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Executive Summary

Japanese investment in automobile production in the United States has often been seen as a helpful way of revitalizing a declining and uncompetitive American industry. Defenders of the Japanese auto "transplants" argue that they bring the world's best production system to the U.S., while helping to retrain the American workforce and make it more productive. Transplant advocates also claim that Japanese investment in these plants creates new jobs in the US. automobile industry and helps to reduce our automotive trade deficit. This study shows that these positive impressions of Japanese auto transplants, which have been the basis for the United States' largely open door policy toward Japanese auto transplants, are in fact mistaken.

On closer examination, transplant production is little better than importing automobiles and does not help to revitalize the U.S. automobile industry as a whole. In addition, the transplants benefit from special competitive advantages in terms of employee benefit costs (mainly for health and pensions) which have nothing to do with greater productivity or quality. These advantages, which stem mainly from having a young, largely nonunionized labor force, enable the transplants to take market share away from existing domestic auto producers. Because transplant vehicles displace domestic vehicles at a very high rate, and because transplants use proportionally more imported parts, transplant production destroys more jobs than it creates (and does not improve the automotive trade balance either). The heart of the more efficient Japanese auto production system remains centered in Japan and is not being transferred to the U.S. In short, under present policies the Japanese auto transplants represent a net loss rather than a net gain for the U.S. economy.

Transplant production is little better than importing automobiles and does not help to revitalize the U.S. automobile industry,

The specific findings of this study can be summarized as follows:

- Japanese firms currently have no economic incentives to build top-to-bottom, paper concept to finished car manufacturing systems in the U.S. The strength of their production system depends on maintaining all of the major design work and the most technologically sophisticated parts production in Japan.
- The Japanese do have incentives to locate final assembly plants and some (more standardized) parts production in the U.S. These incentives come both from the "voluntary export restraints" on finished cars agreed to by the Japanese government, and from the advantages in the fringe benefit costs (pensions and health care premiums> from using young workforces at new, "greenfield" assembly plants. The incentives are particularly great from exploiting low-wage, nonunion labor in parts plants.

- Even in the long run, however, no less than 50 percent (by value) of the parts used to assemble vehicles in the transplants will remain imported, including the core parts of the vehicles such as the drivetrain. Especially, the major design work will remain in Japan, implying that U.S. workers will not receive training at the highest levels of the operation.
- Transplants are really the second phase of a two-part strategy for taking over the U.S. auto market. This strategy begins with imports and ends with domestic assembly of the vehicles using key imported parts and technologies and taking advantage of low Iabor costs. The fact that final assembly takes place inside the U.S. circumvents out trade agreements, while still displacing domestic car producers.

The *transplants...* *will* cause *a* net *loss* of *158,000* *jobs in the* *auto industry.*

- As a result of the continued displacement of domestic autos, by the time the transplants reach their planned capacity in the mid-1990s they will cause a net loss of 158,000 jobs in the auto industry and an annual net loss of $6 billion of income. Policies that have encouraged foreign investment in autos are thus destroying more jobs than they are creating.
- The competition from the Japanese auto transplants only increases the pressure on U.S. automakers to cut costs by closing plants, reducing workforces, cutting back on health and pension benefits, and resorting to low-wage, nonunion suppliers (including offshore sourcing). Thus, rather than helping to revitalize the whole U.S. auto industry, the Japanese transplants are only further weakening the domestic producers.

The automobile industry has historically been a core part of the industrial structure sustaining a high standard of living for American workers. That industrial structure now appears to be in jeopardy and the Japanese auto transplants seem to be hastening its demise rather than helping to resuscitate it. The findings of this study therefore suggest the need for a radical rethinking of our laissez-faire policy toward investment (both domestic and foreign) in the automobile industry, and particularly the special incentives which are given to foreign transplants both by state government policies and by the structure of our fringe benefit systems (mainly how we finance health care and pensions).

The specific policy recommendations of this report are as follows:

- In order to give U.S. auto firms breathing space to adopt improved production techniques, the total market share of Japanese cars (imports plus transplants) should be limited to the current level of 3.9 million vehicles annually over the next five to ten years.

- Since U.S. firms need to make investments which may not realize a return for many years, and because they need the cooperation of workers and suppliers to realize the fruits of these investments, those firms should be provided with sources of patient capital that do not require excessive short-term cost reductions.
- In exchange for these protective regulations, minimum performance requirements should be imposed on the firms which benefit. These requirements should include targets for productivity growth, price moderation, and annual compensation increases for production workers.
- In order to eliminate competition based on discriminatory selection of the workforce (by age, region, or other characteristics), and to preserve the hard-won benefits of autoworkers, benefit costs (such as health care and pensions) should be socialized at either the industry or national level.
- In order to prevent competition over transplant investment which actually causes net losses in jobs and incomes nationally, as well as to protect local tax bases from unnecessary erosion, individual states should be prohibited from "bidding" for new auto investment with tax breaks and other subsidies. Policies toward automobile investment, whether domestic or foreign, should be formulated at the national level. Such investment should be regulated so as to ensure that the social costs of new investment do not exceed the social benefits (i.e., the costs and benefits to society as a whole, not just to the private interests involved in each case).
- The ultimate goal of American auto policy should be to develop a revitalized automobile industry, capable of supplying high-quality cars at affordable costs and of providing high-wage jobs for American workers. To this end, all firms producing in the United States, whether domestic or foreign, should be required to source a minimum percentage of parts from local U.S. suppliers and draw a minimum percentage of their skilled workers from the local labor force.

American auto policy should,,, develop a revitalized automobile industry, capable of supplying high-quality cars at affordable costs,

The findings of this study are based on data compiled in 1991. All predictions for 1993 are based on the information available at that time.

Introduction

While most of the debate over international commercial policy has focused on trade, the issue of foreign direct investment (FDI) looms large. Just as U.S. trade negotiators argue that the U.S. should leave its own markets open and force open Japanese markets to U.S. products, so too do they argue that the U.S. should leave open its markets to foreign direct investment and negotiate greater opportunities for U.S. investment abroad.

Many economists and business scholars argue that foreign direct investment is... a solution to our declining competitiveness,

Robert Lawrence, formerly of -the Brookings Institution and currently a professor at Harvard's Kennedy School of Government, claims we are already benefitting from Japanese investment in the U.S. motor vehicle industry:

> *Japanese-affiliated automakers have transferred production technology and skills to the United States.. .. Japanese operations and the responses of some U.S. automakers have allowed the recovery of competitiveness in an industry in zohich if had seriously eroded.*
>
> *The new approaches to production technology, buyer-supplier relations and labor-management practices introduced by the foreign-affiliated automakers into their own operations are being diffused to their Big Three competitors. By engaging in joint ventures, U.S. producers have not only learned valuable lessons about building small cars, but also importarzt lessons about labor-management relations.. . . The Japanese emphasis on training has given U.S. zoorkers valuable new skills and experience. Their emphasis on collaborative relationships with suppliers has diffused Japanese know-how to U.S. autoparts makers (1990, in Executive Summary, N. pag.).*

Many economists and business scholars argue that foreign direct investment is both a consequence of and a solution to our declining competitiveness. Edward Graham and Paul Krugman (1991) argue that Japanese firms invest in the U.S. when import restrictions limit their ability to profit from their superior technology through exports or licensing. And Robert Reich (1990a, p. 54) argues that foreign-owned corporations bring valuable "skills, training, and knowledge" to the American workforce.

Advocates of FDI advise us that we will be better off if we allow foreign firms with superior technology and organization to produce our products; we can then reallocate our scarce resources to alternative uses. In Reich's words, "Experience shows that foreign-owned companies usually displace American-owned companies in just those industries where the foreign businesses are simply more productive" (1990a, p. 54). Ultimately, there may be further benefits if those foreign investors help to revitalize our industries and retrain our workforce, even if we do not have similar access to foreign markets. As workers are trained and U.S. managers are exposed to Japanese managerial practices, these superior

techniques ultimately filter out to U.S. firms. In time, the U.S. firms will adopt the technology, prices will decline, and overall efficiency will be improved. Furthermore, as FDI replaces imports, the trade deficit is expected to decline. Despite the profit-seeking nature of recent investment, Graham and Krugman (1991) conclude that the gains from inward foreign direct investment outweigh the losses.

But for many industries, trade and foreign direct investment are based on a strategic advantage which is greatly enhanced by a nation's trade and investment policies. The premise of this study is that the strategic advantage of Japanese motor vehicle firms in the global market comes from a production organization which was made possible only because the Japanese auto industry was protected from competition for 30 years and had nearly unlimited access to North American markets during the same period. The rapid growth and stability permitted by Japanese trade and investment policies gave Japanese firms a significant competitive advantage-a constructed comparative advantage. That advantage is embodied in a production organization and technology which cannot be readily transferred to the U.S. Because the transfer is incomplete, Japanese FDI in the U.S. market neither accomplishes the transfer nor helps to close the competitive gap for U.S. firms.

