
2. Joint ventures, coproduction agreements, and other forms of alliances, including sales of vehicles produced in the Far East or by transplants and marketed under U.S. brand names (table 7-6) and U.S. sales by Japanese firms of products made for them by the Big Three.[9]
3. Rapidly rising imports of parts from the Far East, primarily to supply transplant engine and assembly facilities, along with investments in the United States by Japanese parts firms to supply the transplant assembly operations of their traditional Japanese customers.

The transplants and joint venture operations that began to open during the 1980s, largely in response to U.S. policies aimed at limiting imports, significantly increased North American assembly capacity (table 7-7). The new plants have high levels of productivity and quality, placing growing pressures on older U.S.-owned facilities.[10]

costs

Automobile production facilities typically become profitable when operating at relatively high fractions of capacity (e.g., 85 percent or more) .11 In 1991, the Big Three averaged 63 percent, while the transplants operated at an estimated 67 percent of Capacity.[12] The transplants are projected to reach 76 percent in 1992, with the Big Three at only 66 percent. If these projections prove even roughly accurate, U.S. automakers will continue losing money on their North American operations while Japanese fins, although also making losses, would improve their relative positions.

As a result, Japanese automakers would continue to have greater freedom of action. For example, they

9 Single-firm transplants have been more successful than *joint* ventures. In October 1991, Chrysler sold its share in Diamond-SW Motors to its former partner, Mitsubishi. The Subaru-Isuzu transplant lost $31 million in 1991, while CAMI (GM-Suzuki) has been embroiled in a dispute over dutiable content with the U.S. Treasury. Nonetheless, Ford purchased a half-share in Mazda's Flat Rock facility, which already builds cars for both companies. In cooperative agreements, illustrated by Mazda's production of Ford Probes at Flat Rock, one company builds similar vehicles for sale under both nameplates. In another example, Nissan produces the Mercury Villager for Ford, while Ford builds the Nissan Pathfinder. Lindsay Chappell, "Joint Ventures Falter, " *Automotive News*, Dec. 16, 1991, pp. 1, 45; Richard Johnson, "Mazda to Have 'American' Cars, " *AutomotiveNews*, Dec. 16, 1991, pp. 1,43.

10 Toyota, Honda, Mazda, and Nissan are believed to have automobiles that are on average significantly better designed for manufacturability than Ford, the best of the Big Three on this measure. But not all transplant factories have achieved productivity levels superior to the best plants operated by the Big Three. See James P. Womack, Daniel T. Jones, and Daniel Roos, *The Machine That Changed The World (New* York, NY: Harper Perennial, 1991), pp. 84-87.

11 *U.S. Industrial Outlook '92* (Washington, DC: Department of Commerce, January 1991), P. 36-6.

12 "Statement of Ronald R. Boltz," op. cit., footnote 6, chart 12.

Table 7-7—North American Passenger Car Assembly Plants, 1992

	Location			
	United States	Canada	Mexico	Total
	(number)			
Big Three				
General Motors	16	2	1	19
Ford	7	2	2	11
Chrysler	4	1	1	6
Wholly Owned Transplants				
Honda	2	1	—	3
Nissan	1	—	1	2
Toyota	1	1	—	2
Hyundai	—	1	—	1
Mitsubishi[a]	1	—	—	1
Volkswagen	—	—	1	1
Volvo	—	1	—	1
Joint-Venture Transplants				
CAMI (GM-Suzuki)	—	1	—	1
Mazda[b]	1	—	—	1
NUMMI (GM-Toyota)[c]	1	—	—	1
Subaru-Isuzu	1	—	—	1
Total	35	10	6	51

[a]Joint venture with Chrysler dissolved in October 1991.
[b]Ford purchased 50 percent share in 1992.
[c]Consent decree with U.S. Department of Justice calls for dissolution in 1996.

SOURCE: Automotive News 1992 *Market Data Book* (Detroit, MI: Crain Communications, May 27, 1992), p. 13.

might be able to avoid or delay layoffs and contraction in Japan, where profits have declined, while continuing to invest in North America and Europe. They could afford more aggressive pricing/incentive policies that would serve to further drain resources from the Big Three, undermining the latter's ability to overhaul their product lines and continue moving to lean production. Or Japanese firms could choose to continue rapidly introducing new models.

The transplants may have manufacturing cost advantages of up to $1,000 per car.[13] Productivity is only one of many reasons for this difference, and indeed may account for less than $200 of the total. Other factors include incentive packages provided by State and local governments to attract transplants and a new, young workforce with low pension and health care costs.

As table 7-8 shows, transplant assemblers pay about the same wages as the Big Three, but have benefits costs that are lower by roughly $5 per hour, corresponding to $400 per car. Transplant suppliers pay lower wages than traditional U.S. suppliers, while having lower benefits costs in addition; thus they have an even larger labor cost advantage. Lower benefits costs are a direct result of younger workers. The transplants pay much less for funding pensions because they have no retired employees to support; their medical insurance costs average less than half those for the Big Three because their younger workforces are healthier (table 7-9).