The *rapid growth and stability* permitted by Japanese trade and investment policies gave Japanese firms *a* significant competitive *advantage.*

Moreover, the Japanese competitive advantage is based partly on maintaining production and design in Japan, regardless of relative factor costs (i.e., costs of labor, capital, and other inputs). Hence, there is no reason, other than perhaps politics or explicit policies, to expect a wholesale transfer of Japanese motor vehicle assembly, design, and parts production to the U.S.

On the other hand, part of the Japanese success depends on the existence of a large secondary sector of low-wage suppliers producing low-technology parts. These parts producers do not enjoy the collaborative relations with assemblers or first tier suppliers which we have come to identify with the Japanese supply system. Production facilities for these parts are more likely to be located on the basis of labor and materials costs and are transferrable without significant loss of synergy to the production system in Japan. It is these parts which are being transferred to the United States. What we are witnessing is not the transfer of a superior production system to the United States, but the transfer of essentially turn-key assembly capacity and low-wage, low-technology, noncollaborative parts production for which factor costs outweigh other determinants of competitiveness.

In short, transplants are little better than imports and, like imports, will not help to revitalize the motor vehicle sector. We can expect transplants, like imports, to cause large-scale displacement — gross displacement of close to 300,000 people and a net loss of 158,000 jobs, an annual net loss of over $6 billion of income and an erosion of living standards. In the current policy environment, it is very difficult for U.S. firms to respond to the real underlying sources of their competitive disadvantage.

In the long run, they are likely to be forced to compete along a technologically regressive trajectory, closing plants, seeking low-wage labor and low-cost supply sources.

Unless the U.S. designs trade and investment policies which acknowledge the sources of strategic advantage — which are acquired only through the long-term market stability traditionally afforded by protection — U.S. firms face a long, painful march toward eventual extinction.

The next section covers an alternative theory of trade and investment which explains both the relative competitive advantage of Japanese firms and the reason why current trade and investment policies will not allow U.S. firms to restore their competitiveness. It also looks at the history of trade in motor vehicles between the United States and Japan to illustrate the trends in competitive advantages and their relationship to trade and investment policies. The third section returns to Japanese foreign direct investment and shows why, given the conditions which underlie their comparative advantage, Japanese firms cannot transfer their system to the U.S. The focus shifts then, to look at the evidence to show that the transfer is not happening in the manner described by previous observers, but that instead there is a transfer of low-cost suppliers and other factors which give transplants a significant cost advantage over U.S. firms. The fourth section shows the impact in terms of employment and income lost. The final section contains policy recommendations. An appendix explains the methodology used to estimate the displacement of domestic production and employment by the automobile transplants.

In the current policy environment, it is very difficult for U.S. firms to respond to the real underlying sources of their competitive disadvantage.

Trade Theory And Policy

According to the orthodox trade theory which informs our trade policy,, trade patterns are based on relative comparative advantages in the production of goods and services, Assuming that technology can easily be transferred between countries, comparative advantages result from the relative endowments of labor, capital, and natural resources-the "factor endowments" of the trading countries. For example, those countries in which the capital-labor ratio is high will specialize in and export capital-intensive goods to countries which exploit their own advantage in a relatively large labor pool through the production and export of labor-intensive goods. According to the theory, both countries will enjoy gains from trade through greater specialization and efficiency. Through trade, total social production will be maximized and gradually factor prices (real wages and returns to capital) will equalize across countries.

Any attempt to alter the natural pattern of specialization which follows from the initial factor endowments will result in a suboptimal allocation of resources to their best use. For example, a country which subsidizes capital-intensive goods to overcome a natural disadvantage will, through a misallocation of resources, lower its total product. But according to the theory, another country which leaves its markets open to these subsidized goods benefits because it purchases them at a price below their true social value, freeing scarce resources which would otherwise be expended on the subsidized good for some alternative use. Hence, the overall social welfare of the importing country is enhanced at the expense of the exporting country which wishes to develop a local capital-intensive industry in violation of the dictates of its natural factor endowment.

Empirical evidence suggests this model does not explain much of real world trade. The model predicts that international trade will be intersectoral-countries will not import goods in the same sectors in which they export. A country which exports capital-intensive goods will import labor-intensive goods. Yet much of trade in the postwar period, especially among the countries of Western Europe, North America, and Japan, has been intrasectoral — countries export and import goods in the same sectors — a fact which cannot be explained by the orthodox (Heckscher-Ohlin) model of free trade.

Moreover, the countries which follow the most open trade policies do not seem to perform better in terms of economic growth compared with countries that follow more mercantilist strategies. Although the U.S. has imposed limits on imports of some goods, including textiles, steel, footwear, machine tools, and automobiles, on the whole the U.S. has remained much more open to imports than many of its trading partners. As progressive rounds of trade liberalization have been negotiated under the GATT (General Agreement on Trade and Tariffs), all participating countries have reduced tariff rates. But at the same time, nontariff trade barriers and export promotion policies have proliferated, especially for

The **countries *which* follow** the ***most open trade policies do not* seem *to* perform beffer in terms of economic growth.**

those industries believed to be critical for economic development. Unlik the U.S., which has mainly used trade protection defensively for impor competing industries, other countries have used industrial and trad policies strategically to promote new industries and to stimulate exports According to orthodox trade theory, such mercantilist policies shoul have a heavy cost due to misallocation of resources, and thus should con stitute a drag on the economic growth of those countries which practic them. Yet foreign countries such as Germany, Japan, and South Kore which have engaged in such interventionist policies as protection, subsi dization, cartelization, and predatory pricing have in fact grown muc more rapidly than the U.S. in recent decades.

Protection or *subsidization* can result in *a strategic* advantage to *a home country* firm,

Managed Trade and Constructed Comparative Advantage

Two problems with traditional trade theory thus require explanation Why is there so much intrasectoral trade and why has the U.S., which ha pursued a relatively open trade policy, experienced such slow growth?

A body of theory has emerged in recent years which blends th insights of economic theories of competition within oligopolistic indus tries with those of international trade theory. To some extent this "nev trade theory" has been able to explain some of the empirical anomalies.

Most of the models rely on some combination of the following assumptions: there are significant economies of scale' in productio which put an upper limit on the feasible number of economically efficien firms in the world market; there are first-mover advantages associate with early entry into a product market; and early entry may, through th creation of entry barriers, secure a monopoly position for the first mover If there are significant economies of scale, scope, or agglomeration in a new industry, early assistance from the state can allow a home firm t make a sufficiently large capacity commitment to discourage potentia foreign rivals from entering the market (Krugman 1989). Under certai conditions, protection or subsidization can result in a strategic advantag to a home country firm which gives it a monopoly position in interna tional markets. If two countries have firms operating in an industry wit significant scale economies and one country imposes a tariff, its nationa firms may gain market share and realize greater economies of scale com pared to its unprotected foreign rivals. Analogously, where there are sig nificant learning economies, the national firms which are first to enter a industry with assistance from the state will enjoy a strategic advantag over late entrants.

Hence, two general conditions weaken the case for self-regulatin trade, just as they weaken the possibility of a self-regulating economy First, once any static economies of scale, economies of scope, and economies of agglomeration limit the number of efficient firms which ca be sustained in an industry, the possibility arises that tariffs, quotas, o

subsidies can be used to protect the local market or to gain access to a foreign market, thereby foreclosing entry by foreign firms on a similar scale. Second, when dynamic economies are involved, technology is not instantaneously transferable. Those national firms which are first to enter the industry gain a strategic lead in the race down the learning curve. Once a national industry has that lead in an environment of open trade, it is able to penetrate foreign markets, capturing market share which permits it to realize greater economies of scale, as long as most of the production remains in the home country.

An analogous argument holds for foreign direct investment (FDI). Suppose firms in an industry, characterized by varying economies of scale at each stage along the chain of production from materials to final goods, build assembly plants in foreign markets. If upstream component production remains in the home market while only assembly is transferred to the foreign market, the firm may realize greater economies of scale through FDI. A first mover, which from a protected domestic market is able to secure a larger market share than its unprotected foreign rivals by investing in open foreign markets, may secure an initial cost advantage. If there are economies of learning-by-doing (a special case where knowledge is not tradeable), then the first mover may have a permanent advantage.

The importance of strategic *trade* advantages are well *illustrated* by the motor vehicle industry.

As strategic trade theory has suggested, trade and investment policies which protect firms from foreign competition in their home market while promoting access to foreign markets, can confer a strategic advantage on their home firms.

The Case for Managing Trade and Investment in the Auto Industry

The importance of strategic trade advantages are well illustrated by the motor vehicle industry. Economies of scale in the auto industry have commonly been associated with minimum efficient scale in the stamping and engine production processes. In the 1960s, the minimum product-specific efficient scale for stamping (associated with the life of a die which could stamp a single shape) was 250,000 units (White 1971). If vehicles were "reskinned" (i.e., had their exteriors redesigned) annually, each model had to be planned for an annual production volume of 250,000. White argued that the successful firm had to have two divisions to diversify risk in the event that one model was unsuccessful. Hence the minimum efficient scale was at least 500,000 units annually. By the 1980s, based on the scale at which engine plants were being built, minimum efficient scale in engine assembly was considered to be one million units.

While White found risk diversification required that a firm offer only two models, the history of European, Japanese, and Canadian production indicates firms have placed product diversity before product scale economies, offering a full range of products across size class (subcompact,

compact, standard) and use class (passenger cars, pickup trucks) Following the integration of the European market between 1958 and 196 when Ford and General Motors rationalized their separate national pro duction facilities into a single, more efficient European production opera tion, unit costs for the same range of product offerings fell dramatically As Cusumano (1985, p. 217) shows, because it was trying to offer a rang of vehicles for which it did not have the volume to achieve minimum effi cient scale, the Japanese industry did not exhaust economies of scale unt the late 1960s. Hence, large economies of scope due to risk diversificatio are suggested by the history of European and Japanese production.

Japanese firms developed in a unique environment,

Economies of scope may be due not only to the range of vehicle type produced but also to economies associated with production of a broa range of parts — economies due to vertical integration. Evidence c economies associated with internal parts production is mixed Economists and financial analysts have concluded that General Motors i too vertically integrated to be competitive. But evidence from th Japanese industry suggests that it is not vertical integration or ownershi that is the determining factor, but the nature of the transaction betwee suppliers and assemblers. The Japanese industry suggests that there ar significant economies associated with proximity (economies of agglomer ation) and the possibilities that proximity provides for economizing o development, transportation, inventory, and quality control costs Evidence of economies of agglomeration and scope in parts productio suggests that unit costs for a national industry will be lower if the ful range of activities is done within a single national or regional market.

Finally, there is evidence from the Japanese industry of significan dynamic economies which could be realized initially only within a pro tected market. Japanese firms developed in a unique environment, on characterized by limited space and high real estate costs, high energy costs due to Japanese reliance on imported oil, and demand for the ful range of vehicles available in North American and European markets This set of constraints forced them to develop a production system whic economized on the use of space and minimized the volume necessary t achieve minimum efficient scale of production.

The just-in-time inventory system reduces inventories and scrap rate to a fraction of the level carried in a typical North American or Europea plant. The Japanese product development system has reduced produc cycle time from the eight years typical of Western firms to four i Japanese firms, and the volume necessary to amortize development cost from one to two million units down to as low as 80,000 units (in the cas of the Miata). Both the inventory system and the design process require a high degree of cooperation between assemblers and suppliers, amon managers, and between management and production workers, all o which takes time to develop.

The Toyota production system evolved over a period of thirty years Gradually, Toyota introduced elements of its production system—just-in-

time inventories and synchronous design and development of parts and production process with the design of the vehicles-further upstream, beginning first with assembly, working back to first tier suppliers of major systems such as engines and transmissions in the early 1970s. By the early 1980s, the second tier suppliers of technically sophisticated component parts to the first tier suppliers were integrated; only by the late 1980s were the small third and fourth tier suppliers of the less complex components included (Nishiguchi 1987). Analysis of total factor productivity (TFP) growth shows that more efficient use of purchased inputs was the primary source of phenomenal rates of TFP growth throughout the 1970s, a fact which could be explained by the progressive extension of just-in-time inventory and associated quality control practices which reduced scrap rates (Howes 1991).[2] While the principles of the Toyota production system have been codified, the application takes time, patience, extensive training, and practice. The Toyota production system is not instantaneously transferred; there is a steep learning curve involved in its adoption.

Japanese commercial policies had given their auto firms a first-mover advantage.

If the Japanese system had to compete with the U.S. system in its early years, it would not have survived the challenge from the then superior U.S. production system. In the early 1950s the Japanese government closed the local market to imports and foreign direct investment. Japanese firms were allowed to do business with foreign firms only through licensing agreements and joint ventures. Behind this protective wall, Japanese firms were able to produce vehicles at scales well below those achieved by U.S. firms. Their production costs in the early years were considerably higher than those of their American and European counterparts.

By the middle 1970s, the Japanese firms had closed the cost and productivity gap with their foreign rivals. But they had also gotten a head start on what ultimately proved to be a superior system of production organization. By the late 1970s, when Japanese firms began to penetrate western markets in sufficient numbers to cause concern, they had moved so far down their learning curve that technology transfer offered U.S. and European firms little chance of catching up. Japanese commercial policies had given their auto firms a first-mover advantage which would guarantee dominance of a world market organized on the basis of free trade principles.

Were the Toyota production system instantaneously transferable, U.S. firms might have licensed the technology and soon reached best-practice production standards. But given the significant lead enjoyed by Japanese firms, U.S. firms were and still are unlikely to catch up with Japanese firms under the present rules of the trading system. Furthermore, as Japanese vehicles capture an increasing share of the U.S. market, other sources of static efficiency are eroded for U.S. firms, namely those economies associated with scale, agglomeration, and scope. Declining sales volume, especially for General Motors and Chrysler, has meant that

many assembly and parts plants are now operating well below minimu efficient scale. While General Motors' reduced volume can be reallocate to fewer plants through plant closures, this requires reducing the numb of models produced. That in turn affects economies of scope as commo parts are spread over fewer related models. The possibility of balancin economies of scale with economies of agglomeration is reduced as few assembly groups have the scale to sustain contiguous parts plants.

A country in the position in which the U.S. now finds itself has tw options. Following free trade principles, it can concede defeat in its aut industry, import cheaper vehicles from Japan, and shift the abandone resources into alternative uses. This prescription depends on two assump tions: first, that the adjustment is costless with all resources remaining full utilized throughout the transition; and second, that there is no secondar impact on other industries. The eight to nine percent unemployment rate in midwestern states suggest that the adjustment is not instantaneous. An just as there are economies of scope and agglomeration within the automo tive sector, there are similar economies between sectors. Hence, when w allow the auto industry in the U.S. to be displaced by Japanese import which reflect the economies of scale, scope, and agglomeration now poss ble in the industry, we weaken other industries which are directly linked a suppliers of parts and technology, or indirectly because they share suppl ers. The aircraft industry uses many of the same suppliers, especially o electronic parts and machine tools, as does the auto industry

When **we *allow* the *auto* industry *in* the U.S. to be displaced by *Japanese imports* we *weaken* other industries which *are* directly linked *as* suppliers of parts and technology,**

Alternatively, the U.S. can provide its industry with the necessar environment (and required incentives) to adopt superior productio techniques and begin the long trip down the learning curve. That envi ronment would require that static economies of scale, scope, and agglom eration not be sacrificed to declining market share. The greater the vol ume and faster the rate of growth of volume, the better able U.S. firm will be to make the necessary investments, the faster the firms will mov down the learning curve, and the sooner they will be able to once agai compete openly with Japanese rivals.

The Evidence for Constructed Comparative Advantage

American manufacturing firms were the unrivaled leaders in the worl market throughout the 1950s and 1960s. In 1963, the value of merchandis exports from the North American region exceeded imports by 50 percent About half of American exports went to Europe and the remaining hal went to developing countries (including Japan>. By 1973, European manu facturing development was on par with the U.S. Productivity and incom levels were comparable and trade between the two regions was intra-sec toral and based on regional specializations. The U.S. exported aircraft office machinery, and oilseed products and imported chemicals, beer, wine and European specialty vehicles — fuel efficient Volkswagens and high-per formance luxury cars. Trade between major regions of the world-Nortl America, Europe, and Japan-was approximately balanced.

By 1986, Japan was in surplus with every region of the world. The value of its exports to both Europe and the U.S. was three times the value of its imports from either region (General Agreement on Tariffs and Trade (GATT) 1992). Japan had a merchandise trade surplus of $24 billion with Western Europe, $56 billion with the U.S. and Canada, and a $10 billion surplus with developing countries. 43 percent of its total exports went to the U.S. and Canada, 18 percent to Europe, and 29 percent to developing countries.

While the Japanese trade surplus was growing, the U.S. merchandise trade deficit increased by $97 billion between 1980 and 1990, from $27 billion to $124 billion.' The manufacturing trade balance deficit worsened by $104 billion from a $22 billion surplus to an $84 billion deficit (GATT 1992, Vol. 2, Table A-10, p. 95). Decomposing manufacturing into three sectors — semi-manufactured goods (iron, steel, chemicals), machinery and transportation equipment, and consumer goods (textiles, clothing, and other consumer goods) — we find that about one third ($39 billion) of the decline is attributed to rising imports of labor-intensive consumer goods from low-wage countries, approximately one fourth ($27 billion) is due to semi-manufactured goods and machinery and transportation equipment from developing countries, and another third (S46 billion) is due to machinery and transportation equipment imports from Japan.