Largely because of differences in national approaches to health care, medical insurance cost differentials are at least as great when U.S. costs are compared with those in Canada, Germany, or Japan. Ford puts its 1990 health insurance expenses at $65 per vehicle produced in Canada, compared with

13 'Testimony by Candace Howes before the Joint Economic Committee hearing on The Future Of U.S. Manufacturing: Auto Assemblers and Suppliers," Dec. 10, 1991, p. 12.

A recent report from the Economic Strategy Institute (ESI) argues that, with favorable exchange rates, parts produced in the United States cost significantly less than parts shipped in from Japan, and that, largely for this reason, Ford has the lowest delivered costs per vehicle in the U.S. market (and, indeed, lower production costs than Japanese automakers in Japan). But when differences in capacity utilization, benefits, and capital costs are taken into account, the average U.S. automaker still has costs about $1,000 greater than the average Japanese automaker. ESI also acknowledges that Ford needs significantly more labor hours for assembly than Toyota, Honda, Nissan, or Mazda, and that GM and Chrysler take substantially more hours than Ford, *The Future Of The Auto Industry: It Can Compete, Can It Survive?* (Washington DC: Economic Strategy Institute, 1992).

Table 7-8-Comparative Wage and Benefit Levels, 1986[a]

	Average hourly wage	Index	Total compensation (including benefits)	Index
Big Three assembly and in-house parts	$15.00	100	$22.50	100
Transplant assembly	15.00	100	17.50	77
Parts				
Independent U.S. suppliers	10.40	69	13.00	58
Transplant suppliers	8.00	53	10.00	44

[a]No comprehensive data are available for later years; although wages and benefits have increased considerably since 1986, with Big Three wages and benefits currently exceeding $35 an hour, OTA's interviews indicate that the ratios in the index columns remain about the same.

SOURCE: Candace Howes, "The Benefits of Youth: The Role of Japanese Fringe Benefit Policies in the Restructuring of the US Motor Vehicle Industry," *International Contributions to Labour Studies, vol.* 1, 1991, table 4, p. 125.

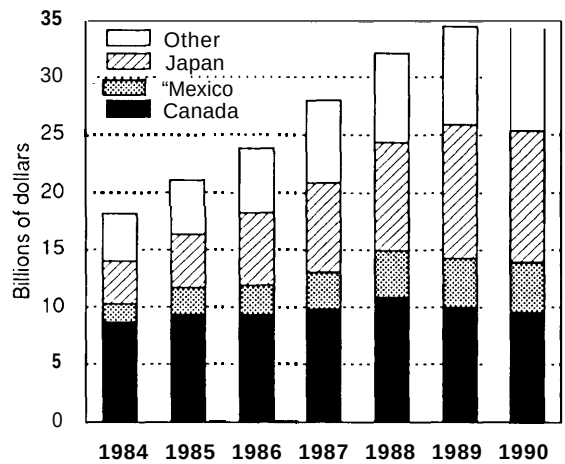
Table 7-9—Pension and Health Insurance Costs

	Big Three	Transplants
	(dollars per hour)	
Pension contributions	$2.75	$0.75
Health insurance	5.29	2,10
Total	$8.04	$2.85

SOURCE: "Statement of Ronald R. Boltz, Vice President, Product Strategy and Regulatory Affairs, Chrysler Corporation, Before the Joint Economic Committee," Dec. 10, 1991, chart 15.

$300 in its U.S. plants.[14] Health care costs for auto firms are lower by half in Germany, and by three times in Japan.[15] Countries with national health plans and different approaches to pensions thus gain signtificant cost advantages, The problem is much greater for the Big Three than the transplants because Ford, GM, and Chrysler must pay the full costs of health and benefits packages for an older and still aging workforce.

Figure 7-2—U.S. Imports of Auto Parts by Source



SOURCE: Stephen A. Herzenberg, "The North American Auto Industry At the Onset of Continental Free Trade Negotiations," Economic Discussion Paper 38, U.S. Department of Labor, Washington, DC, July 1991, table 13.

Suppliers

U.S. parts suppliers are in as much trouble as the assemblers. Imports of parts from Japan have been increasing rapidly (figure 7-2). The majority of these parts go to transplant assemblers, which import an estimated 52 percent by value of the components in their vehicles (table 7-10). Transplants source the other 48 percent internally, from transplant suppliers, and from independent U.S. parts suppliers. Japanese-owned parts firms followed their customers to the United States, operating about 300 plants here and in Canada by 1992. Transplants buy mostly simple, low-value-added parts from independent U.S. suppliers-gaskets and hoses, not gears and bearings.[16]

Because transplant suppliers pay less than traditional U.S. suppliers, a transplant assembler can save

14 William C. Symonds, "It's Not Perfect, But It Sure Works," *Business Week, Mar. 9, 1992,* p. *54.*

15 "Auto Firms Need Both Trade Help, Domestic Reforms, Industry Experts Say," *International Trade Reporter,* Dec. 11, 1991, p. 1,803.