The *U.S. manufacturing* trade deficit *with Japan* widened from $24 billion in *1980 to* $62 billion in *1990.*

Thus the U.S. manufacturing trade deficit with Japan had widened from $24 billion in 1980 to $62 billion in 1990, due primarily to the phenomenal increase in imports of office machinery, telecommunications equipment, and automotive products from Japan (Table 1). Japan's manufacturing trade surplus with the rest of the world follows a similar pattern. Japan's surplus in automotive trade ($59 billion), office and telecommunications equipment trade ($56 billion), and nonelectrical machinery trade ($29 billion) comprise 82 percent of its $175 billion manufacturing trade surplus (GATT 1992, Vol. 2, Table A-l 7, p. 109).

The fact that the U.S. trade deficit is so heavily weighted to certain industries suggests that it has underlying structural determinants, namely real competitive differences among nations in manufacturing industries. Since the competitive differences seem to favor some Japanese manufactured products over European and North American products, contrary to the expectations of orthodox trade theory, this suggests that strategic advantages, perhaps induced by commercial policies, may be part of the explanation.

The history of the global motor vehicle industry illustrates how strategic advantage shaped by national commercial policies, rather than natural comparative advantage, has influenced world trade in manufactures. Despite the fact that the U.S. industry held a position of productive superiority for seven decades, it was unable to export vehicles to most markets during much of that time. When the U.S. industry lost the productive advantage to Japan, it found itself in the more troubling position of being unable politically to protect its own markets from its superior rival.

TABLE 1
Composition of the US. Manufacturing Trade Balance with Japan by Sector, 1980 . 1990
(billions of U.S. dollars)

	1980	1990	Chance
Machinery & transportation equipment	$-18	$-56	$-38
Power generating	0	0	0
Other non-electrical	-1	-7	-6
Office and telecommunications	3	-19	-16
Electrical machinery	-1	-4	-3
Automotive products	-11	-29	**-18**
Other transportation equipment	0	t 2	t 2
Semi-manufactured	-4	-2	t 2
Consumer goods	-2	4	-2
All manufactured goods	-24	-64	-38

Source: Derived from GATT (1992), Vol. 2, Table A-1 0, p. 95.

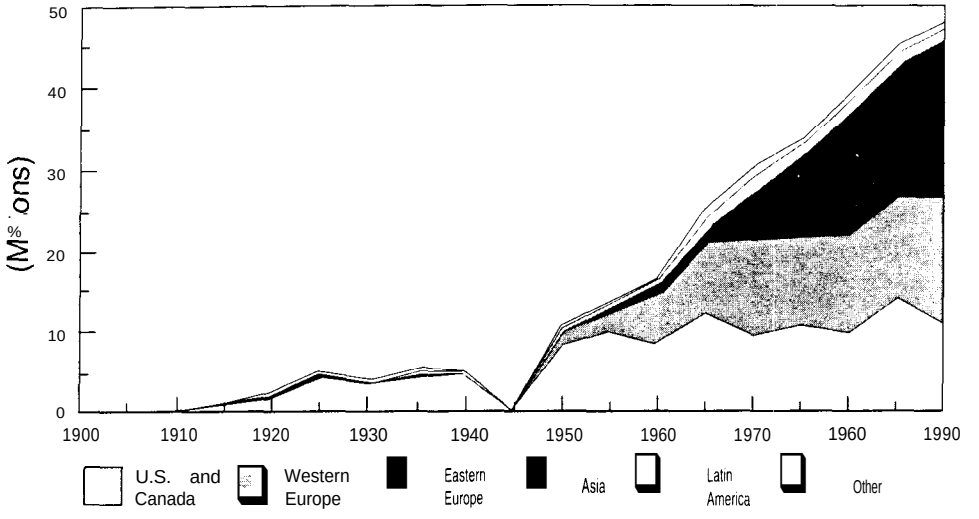
The evolution of the global auto market can be divided into rou four periods. Until about 1955, the U.S. was the unchallenged lead world auto production. The U.S. market grew rapidly from less than 5 lion units just before World War II to over 9 million in 1955. Worldv most vehicles were built and sold in the U.S. and Canada (Figure 1). second period, the decade after 1955, witnessed Europe's ascendence close second place as a world power in the motor vehicle industry. European market and European production tripled, reaching a s almost comparable to that of the U.S. Japan emerged as a contender i third period, after 1965. Japanese production more than tripled betv 1965 and 1973, rapidly narrowing the gap with slow growing Euro and North American (U.S.-Canadian) producers. Since 1973, Japanese duction, fueled almost entirely by export growth, has again doul reaching parity with American and Canadian production in 1986.

North American Preeminence, World War I - 1955

Automotive production was begun in the 1890s both in America Europe by many small manufacturers engaged in craft style produc This period stretches from the beginning of auto production in the 1890s until about 1913. In both Europe and America, small manufactu located at sites formerly dedicated to carriage or bicycle manufacture. because U.S. manufacturers had developed a system of large-scale r production using standardized parts, they had a significant cost ad tage over European firms. Whereas European firms produced more

Figure 1

World Motor Vehicle Production by Region, 1900-1990



Source: MVMA World Motor Vehicle Data. 1989 ed
Ward's Automotive Yearbook, 1992

half of all motor vehicles until 1906, by 1925, the European share had eroded to 10 percent of world production. With the exception of a Ford branch plant established in the UK in 1911 to assemble knock-down kits, U.S. firms exported only built-up vehicles to Europe in the first two decades of this century. This was probably the last time free trade and comparative advantage determined trade patterns in the auto industry.

Following World War I, when Britain, France, Germany, and Italy erected 30 to 50 percent tariff rates, Ford and General Motors (GM) began to build or acquire European factories. Soon, European firms were adopting some of the U.S. mass production manufacturing techniques and competing successfully with the European operations of U.S. firms (Bloomfield 1978). By 1937, the last peak year before World War II, U.S. firms had settled into a 25 to 30 percent share of the then 1.1 million unit Western European market. Also in the early 1920s Ford, and some years later General Motors, established branch plants in other parts of the world including Brazil, Argentina, and Mexico. In 1937, 78 percent of worldwide vehicles were produced in the U.S. and Canada, compared to 17 percent in Western Europe (Table 2).[4]

The European industry was a collection of small national industries. High tariffs prevented trade among countries, thereby restricting production of each vehicle model to a scale which could be supported by the national market. High unit costs kept prices high and the industry grew slowly from 1.1 million vehicles in 1937 to 3.2 million in 1955. Though by 1955 Europe had a much larger population than the U.S., the U.S. and

TABLE 2
Regional Production of Motor Vehicles, 1925-1986

	U.S.	U.S. & Canada	Eastern Europe	Western Europe	Total Europe	Japan	Other World	
Production (millions of units)								
1925	4.3	4.4	0.0	0.5	**0.5**	0.0	**0.2**	4.9
1937	4.8	5.0	0.0	1.1	**1.1**	0.0	**0.2**	6.4
1955	9.2	9.7	0.5	2.7	**13.2**	0.1	**0.3**	13.2
1965	11.1	**12.0**	1.0	**8.6**	**9.6**	1.9	**1.1**	24.6
1973	**12.7**	**14.3**	2.3	13.3	**15.6**	7.1	**2.3**	39.2
1986	**11.3**	**13.2**	3.4	13.3	**16.7**	12.3	**2.9**	45.1
Regional shares (percent of world)								
1925	88%	90%	0%	10%	**10%**	0%	**0%**	100
1937	75	78	0	17	**17**	0	**4**	100
1955	69	73	4	20	**24**	1	**2**	100
1965	45	49	4	35	**39**	a	**5**	100
1973	32	36	6	34	**40**	18	**6**	100
1986	25	29	**a**	29	**37**	27	**6**	100

Source: Compiled by author from Motor Vehicle Manufacturers Association (MVMA), World Motor Vehicle Data, 1989 Edition.

Canada still produced (and consumed) 73 percent of all world veh compared to Europe's 24 percent.

Europe's Decade, 1955-1965

In the ten years between 1955 and 1965, European production three-fold. Recovery from World War II and a huge spurt of inc growth accounted for rising demand. On the supply side, signif changes in the structure of the industry led to rising productivity falling prices. In 1957, with the establishment of the European Econ Community (EEC), the process of intra-regional trade liberaliz began. By 1967, intra-community tariffs were eliminated. Within a

short years, the automotive firms were finally able to exploit the potential of mass production, consolidating and rationalizing dozens of firms and production facilities, and centralizing production in areas convenient to supply the entire community.

In the decade after 1955, the Japanese industry also took off. The U.S. decision to procure military vehicles from Japan during the Korean War provided stimulus to an industry so moribund that in 1950 the President of the Bank of Japan had suggested that it be phased out (Ono, Odaka and Adachi 1988). Throughout the 1950s, behind a protective wall of 40 percent tariffs on small cars and an absolute prohibition on foreign direct investment in Japan, Japanese firms undertook technical tie-ups with European firms to learn product design and production techniques. Japan's Ministry of International Trade and Industry (MITI) issued strict guidelines for the joint ventures, enforced by rigid foreign exchange allocation to force rapid localization. Nissan achieved complete localization of Austin production within four years (Ono, Odaka and Adachi 1988; Cusumano 1985). High import duties were maintained throughout the 1960s. Japan produced 500,000 vehicles in 1960 and 1.9 million by 1965. Most of these vehicles were produced for the domestic market, though by 1965 approximately 10 percent were exported.