16 A recent (and controversial) study estimated that Honda's Marysville plant-often thought to purchase more from the traditional U.S. supplier base than other transplant-sources only 53 percent (by value) of its parts content in the United States, not far above the average of 48 percent given in table 7-10. Of this 53 percent (the rest comes from Japan), Honda buys 20 percent from traditional U.S. suppliers. The other 33 percent comes from transplant suppliers and internal Honda production in North America. Sean P. McAlinden, David J. Andrea, Michael S. Flynn, and Brett C. Smith, *The U.S. Japan Automotive Bilateral 1994 Trade Deficit,* Report Number UMTRI 91-20 (Ann Arbor, MI: University of Michigan, Transportation Research Institute, May 1991). Also see, "Honda: Is It An American Car?" *Business* Week, Nov. 18, 1991, pp. 105-112.

Table 7-10—U.S. Content

	Estimated percentage value of U.S. parts[a]
Vehicles imported from Japan.	1%
Transplant production.	48
Big Three U.S. production.	88

[a]To determine whether a given model qualifies as "domestic" or "imported" for purposes of fuel economy standards, the U.S. Environmental Protection Agency (EPA) uses a formula for determining North American content that gives substantially different results. EPA content figures bear little relationship to the dollar values of U.S. and foreign parts.

SOURCE: "Statement of Ronald R. Boltz, Vice President, Product Strategy and Regulatory Affairs, Chrysler Corporation, Before the Joint Economic Committee," Dec. 10, 1991, chart 13.

a substantial sum on its total component costs simply by purchasing from low-wage transplant suppliers.[17] But even if Japanese automakers could buy equivalent parts more cheaply from a U.S. firm, they might gain by sourcing within their *kieretsu.* Supplier profitability, and with it the ability to contribute engineering support, depends on capacity utilization. The Japanese assemblers have no wish to weaken their traditional suppliers, while weakening their rivals' supplier base could help them.

Mounting pressure on the traditional supplier base has led companies to close unionized plants, add capacity in low-wage southern states, and in some cases relocate to Mexico. The principal countervailing force has been demand by assemblers for nearby parts plants to meet "just-in-time" (JIT) delivery requirements. Still, lean production does not automatically require that critical components and subassemblies come from tightly grouped plants. The need is for low inventories so that potential bottlenecks—for instance, a batch of bad parts-surface before they disrupt downstream production. Automakers continue to weigh transportation costs, economies of scale, currency exchange risks, political factors, labor costs and workforce capabilities, and regulatory requirements in deciding where to locate assembly and captive parts plants.

Transportation and inventory costs make it unlikely that imports to North America will incorporate significant content purchased from independent U.S. suppliers. Suppliers would have to offer exceptional advantages in cost, functional performance, or quality to win such business.[18] Critical components for transplants will likely continue to be made by the assembler (in Japan or in North America) or by the transplants' traditional suppliers, either in their Asian plants or here. The high proportion of components and subassemblies currently being imported or made in transplant supplier facilities, suggests that, even if all the vehicles now being imported from Japan were to be replaced by North American transplant production, many independent U.S. suppliers would continue to find it difficult to win the business of transplant assemblers.

State and Local Government Incentives

State and local governments have bid aggressively for transplant assembly and parts facilities, offering tax deferrals and abatements, new highways and industrial parks, training grants, and low-cost financing for plant and equipment. Subsidies provided by State governments to assembly transplants alone have been placed at $50 to $75 per vehicle.[19]

State and local government pay for these incentives from tax revenues that come in part from existing plants, which are thus supporting the creation of new competitors. Once fully established, the new competitors can expect to be more efficient, if only because they will have new equipment and factories laid out in accord with the latest practices. They may have better prepared workers, particularly if incentives include training grants, By reducing capital outlays and startup costs, incentives shorten the time it takes a new entrant to become profitable and challenge existing firms.

17 Candace Howes, "The Benefits of Youth: The Role of Japanese Fringe Benefit Policies in the Restructuring of the US Motor Vehicle Industry," *International Contributions to Labour Studies, vol.* 1, 1991, pp. 113-132.

18 Toyota claims that, in 1990, the ' 'defect ratio for parts imported from 75 North American and European companies was 100 times greater than the ratio for parts supplied by 147 Japanese makers—1,000 defects per million imported parts versus 10 for locally produced parts. " Richard Johnson, "Quality Still the Key, Toyota Tells Parts Makers, " *Automotive News, Nov.* 11, 1991, p. 42.

19 ''Tes~ony by Candace Howes, ' op. cit., footnote 13, p. 9.

For a summary of incentive packages provided transplants, see *After the Cold War: Living with Lower Defense Spending* (Washington, DC: Office of Technology Assessment, February 1992), table 6-11, p. 181. Some U.S.-owned manufacturers also benefit from incentives. Thomas J. Leuck, "Business Incentives: A High-Priced Letdown," New *York Times,* Mar. 8, 1992, sec. 4, p. 16.

Table 7-11—U.S. Auto Industry Employment

	1978	1987	1991
	(thousands)		
Total employment	1,311	1,131	1,036
Total production workers	1,032	889	799
Big Three	693	536	436
Assembly	263	242	191
Parts	428	293	245
Transplants	—	13	26
Union	—	4	11
Nonunion	—	9	16
Independent parts	296	320	325
Union	155	84	81
Nonunion	141	236	244

NOTE: Totals may not add because of rounding.

SOURCE: Office of Technology Assessment, 1992.

The Labor Market

Employment

In 1991, a little over a million people held jobs in the U.S. auto industry (table 7-1 1). Seventy-seven percent worked in direct production—30 percent in assembly (including transplants and truck assembly) and the rest in parts production. The Big Three, including their parts divisions, employed 55 percent of all production workers, independent parts suppliers a little over 40 percent, and transplants 3 percent.

As the table shows, since 1978, employment has declined more than 20 percent, with Big Three employment dropping by 37 percent overall and fully 42 percent in captive parts divisions; as Big Three firms bought more parts from independent U.S. suppliers—and from Mexican *maquiladoras—they* shed 180,000 jobs in parts production. Nonunion U.S. parts suppliers, including transplants, have added roughly 100,000 production jobs since 1978, while employment in unionized independent parts suppliers has declined by an estimated 74,000 jobs. As a result, union coverage in independent U.S. parts plants has fallen from something over half to between one-sixth and one-third.[20]

Wage Setting and Wage Trends

From the late 1940s to the late 1970s, real hourly wages rose steadily as a result of United Auto Workers (UAW contracts that stipulated annual increases of roughly 3-percent plus inflation. A pattern-setting agreement negotiated between the UAW and one or the other of the Big Three became the basis for subsequent negotiations at the other U.S. assemblers and major unionized suppliers. By 1982, competitive pressures ended the tradition of annual real wage increases; average hourly wages for assembly workers fell in real terms by 3 percent from 1985 to 1991. In exchange for wage moderation and acceptance of the automakers' demands for more flexible work rules on the shop floor, the UAW has gained guarantees for most workers of almost fill-time pay even if laid off during the 3-year contract period.

Transplant assemblers, union and nonunion, have typically matched or almost matched Big Three wages, but real wages in the independent parts industry have declined steeply because of falling union coverage and the breakdown of pattern bargaining in parts companies that remain unionized. Since the mid-1980s, Big Three contracts have had little influence on bargaining at unionized independents. Contract outcomes depend on local labor market conditions, wage levels at competing companies, including nonunion and foreign producers, and the employer's financial position. By 1989, wages at unionized independents were only two-thirds those in assembly companies, and were nearly identical to the average in all U.S. manufacturing. At nonunion parts suppliers, wages had fallen to 77 percent of the U.S. manufacturing average.

MEXICAN AUTO PRODUCTION TODAY AND TOMORROW

Mexico as a Location for Production

Assembly

To build and equip a modern new assembly plant in Mexico, capable of producing 250,000 cars per year for the U.S. and Canadian markets, would cost at least $500 million-more if a stamping facility were included. Construction and plant startup would take at least 3 years. As table 7-12 shows, shipping in components would impose a substantial cost penalty over a U.S. plant. In OTA interviews, one

20 There are no U.S. Government statistics on employment in independent parts firms, which has been estimated as total industry employment minus assembler employment. Union members in independent parts plants are estimated as auto industry union members minus assembly company union members, using figures on union membership collected in the Current Population Survey. Alternative estimates of union coverage over time based on membership figures from the United Auto Workers and on the Industry Wage Surveys of the Bureau of Labor Statistics give comparable totals.

Table 7-12—Cost Structure for Auto Assembly in the United States and Mexico[a]

	United States	Mexico
Labor[b]	$700	$140
Parts, components, subassemblies	7,750	8,000
Component shipping costs	75	600'
Finished vehicle shipping	225	400
Inventory costs[d]	20	40
	$8,770	$9,180

[a]Illustrative only.
[b]Assumes 20 hours of assembly labor per vehicle in the United States, 30 hours in Mexico, representative of good but not best current practice.
[c]Includes shipment of stampings from the United States; component shipping costs would come to about $400 for a plant that did its own stamping.
[d]Assumes 10 percent cost of funds.

SOURCE: Office of Technology Assessment, 1992, based on industry interviews.

Big Three firm put these costs at $500 to $700 per vehicle, roughly 10 percent of the cost of the components. Shipping costs could be reduced by about one-third if the Mexican plant did its own stamping (sheetmetal parts are hard to handle and easily damaged in transit). But an integral stamping plant would raise the initial investment by about $250 million. Shipping completed vehicles would also incur a cost penalty in major U.S. markets that are distant from Mexico.

Table 7-12 indicates that cheap labor currently provides little or no incentive to build a new assembly plant in Mexico, unless a substantial proportion of the output were to be sold there or in Central and South America. Predictable future developments would work both for and against Mexico. A stronger Mexican supplier base, able to produce many of the components that must now be imported, would reduce the transportation cost penalty somewhat. OTA's industry interviews indicate that it would probably take 10 to 15 years to broaden and deepen the supplier base sufficiently.

Photo credit: Ford Motor Co.

Assembly line at Ford's Hermosillo, Mexico plant.

Over this period, the automakers will redesign most of their vehicles twice, in the process reducing labor content through improved design-for-manufacturebility and design-for-assembly. By the time Mexico's supplier base develops—and its transportation system improves, so that shipping costs decline—lower labor content will reduce the advantages Mexico can expect from low wages.