In the decade after 1955, the Japanese industry took off,

Development strategies similar to those of Japan were pursued by the Latin American countries in the 1950s with the exception that inward foreign direct investment was permitted. In Brazil, beginning in 1956-57, companies which accepted plans for local manufacturing were granted various incentives, including favorable tariffs on imported equipment, and tax benefits. Within four years, 95 percent of the weight of each vehicle was being produced locally (Jenkins 1987). Tariffs as high as 200 percent were imposed on imported vehicles to protect the fledgling industry. Similarly in Mexico, under the Auto Decree of 1962, firms were required to source 60 percent of the value of production locally (Bennett and Sharpe 1985). Between 1955 and 1965, Latin American production, largely by North American and European multinational operations, rose from about 70,000 units to almost 500,000 units.

During the decade after 1955, the U.S. share of world production shrank to 45 percent while the European share rose to 39 percent and the Japanese share to 8 percent. Virtually all vehicles produced in each of these regions were purchased in the local markets. High tariffs in Japan and Latin America, and continuing high external tariffs for the European Community, kept the technically superior U.S. firms from exporting to these markets. On the other hand, Germany exported about 10 percent of its vehicles to the U.S. beginning in 1957. Since all markets were growing during the period, most auto-producing countries experienced rapid growth of production and employment in the industry.

Japan Enters the World Market, 1965- 1973

During the third period, 1965 to 1973, Japanese production tripled and European production increased 62 percent, while U.S. output rose by only 14 percent. By 1973, Japan produced 18 percent of the world's vehicles, Europe maintained a constant share of 40 percent, and the U.S. share fell to 32 percent. Since U.S. production in Europe continued to expand at the same rate of growth as the European market, U.S. firms retained a 25 percent share of the Western European market.

Much of Japanese growth came through exports. Japanese firms sought out a niche in the American market unexploited by U.S. firms. After witnessing the growing popularity of Volkswagen Beetles in the U.S. market, Toyota began efforts to export to the United States in 1957. Both Toyota and Nissan, fearful that U.S. firms would develop their own small vehicles and preclude late entry into the market, showed vehicles in the Los Angeles imported car show in 1958. Both vehicles performed badly in road tests and the companies suspended export efforts for several years (Cusumano 1985).

Japanese cars gained acceptance in the U.S. market by the early 1970s, as their cost and quality improved.

Japanese companies also had problems with costs until the late 1960s, due mainly to low volumes and high material and components prices. But by the late 1960s, most firms had lowered production costs to international levels and improved quality. Japanese cars gained acceptance in the U.S. market by the early 1970s, as their cost and quality improved and American consumers began to seek smaller vehicles for their second family car (Cusumano 1985). Japan's car exports to the U.S. increased fourteen-fold between 1967 and 1973. By 1973, Japan was exporting 31 percent of its total production, or two million units, half to the U.S. and Canada. The three largest firms, Mazda, Toyota, and Nissan were each exporting nearly half of their total output.

Between 1968 and 1973, Germany exported about 20 percent of its production to the U.S. However, total Western European exports to the U.S. never accounted for more than about seven percent of European production or eight percent of the U.S. market.

Export-Led Growth and Beyond, 1973 - Present

The final period stretches from 1973 to the present. (Since this is an analysis of changes in market share between peak years of output, only the period 1973 to 1986, the most recent peak year, is considered (see endnote 4). Both the European market and the US. market demonstrated signs of maturity, marked by a seven percent growth and an 11 percent decline in production, respectively. Japanese production, similar to Europe in the 1950s and 1960s, grew 72 percent over thirteen years. Japanese firms continued to base their growth strategy on exports to the American and European markets and some markets of the Pacific. Japanese firms exported half of their output; 50 percent of Japanese exports went to the U.S. market in 1986, 25 percent to the European market.

Four factors during this period accounted for the change in the relative competitive advantage and trade patterns. First, Japanese firms produced a product line which was not produced in the United States-the minicompact and subcompact car. This product differentiation strategy which allowed them to enter the market in the late sixties, gave them a particular advantage following the oil crises of the 1970s. Second, the oil crisis contributed to debt crises in developing countries. The developing countries undertook export promotion programs, including promotion of automotive exports to earn the foreign currency necessary to pay interest on the debt. Third, as the Japanese export volume grew, Japanese firms moved rapidly down a learning curve, ultimately surpassing foreign firms in productivity and product quality. By the late 1970s, Japanese firms were then able to compete head-on with U.S. firms in their primary market segments.

Finally, despite the fact that the volume of imports from countries with protected markets was rising, the U.S. continued a largely open market policy even after 1981 when some limited restrictions were placed on imports. By the late 1970s, little automotive trade was based on natural comparative advantage. Not only were import restrictions commonplace, but now numerous countries were systematically adopting sectoral policies to promote exports. Subsidies, tariffs, protection, and predatory pricing (dumping) were combined to protect the local market and assure low export prices. In the face of the changed nature of the competition, the U.S. failed to adopt rules for access to its market which would guarantee mutual gains from trade.

Japanese firms **continued to base their growth strategy on exports to the American and European markets,**

By the late 1960s, American families were seeking cheap, small second cars. Japanese specialization in minicompact and subcompact vehicles put them in an ideal position to capitalize on both this trend in the U.S. market and the sudden demand for small cars precipitated by the first oil crisis in 1973. Coming out of the recession induced by the first oil crisis, as motor vehicle sales resumed at a healthy pace, Japanese exports to the U.S. increased from 1 million in 1973, to 1.7 million, 11 percent of the U.S. vehicle market, in 1978. But while Japanese firms had made sizeable inroads into the U.S. market, it took a second oil crisis in 1979 to create a large and permanent shift in consumer demand toward smaller vehicles. The oil crisis of 1979 led into a much deeper crisis for the U.S. auto industry and the economy. By 1981, though total sales in the U.S. had declined 30 percent to eleven million units, Japanese imports had risen 600,000 units to 2.3 million, capturing 21 percent of the total vehicle market.

Japanese exports had less success in the European market, in part because their product was less unique relative to small European cars, and in part because, despite the tariff free policy for trade among member nations, the EEC had a complicated pattern of protective practices toward non-member trading partners. All the auto-producing countries, with the exception of Sweden and Belgium, maintained some form of barrier to Japanese imports, either through tariffs or explicit quotas. Even now, Italy permits only 2,500 Japanese passenger cars to be directly

imported from Japan annually. Britain restricts Japanese firms to 11 percent of the market; France has a 2 percent quota; and, Germany an informal 11 to 15 percent quota. Portugal and Spain have very high tariffs. There is agreement among the members of the EEC that Japanese car imports should not exceed eleven percent of the total market. In a market which is as large as the U.S.-Canadian market, Japanese imports reached only 1.2 million units or 10 percent of European sales in 1981.

Latin American producers also had erected trade barriers to protect their fledgling industries well before the upheavals of the 1970s. But the debt crisis resulting from the oil price hikes of the 1970s and the interest rate appreciations, renewed their commitment not only to develop their local industries but also to use them as prime sources for export earnings. Mexico and Korea are the most successful examples.

The *U.S. failed to* adopt rules for access to its market which would *guarantee* mutual gains from trade,

Export requirements were added to the Mexican Auto Decree in 1969. The Mexican government added several provisions over the next 10 years designed to bring the value of exports in line with the value of imports. In a policy meant to encourage multinational production in Mexico for export to U.S. markets, multinational firms were given greater flexibility to import parts as long as imports were compensated by exports (Jenkins 1987). The peso devaluation of 1980 coupled with existing U.S. trade regulations which facilitated low-wage (*maquiladora*) production on the Mexican border, made Mexico a desirable production location for U.S. parts manufacturers. In 1980, Ford, Chrysler, and General Motors all built or expanded engine capacity in Mexico, both to serve the Mexican market and for export to the United States. By 1984, Chrysler and General Motors were both exporting small volumes of vehicles from Mexico to the United States. In 1988, Ford began assembling large volumes of small cars in a new plant, exclusively for export to the U.S. The Mexican export strategy has been executed entirely by foreign multinational firms, including Ford, Chrysler, General Motors, Volkswagen, and Nissan.

South Korea's export strategy is more ambitious. They have put their auto industry at the center of an economic development strategy. The appreciation of the U.S. dollar between 1980 and 1986 abetted export efforts. Between 1980 and 1987, Korean motor vehicle production rose from 100,000 units to 1 million. In 1987, half of Korean production was exported, 90 percent to the U.S. and Canada. The Korean export strategy, like the Mexican strategy, is being furthered by the offshore production strategies of US. firms. Half the vehicles produced by two Korean firms are exported to the U.S. as the Ford Festiva and the Pontiac Le Mans. But unlike the Mexican industry, there is a large Korean national manufacturer — Hyundai — which in 1987 accounted for 75 percent of all exports. Together Mexico and Korea had the capacity to export close to 750,000 units to the U.S. and Canada by 1988.

In contrast to Japan, Mexico, and Korea, European exports have slowed. The exchange rate has not worked in favor of European exports, except in the case of Germany. But German volume exports have been

badly battered by competition from the Japanese. After 1973, the share of total German production going to the U.S. fell to 10 percent; on average, 5 to 6 percent of European production is now exported to the U.S.

Though U.S. motor vehicle imports grew steadily from one million units in 1973 to 1.7 million in 1980, it was only in 1980 that any restrictions were considered on access to the U.S. market. Anticipating protectionist legislation, due to their large share of the U.S. market, the Japanese agreed to a Voluntary Restraint Agreement (VRA). The VRA limited the volume of imports to 1.68 million passenger cars annually beginning in 1981. The Japanese Ministry of International Trade and Industry (MITI) was responsible for determining the export limits for individual Japanese companies. In theory, the VRA was meant to encourage Japanese firms to invest in local production as a condition of expansion in the U.S. market.' While the VRA restricted the level of car imports, no such volume limitations were put on truck imports." The VRA was renegotiated annually and the minimum level rose at an annual average rate of about 8.6 percent to 2.3 million units by 1985. Total Japanese car and truck imports to the U.S. peaked at 3.4 million units in 1986 (Figure 2).

following the *imposition* of the *Voluntary* Restraint Agreement, Japanese firms began to invest in *U.S.* production.

The VRA merely forced Japanese firms to rethink their strategy in the U.S. market. Following the imposition of the VRA, Japanese firms began to invest in U.S. production. In 1982, Honda built the first automotive assembly plant in Ohio. Nissan and Toyota (in a joint venture with General Motors) followed in 1984. Most of the plans to build thirteen plants in the U.S. and Canada have now been completed (Table 3). By 1986, 3.9 million Japanese cars and trucks were being sold in the United States, 3.3 million imports and 0.6 million transplant vehicles. So while the Voluntary Restraint Agreement with the U.S. altered the form of Japanese access to the U.S. market, it did not reduce the overall level of access. Japanese firms still had considerably more access to the U.S. market than to the European market where only 1.6 million vehicles were sold in 1986, or to any of the markets of developing countries with motor vehicle industries.

Figure 3 illustrates the growth of Japanese transplant production from just 1,500 units in 1982 to almost 2 million in 1991, and a 1993 planned volume of 3.2 million vehicles exceeding Chrysler's output in 1991.

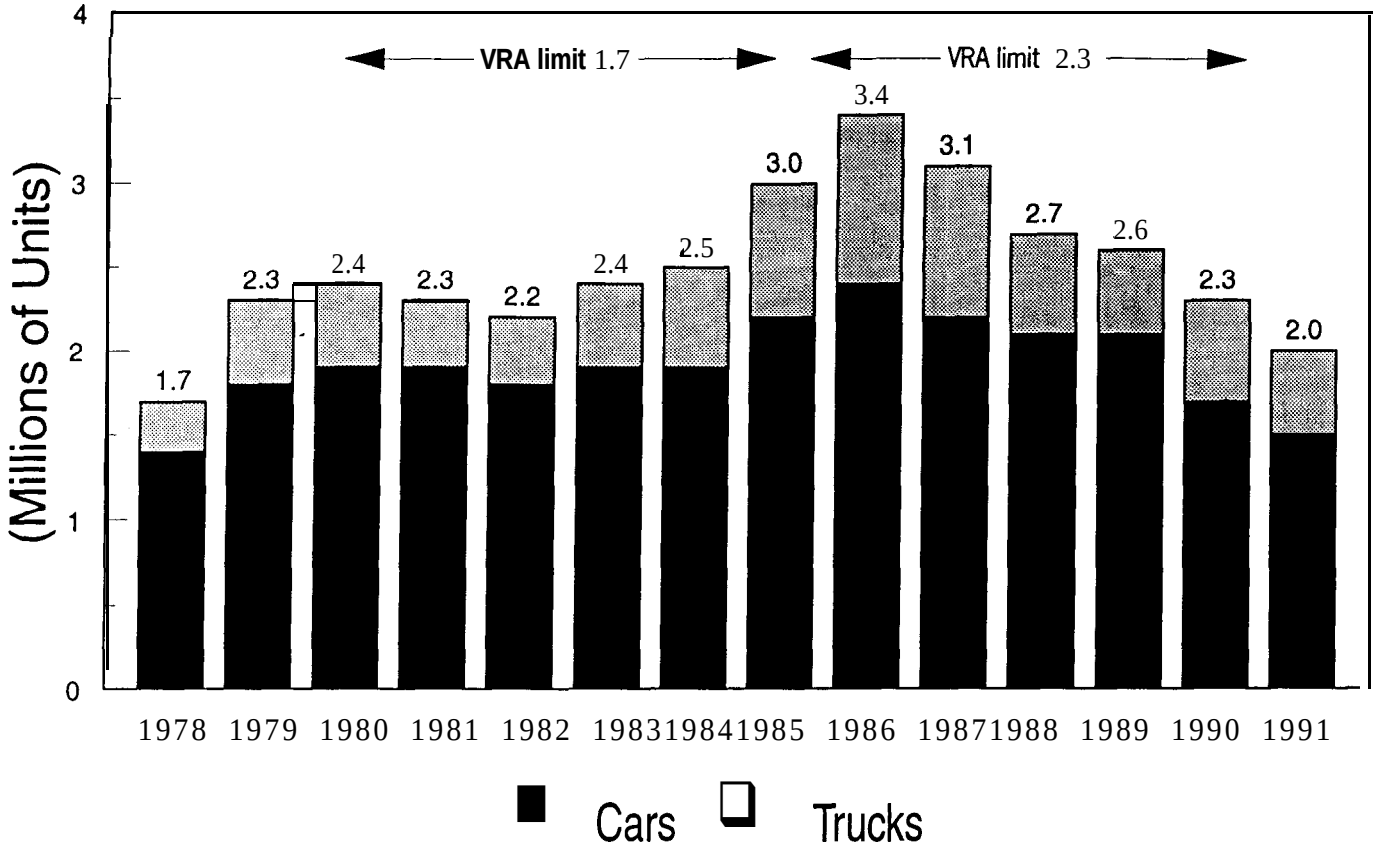
Japanese assemblers are being followed to the North American market by their parts suppliers. By the end of 1990 there were 322 Japanese parts and materials plants in North America, 75 percent of which were in Kentucky, Tennessee, Southern Ohio, Illinois, Indiana, and Michigan (University of Michigan Transportation Research Institute 1991).

Commercial Policies and Trade Patterns

As the preceding discussion shows, not since World War I has there been free trade in automobiles. Once mass production gave them a cost advantage ***over*** European firms, U.S. firms experienced a brief period of

Figure 2

U.S. Automobile Imports from Japan, 1978-I 991



Source: Ward's Automotive Reports (first Monday in January, 1979-1992).

Note: VRA limits refer to voluntary restraint agreements on Japanese exports of cars to the U.S.

unrivaled supremacy. But soon European nations were erecting high tariff walls behind which less efficient local producers were protected from low-cost imports. U.S. firms were obliged to build small-scale production facilities in several European countries to serve the local market.

Japanese firms grew behind an even tighter protective shield which precluded any competition, either from imports or foreign direct investors. For decades they had a captive market for their vehicles which were, by world standards, low quality and high cost. **By** the 1970s when they began to export to the American and European markets, they had approached levels of efficiency and quality comparable to the indigenous

TABLE 3
Transplant Production Capacity Planned for 1993

Company	Plant location	Start-up	Vehicle	Planned Capacity for 1993
United States				
Diamond Star	Normal, IL	1988	laser/Eclipse/Talon; Mirage/Summit	240,000
Ford-Nissan	Avon lake, OH	1991	Minivan VX54	135,000
Honda	Marysville, OH	1982	Accord (2dr); Accord wagon	360,000
Honda	E. Liberty, OH	1986	Civic (4dr)	150,000
Mazda	Flat Rock, MI	1987	MX6; Probe; 626	3 16,000
Nissan	Smyrna, TN	1984	Pickup; Sentra; Stanza; Pathfinder	440,000
NUMMI	Fremont, CA	1985	Prizm, Corolla	220,000
NUMMI Truck	Fremont, CA	1991	Midsize pickup	100,000
SIA (Subaru-lsuzu)	Lafayette, IN	1989	Subaru Legacy; lsuzu pickup, Rodeo, Impulse	240,000
Toyota	Georgetown, KY	1988	Camry	440,000
Canada				
CAMI (GM-Suzuki)	Ingersoll, ONT	1989	Tracker/Sidekick(SUV); Metro/Firefly/Swift(mini)	220,000
Honda	Alliston, ONT	1986	Accord (4-dr); Civic hatchback	100,000
Hyundai	Bromont, QUE	1989	Hyundai/Eagle Sonata	100,000
Toyota	Cambridge, ONT	1988	Corolla	100,000
			Total U.S. plus Canada	3,161,000