Table 7-13 illustrates, comparing three vehicles that differ in assembly labor requirements. In the first case (' 'Future"), assembly labor in the United States has fallen to 13 hours, about the best achieved anywhere in the world today. The second case ("Current") requires 20 hours-not far from the best achieved by the Big Three at present, and the same as assumed in table 7-12. The third case requires 30 hours, not uncommon today and representative of many cars still built in Mexico. In all three cases, stampings come from an integral plant,

Table 7-13—illustration of the Effect of Design-for-Assembly on Costs[a]

	U.S. assembly plant				Mexican assembly plant							
					Current productivity[b]				Equal productivity			
Vehicle design case	Assembly hours	Costs (dollars) Labor	Shipping	Total	Assembly hours	Costs (dollars) Labor	Shipping	Total	Assembly hours	Costs (dollars) Labor	Shipping	Total
Future	13	$455	$300	$755	19.5	$91	$750	$841	13	$61	$600	$661
Current	20	700	300	1,000	30	140	750	890	20	93	600	693
Older designs	30	1,050	300	1,350	45	210	750	960	30	140	600	740

[a]Assumes: integral stamping (no shipping costs for stamping); equal component and inventory costs; wage/benefit costs at $4.67 per hour in Mexico and $35 per hour in the United States; finished vehicles shipped to U.S. markets.
[b]Labor hours assumed 50 percent higher in Mexico.

SOURCE: Office of Technology Assessment, 1992.

avoiding the cost penalties of shipment from the United States to Mexico, while about 40 percent of the vehicles' components continue to be imported. The table includes two scenarios for Mexico. In the first, or current scenario, productivity is lower than in the United States, requiring 50 percent more assembly hours for vehicles of the same design—about the norm today. In the second scenario, Mexican productivity equals that in the United States; in addition, shipping costs decline from $750 to $600 as a result of improvements in Mexico's transportation system.

Table 7-13 indicates that Mexican assembly plants will have significant cost advantages in the future only if they incorporate integral stamping facilities and their productivity increases. If vehicle designs improve, reducing labor content, shipping costs will continue to offset much of the labor cost differential. If the Mexican supplier industry improves, assembly in Mexico will become more attractive. It is no surprise, then, that none of the Big Three's announced new capacity is planned for Mexico, with the exception of replacements for existing plants in Mexico City (table 7-14).

Table 7-14—New Assembly Plant Investments by Big Three Automakers[a]

	Location	Investment (millions of dollars)	Planned startup
Ford	Avon Lake, OH	$900	1992
Ford	Oakville, Ontario	900	1993
Ford	Louisville, KY	650	1995
Chrysler	Detroit, MI	1,000	1992
Chrysler	Bramalea, Ontario	600	1992
Chrysler	Mexico[a]	To be determined	
General Motors	Silao, Mexico[a]	400	1994

[a]Replacement for existing plant.

SOURCE: Office of Technology Assessment, 1992, based on industry interviews.

Engines

All five automakers active in Mexico elected to export engines to satisfy the government's trade balancing requirements. Engines are easy to ship; after transportation costs and tariffs, Mexican engine plants have proven able to deliver into the United States at costs perhaps 7 percent below those of U.S. plants.[21] The complex equipment required in engine plants means that workers must have good skills; while training is time consuming, it has not proved a major hurdle.[22] Engine production is high in value-added but not in labor intensity. A high-volume plant employs about a thousand people, about a third as many as a typical vehicle assembly plant. Companies can afford to pay a wage premium to reduce turnover and retain workers they have trained. They can also afford to bring in components from outside Mexico because parts like pistons and valves have low shipping costs relative to their value. Mexico has several foundries capable of producing complex castings at competitive cost and quality levels.

Would companies put engine plants in Mexico in the absence of the government's trade-balancing requirements? Today, a new world-class plant with an annual capacity of 400,000 to 450,000 engines would cost around $700 million to build, about the same as anew assembly plant.[23] Such a factory, built in Mexico, could supply engines to the United States at unit cost savings (after transportation) of perhaps $50 to $70. In the United States, it would take about 2 years to build and equip the plant. It would be a further 2 years before it was running at full capacity. Construction would take longer in Mexico. It would also take an additional 1 to 2 years to reach full production because of the need to train the entire workforce, and because start-up would be slowed by lack of experience even given a well-trained workforce.

A firm that contemplated replacing an existing (high-wage, efficient) U.S. engine plant with a new factory in Mexico would calculate financial break-even at more than 30 years after construction began. The picture would look better if the existing U.S. plant was old and inefficient, or suffered from poor labor relations. The performance records of existing Mexican engine plants mean that when automakers consider location decisions in the future, Mexico will be viewed on its merits rather than in terms of meeting the requirements of the Mexican Government.

Parts

Powertrain assemblies have high value and are critical for customer satisfaction. Automakers make these themselves, with some exceptions for engines

21 OTA interviews.

22 "The Auto and Electronics Sectors in US-Mexico Trade and Investment," op. cit., footnote 1.