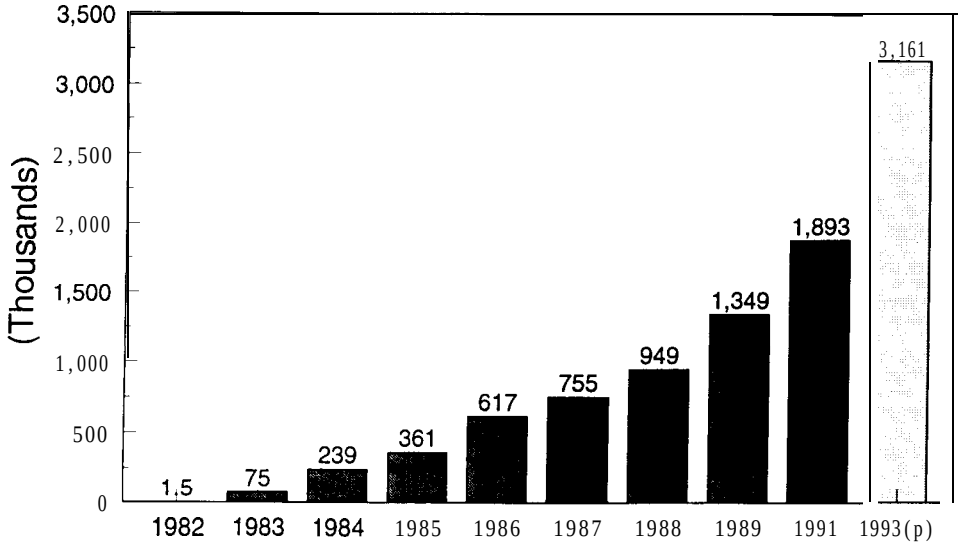
Source: Compiled by author from Ward's Automotive Reports.

firms in their export markets. Rapid growth through exports over the next ten years allowed them to fine tune what was becoming a superior productive system, so that by the 1980s the policies of the past thirty years had succeeded in constructing a solid comparative advantage for Japanese firms vis-a-vis their rivals in the global market.

Automotive trade grew enormously after 1973. In contrast to the minimal role played by trade in the world motor vehicle market previous to 1973, by 1987 approximately 15 percent of all vehicles were exported. (This figure does not include intra-regional trade between the U.S. and Canada or within Europe.) The superior production system of Japanese

Figure 3

North American Transplant Production 19824991, and Planned Capacity for 1993



Source: Ward's Automotive Reports and author's projections.

Note: (p) Author's projection of planned capacity for end of 1993.

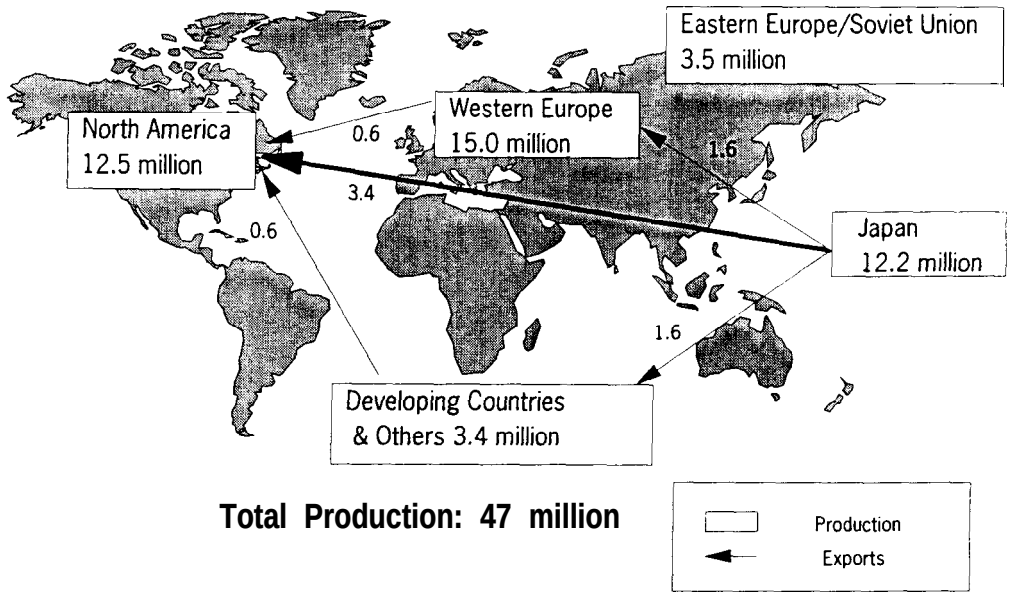
firms, the relatively open markets of the United States, and the relatively closed markets of the remaining auto-producing countries determined the patterns of global production, trade, and employment. Traditional theories of trade following comparative advantages lend little to our understanding of these patterns.

By 1987, trade in motor vehicles was extremely lopsided (Figure 4). Most of the volume was generated by Japanese exports to North America, Western Europe, and developing countries. As a consequence, there developed a huge global imbalance between production and consumption of motor vehicles. By 1990, the U.S. and Canada combined produced only 19 percent of world motor vehicles, but consumed 30 percent; Japan, which produced 28 percent, consumed only 16 percent (Figure 5).

In recent years, Japanese investment in the U.S. market has begun to raise significant doubt as to whether this trend will continue. In 1991, two million transplants and two million imports were sold in the U.S. market. By the end of 1993, an additional 1.2 million units of transplant capacity were planned.' Advocates of foreign investment in U.S. autos have argued that transplant investment marks a radical break from the export-based competitive **strategy** of Japanese firms. They cite the decline of built-up vehicle imports with the rise of transplant production. They claim that with the introduction of the VRA in 1981, and the deval-

Figure 4

World Vehicle Production and Exports, 1987



Source: MVMA, 199 1.

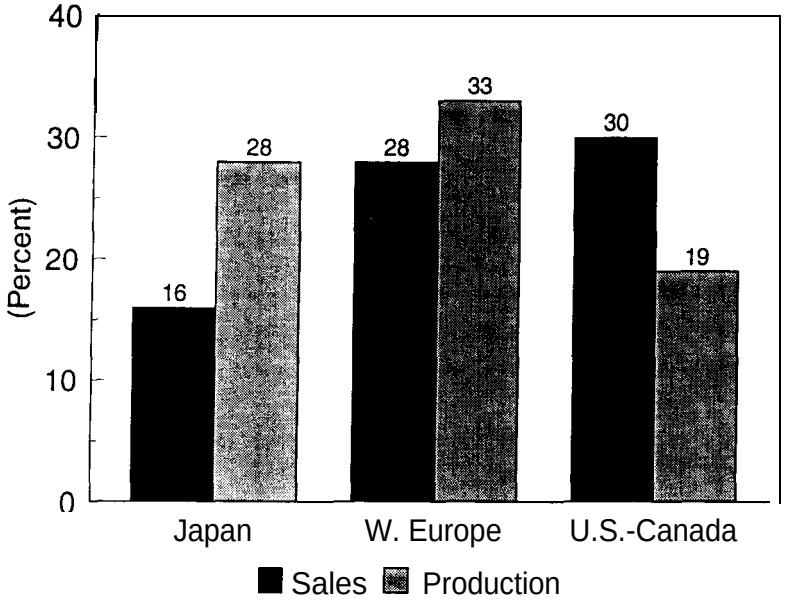
uation of the dollar in 1986, politics and economics both now favor Japanese production in the U.S.

Over time, it has been argued, Japanese firms will replace imports with transplants and U.S.-assembled Japanese cars will inevitably become more American (Womack 1991). The automotive trade deficit is expected to decline and the transfer of Japanese technology to the U.S. is expected to raise the productive capability of the U.S. automotive sector as Japanese firms train the workforce and supplier industry and as U.S. firms adopt the production techniques of their Japanese neighbors, The VRA is seen as increasingly irrelevant as Japanese firms exploit the site cost advantages of U.S. production.

The next section examines the question of whether transplant investment is better than imports and finds that it is not. The logic of the Japanese system requires that firms continue to source parts from Japan. Hence transplants are just an extension of the export-based competitive strategy, a fact Europe understood well when it tightened its restrictions on automotive trade from Japan to include transplants. Trade and now investment continue to be structured by the commercial policies of trading nations-Japan's export-based mercantilist policies, Europe's defensive mercantilist policies, and the free trade orientation of the U.S., punctuated by sporadic, ineffective U.S. protection.