23 OTA interviews.

Table 7-15-Cost of Typical Wiring Harness

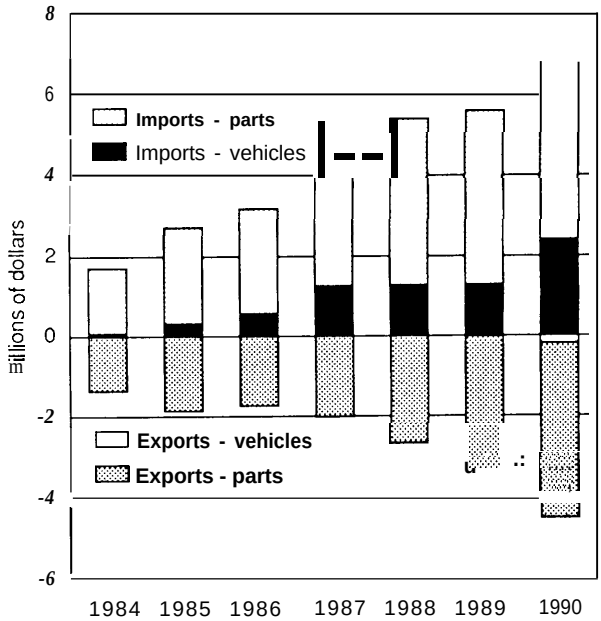
Selling or transfer price	$250
Expected profit	$10-20
Assembly cost (40 minutes)	
Mexico	$1-2
United States	
Big Three internal supplier (@$35 per hour)	23
Independent unionized supplier (@ $26 per hour)	17
Independent nonunion supplier (@ $18 per hour)	12
Added shipping costs for Mexican assembly	$7
Extra inventory costs for Mexican production	$0.50

SOURCES: Industry interviews; Candace Howes, "The Benefits of Youth: The Role of Japanese Fringe Benefit Policies in the Restructuring of the US Motor Vehicle Industry," *International Contributions to Labour Studies*, vol. 1, 1991, table 4, p. 135.

and more frequent exceptions for transmissions. Finish parts such as exterior sheetmetal or dashboard assemblies are easily damaged in shipping and critical for customer perceptions of quality. Automakers also control this production, either through internal production or subcontracting to trusted suppliers, and seek to keep it close to the point of final assembly. Specialists, either internal parts divisions or first-tier suppliers, design, develop, and manufacture many other vehicle subsystems—brakes, sunroofs, catalytic converters. Economies of scale are important, proprietary technology significant, and transportation costs typically low relative to value. Today, Mexican suppliers have little hope of competing for this business without a partner that has an established track record.

The situation is quite different for the labor-intensive *maquiladora* plants. Table 7-15 shows that Mexico has far lower costs for wiring harness assembly. Much the same is true for airbags and cut-and-sew operations on seats. Difficult to automate, this sort of work can be performed by low-skilled labor with little or no training. Production went to Mexico because of labor costs, not because of the government's trade balancing requirements. JIT means a potential distance handicap that *maquiladora* plants must overcome, but supply pipelines from Mexico are much shorter than those from the Far East. In combination with the other forces at play in this industry, a NAFTA would encourage further transfers of production.

Figure 7-3-U.S.-Mexico Auto Trade



NOTE: Engines included under parts.

SOURCE: Stephen A. Herzenberg, "The North American Auto Industry At the Onset of Continental Free Trade Negotiations," Economic Discussion Paper 38, U.S. Department of Labor, Washington, DC, July 1991, table 2.

Employment in *maquiladora* parts production, less than 10,000 in 1980, reached 100,000 in 1990 and 130,000 by the end of 1991. Already, GM is Mexico's largest employer, with, for example, 27,000 workers assembling wiring harnesses in *maquiladoras* operated by the company's Packard Electric Division.[24] Of 64 Big Three-owned plants in Mexico, 40 are near the border; 26 of the border plants assemble wiring harnesses and 6 export upholstery and soft trim parts to the United States .[25]

NAFTA Impacts

Assembly

Figure 7-3 illustrates the speed with which U.S. imports of vehicles and parts from Mexico have increased. This is largely a result of Mexico's trade-balancing policies. Almost all of the vehicle imports are passenger cars, because light trucks face tariffs of 25 percent when imported into the United States, while tariffs on passenger cars are only 2.5 percent.

24 OTA interviews and GM annual reports.

25 *The ELM Guide to Mexican Auto Sourcing*, op. cit., footnote 2, pp. C1-C20. Many of the other border plants assemble electrical components such as relays and motors.

If a NAFTA led to the removal of Mexico's export-balancing requirements, U.S. imports of passenger cars from Mexico would probably stabilize, unless the relative cost picture changed a good deal. As discussed above, this seems unlikely; there is little or no advantage in locating assembly plants in Mexico today, and newer vehicles will require less assembly labor. Investments in new assembly capacity in Mexico will be driven primarily by Mexican demand. A NAFTA that removed the tariff on light trucks could encourage new Japanese investment in Mexico.

There is one further consideration. Mexican plants, because they use less automation, can be very flexible. This makes them attractive for assembling older designs with high labor content, low-volume niche vehicles such as convertibles (which likewise have high labor content), or as a means of increasing production when capacity limits have been reached in the United States and Canada. Thus, in some cases it might be profitable to close an older U.S. plant making such vehicles and transfer production to Mexico. Furthermore, if automakers continue to pursue niche marketing strategies, assembly in Mexico could become more attractive. However, the proliferation of new models during the 1980s strained the financial resources of a number of companies, and this trend has at least temporarily Peaked.[26]

Engines

Mexico has demonstrated cost advantages in engine production. Nonetheless, while all five automakers active in Mexico have been adding engine capacity, their favorable experiences with export-oriented Mexican plants have not led them to put new capacity there. Ford, for instance, will have built or renovated three engine plants in the United States, one in Canada, and one in Mexico over the period 1990 to 1995. The existing Mexican plant, in Chihuahua, was closed for 2 years to be retooled for Ford's new Zeta engine. This is the only new or renovated Big Three engine plant that will come on stream in Mexico during these years. Nor have any of the Big Three announced major new investments in transmissions or other powertrain components in Mexico, although the economics for such plants are similar to those for engines.

A NAFTA that eliminated the current 2.5 percent tariff would reduce the costs of a typical engine delivered into the United States by $15 to $20. This would increase the cost advantage compared with U.S. production by as much as one-third, a significant amount. Automakers would be more likely to put new engine plants into Mexico after a NAFTA than they would new assembly plants. Nevertheless, the financial penalty of slower startup would likely outweigh the advantage of lower labor costs.

Parts

Relaxation of Mexico's investment requirements could attract more first-tier suppliers to Mexico, along with lower tier firms that have not considered Mexico in the past because their manufacturing processes are not especially labor intensive. Although Mexico could not become a design and development center within the next two decades (Canada has not managed that, after all), the growing role of suppliers in development suggests that some Mexican component firms would begin to take on more engineering-intensive work.

For labor-intensive parts production, a NAFTA, by itself, would do little to either encourage or discourage relocation. Mexico has sought to attract *maquiladora* parts plants for years. A good deal of the work suited to these plants has already moved, but more could be relocated in the years ahead, particularly if small U.S. parts manufacturers, many of whom are losing business, believe they can remain viable with lower wages. If more of these companies do flee to Mexico it will not be because of NAFTA provisions themselves, which should not change the economics of producing in Mexico significantly. An agreement might have its greatest impacts simply by publicizing the opportunities, so that smaller companies that might otherwise not think of moving begin to consider Mexico.

The Mexican Market

Given very substantial excess capacity in both the assembly and parts sectors in North America, immediate ''Ikee trade" would decimate Mexican suppliers. An end to local content requirements and import restrictions would also render much of Mexico's assembly capacity uncompetitive. If assemblers were permitted to supply Mexico by

26 The number of models available in the U.S. market grew from about 400 in 1980 to a high of 614 in 1987, and now stands at 555. ''Numb of Car Models Drops For '92: U.S. Builts Pass Imports," *AutoWeek, May 18,* 1992, p. 11.

importing vehicles, they would close some of these plants because they could thereby increase their capacity utilization and profitability in the United States and Canada. Nissan could supply Mexico from both the United States and Japan. Only VW needs its Mexican plants to continue servicing the rest of North America.

In the absence of trade restrictions, other Japanese and Korean automakers would quickly begin exporting to Mexico as well, reducing the market shares of the five firms that now sell there and cutting into their profits. If all but VW closed their assembly plants, the Mexican auto industry would be left with little beyond export-oriented engine plants, several modem assembly plants, and *maquiladoras.* Such an outcome would be unacceptable to the Mexican government-thus the negotiated NAFTA transition period, with rules of origin that vehicles or components would have to meet to qualify for favorable tariff treatment. Given a North American rule-of-origin of 62.5 percent, two-way trade in finished vehicles should increase during and following the transition period. Modernized Mexican assembly plants would produce fewer models in higher volumes to achieve economies of scale, and Mexico would import other models.

Sales in Mexico could approach those in Canada after 10 years or so, provided wages and living standards rise, enabling more Mexicans to buy cars. New capacity would probably go into Mexico in step with increases in sales. If infrastructure improvements continue at the pace currently planned, per-mile transportation costs would converge with those in the United State. Even so, if wages increased, shipping cost penalties would probably continue to make it unprofitable to assemble vehicles in Mexico for export unless the country's supplier base became much stronger. On balance, a NAFTA, if accompanied by growth in the Mexican market, should provide additional sales and profits for the Big Three firms and their suppliers as excess capacity in the United States and Canada came on line to replace higher cost assembly plants in Mexico.

NAFTA and U.S. Jobs

If **a** NAFTA benefits U.S. automakers by opening up the Mexican market, it is not likely to do much for U.S. auto workers. In the 1970s, the UAW represented the vast majority of workers in the industry, and wages had been largely taken out of competition. Today, the industry is evolving toward a core of assembly companies, mostly unionized and paying high wages, surrounded by first-tier suppliers, some unionized, that pay somewhat lower wages, and by lower tier suppliers that are mostly nonunion and pay much lower wages.

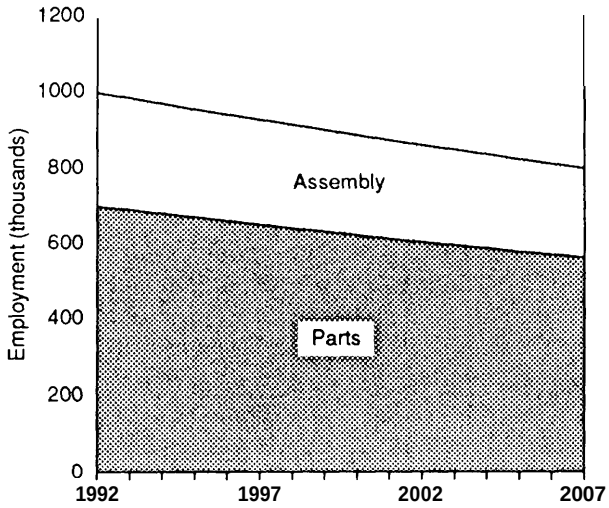
Restructuring along these lines will continue. The high-wage core will shrink as the assemblers become more efficient and buy more of their components from independent suppliers. The rate at which the core shrinks will depend on the fortunes of the Big Three relative to the transplants. It depends particularly on the fate of GM, which remains much more vertically integrated than its competitors, employing about 150,000 production workers in its parts plants.

In this context, a NAFTA would affect U.S. jobs and job opportunities in two primary ways:

1. To the extent that Mexico relaxes its trade balancing and local content rules, U.S. companies would be able to increase their exports of vehicles and parts to Mexico. This would save a modest number of U.S. jobs, and a greater number if the Mexican market expands as a result of NAFTA.
2. A NAFTA would also influence business **strategy** and wage setting in the independent parts sector. By locking in more liberal policies in Mexico, a NAFTA could lead to increased investments in Mexico by first-tier U.S. and Asian suppliers and to plant relocations by lower tier U.S. suppliers pursuing low-wage strategies. A larger, more competent Mexican supplier base would in turn mean increased competition for suppliers that remained in the United States, putting downward pressure on U.S. wages.

Figure 7-4 shows one set of projections, based on output growth at 1.5 percent per year coupled with productivity improvements of 3 percent per year. Over a 15-year period, industry employment falls by 20 percent, from its current level of about 1 million workers to 800,000. If, over this same period, Mexican plants producing for the U.S. market added another 130,000 jobs—about the number working in *maquiladora* parts production at the beginning of 1992—and these jobs represented a one-for-one replacement of U.S. jobs—the U.S. total would fall to 650,00.

Figure 7-4-Projected U.S. Auto industry Employment"



[a]All workers; assumes output increases at 1.5 percent per year, productivity increases at 3 percent per year.
SOURCE: Office of Technology Assessment, 1992.

Contraction and competition will probably mean continued real wage losses even for workers who keep their jobs. And few of those who lose semi-skilled jobs in the auto industry can expect to find comparable employment. Long-tenure, high-wage auto workers suffer longer unemployment spells and greater earnings losses than other displaced workers (see ch. 4, table 4-3). In a sample including engineers, managers, and skilled workers, as well as direct production employees, 40 percent of those displaced from auto industry jobs over the period 1979-89 were unemployed for more than 6 months. Of those who found new work, 55 percent suffered earnings loses of 25 percent or more. Restructuring in this industry will continue to place a heavy burden on the individuals who lose their jobs and the communities in which they live. And the reliance by independent parts suppliers on low-wage, low-skill strategies increases the likelihood that they will relocate to Mexico.

Even so, a NAFTA is unlikely to have the devastating effects on U.S. workers that the UAW has charged. To some extent, NAFTA has become a lightning rod for fears over the future of jobs in a Shrinking industry with declining real wages. These trends have their origins in the globalization of the auto industry, a development in which Mexico has, as yet, played only a small part. But if NAFTA is not the root of U.S. auto workers' problems, it could **aggravate them or contribute to their solution.** To contribute to solutions, a NAFTA would have to address four issues alongside liberalization of Mexico's government polices:

1. measures for limiting net imports into the North American market, so that some production now taking place in Asia would move to the United States, Canada, and Mexico;
2. to the extent that vehicles and components continue to enter from outside North America, measures for improving competitiveness here to achieve a rough trade balance with the rest of the world;
3. help for U.S. plants, particularly suppliers, in pursuing high-productivity strategies; and
4. measures for dampening downward pressure on wages in the United States and Canada, particularly in independent parts firms.

Chapter 2 includes a number of policy options that address these issues.

CONCLUDING REMARKS

Over the past three decades, U.S.-based automakers have seen their share of domestic sales decline from 95 percent to about 65 percent. They first lost market share to imports, later to Japanese-owned transplants. Transplant production provides some jobs for U.S. workers that would otherwise have been lost to imports. But transplant suppliers pay lower wages than traditional U.S. suppliers, and independent U.S. suppliers face a difficult future unless transplant assemblers begin buying from them in greater volume.

Mexico's auto decrees have sheltered the five participating assemblers, providing higher profits than they could otherwise expect. These profits came at a cost—the requirement for a positive trade balance, even at the expense of operating inefficient assembly plants and buying parts from inefficient Mexican suppliers. A NAFTA that reduced Mexico's local content and trade balancing requirements and included a reasonable transition period before new entrants could freely sell in Mexico should provide some additional sales, profits, and jobs in the United States. But this will be a very small effect superimposed on long-term employment decline. Despite widespread plant closings and layoffs, the Big Three as a group have yet to complete the transition to lean production. Auto industry employment will continue to fall as productivity improves.