Figure 5

Shares of World Sales and Production, 1990



Source: Ward's Automotive Yearbook

The Fake Case For Transplant Investment

Some authors have argued that, in contrast to imports, Japanese investment in the U.S. has the salutary effect of pushing U.S. firms to adopt the superior Japanese productive system. Japanese firms, the argument goes, by transferring their superior production system to the United States, will train U.S. managers, workers, and suppliers in new skills. Ultimately, the U.S. firms will either become more Japanese or continue to lose market share. In either case, the performance of the U.S. industry will improve, regardless of whether production is taking place in facilities of U.S. or Japanese parent firms. Following this logic, Japanese direct investment should be encouraged because it displaces imports and transfers superior technology. Robert Reich argues that we should not

> *.bar foreign firm from operating in the United States — particularly if they'll spend more money training American workers than is spent by American* firms *in the same industry, pay American workers higher salaries, give them more job security, and make them far more productive than American firm do — even if the country where they have their headquarters prohibits American firms from investing* there. Studies *have shown that Japanese firms, in particular, fulfill all these criteria (1991, p. 53).*

The case for how the U.S. benefits from Japanese foreign direct investment is also expounded by Graham and Krugman (1991). In their view, firms with a competitive advantage, based on monopolistic control of a superior nontransferable technology, invest in foreign markets in order to capture the "rents" which cannot be recovered through exports or licensing." Turning the theory of strategic trade policy on its head, they argue that there are potential gains for the host country from foreign direct investment based on comparative advantage due to increasing returns to scale and increasing competition, especially in an industry with imperfect product markets. Foreign direct investment may extend the gains from trade where rents cannot be captured through trade. But there are additional potential gains for the host country from foreign investment, based on externalities. The foreign firm is not always able to capture the full rent. As workers are trained and U.S. managers are exposed to Japanese managerial practices, these superior techniques ultimately filter out to U.S. firms. In time, the U.S. firms will adopt the technology, monopolistic rents will be eroded, prices will decline, and overall efficiency, both technical and allocative, will be improved. Despite the rent-seeking nature of recent investment, Graham and Krugman conclude that the gains to the host country from inward foreign direct investment outweigh the losses.

Japanese direct investment *in* automobile production in the United States does *not* fit *this* profile,

Such a perspective would suggest the following consequences for U.S. automotive geography and employment. New plants would be established in the optimal locations based on site costs. Given that Japanese firms have apparently evolved a system based on high economies of agglomeration, the location would be one large enough to accommodate the assembler and its suppliers, such as locations found in rural areas of Kentucky or Tennessee, for example. While transplants might displace some imports, it seems more likely they would displace the vehicles made by the inferior plants of American producers. But there should be no significant employment impact because Japanese firms would want to establish parts plants and localize production so they could achieve the same economies of agglomeration in the U.S. that they do in Japan. Since, as we shall see, transplant assemblers are paying wages and benefits "comparable" to the Big Three (General Motors, Ford, and Chrysler), there should be no negative income effect, according to these economists. In short, this geographic reorganization will be little different from previous reorganizations within the United States. The only difference is that, since U.S. firms had ceased to innovate under their secure oligopolistic structure, outside innovative firms are required to introduce the superior production system into the United States.

Japanese direct investment in automobile production in the United States does not fit this profile. The location decisions of Japanese firms in the U.S. do not flow from the locational imperative of a superior production system based partly on agglomeration economies, but rather from an explicit cost calculus about the high cost of using union workers, minority workers, and older workers, as well as a careful calculation of what investment locations would best mitigate the inevitable political fallout

from the large volume and displacing nature of the investment. Japanese firms have no incentive to buy lots of parts in the U.S. to achieve their agglomeration economies. Such economies are, in fact, better achieved by keeping a high proportion of production in their own home market. Hence, as it is now practiced, Japanese direct investment in the U.S. is not very different from importing.

As a consequence, many of the potential costs and few of the salutary effects of FDI are being realized. Furthermore, when Japanese firms assemble vehicles in the U.S., they capture not only technological rents available through trade, but also factor cost-based rents which are largely foreclosed to U.S. parent firms. The rents are a consequence both of the superior production system in Japan and of segmented labor markets in both Japan and the U.S. Japanese firms, through investment in the U.S. market, have access to a labor market of young, healthy, nonunion workers. As a result of the U.S. system for paying fringe benefits, including health care and pensions, these workers are very cheap relative to workers in Big Three firms.

Japanese firms have neither an incentive nor a need to transfer their superior system to the United States in order to reap the benefits of that system in the U.S. market,

The locational and employment consequences will bear little resemblance to the rosy picture painted by the free foreign investment advocates. And, as the section on the employment impact of transplants will show, once all currently planned transplant capacity is up and running, approximately 360,000 auto workers in traditional auto regions will have lost their jobs. Only 200,000 new jobs will have been created in the upper South and most of those jobs — the ones in small parts plants — will be paying wages 40 percent below the average for the parts industry.

The next section explains why, based on the competitive strategy of Japanese firms and the inevitable response of U.S. firms, Japanese firms have little incentive to transfer production to the U.S. It assumes no change in the policy environment, which fact both defines the terms on which Japanese firms can compete in the U.S. market and severely circumscribes the competitive response of the U.S. industry, guaranteeing the worst possible outcome for the U.S. auto industry.

The Japanese Production System

A brief discussion of the Japanese production system is required to explain why Japanese firms have neither an incentive nor a need to transfer their superior system to the United States in order to reap the benefits of that system in the U.S. market.

It seems that much of the enthusiasm for the Japanese system is based on consideration of only part of its operation. The Japanese production system is a finely balanced blend of two diametrically opposed incentive systems. One, the system which has enthused Western writers, draws on community values and common interests to forge a consensus around corporate strategy in large manufacturing firms. The second system is made up of contingent workers and secondary suppliers whose behavior is

motivated by more traditional economic incentives. Students of Japanese industry have concentrated on the large manufacturing firms (Dore 1986, 1987; Aoki 1990; Abegglen and Stalk 1985). Less is known about the secondary markets for parts and labor which supports the large firms.

Key to the consensus-based incentive structure is the corporate strategy which places long-term growth ahead of short- term profitability. Critical to growth is the flexibility to change directions quickly when an opportunity suddenly arises or when the market requires it, as was the case in 1973 when the price of oil rose. Flexibility requires adaptability at all levels of the production organization, both within the firm and in relations between firms. Japanese firms have achieved this flexibility largely through a high degree of communication, sharing of responsibility, and consensus decision-making. But they have also been able to achieve it because markets have grown steadily so that the sharing of both the benefits and pain of fluctuations rarely threatens the livelihood of anyone involved in these transactions. There is in effect good faith bargaining grounded in the expectation that all will be better off in the long run. This would not be a reasonable expectation if the firm were facing a declining market.

The "market" plays a secondary role in many transactions of the Japanese firm — transactions between firms and workers, firms and suppliers, and firms and creditors. The result of an exchange should be a sharing of the benefits and losses which is optimal for the sustained growth of the firm and that frequently means supporting local firms, suppliers and workers through difficult times. So the market is suppressed in the vertical supply chain. Where the market does prevail is in the final rivalry between firms in the same product market, except when that fierce rivalry threatens to devolve into cutthroat rivalry, which threatens the vitality of the industry as a whole. But in good times, firms compete aggressively around product technology.

For example, the permanent employment system in large firms, which was initiated in the 1950s to retain scarce skilled labor, is part of an incentive system which now draws a high level of commitment from employees. The technological and commercial dynamism of the system-new products are brought to market in half the time required of Western firms (Clark and Fujimoto 1991) -is frequently credited to the scope and sophistication of the permanently employed workforce.

The majority of the workers in the top tier firms in the industry face a labor market only for entry-level positions in the firm. Once workers join the firm there is virtually no lateral mobility outside the company. They expect to spend their lifetimes (until age 55) in a single firm. Workers are rewarded through promotion and both group and individual performance-based productivity bonuses. Promotion is based on performance criteria which include some measure of the workers' ability to handle a broad range of tasks and work collectively in groups. Broadly defined tasks and job rotation relieve the traditional boredom of the assembly line

The permanent employment system in large Japanese firms is part of an incentive system which now draws a high level of commitment from employees,

while raising the employees' awareness of the objectives of the firm. Ronald Dore, Masahiko Aoki, James Abegglen, and George Stalk all suggest that this incentive system successfully encourages employees to view their interests in common with the firm.

The Japanese supply chain is organized in clearly defined and highly concentrated tiers. In 1986, 172 first tier firms supplied 90 percent of the value of manufactured components to Toyota. In contrast, 5,500 firms supplied 80 percent of the value of purchased components to General Motors (Asanuma 1988b). The relationships between buyers and suppliers in Japan are long term, lasting at least for the four-year lifetime of the part (Asanuma 1988a, 1988b) but in practice for decades as long as the supplier maintains quality. U.S. firms open procurement to competitive bidding annually, although the relationship usually lasts for the life of the part.

But the consensus forged from job security and sharing the benefits of prosperity depends on the cost flexibility built into the system through the use of contingent workers and secondary and lower tier suppliers,

Japanese suppliers also agree to reduce the price annually over the term of the contract, a promise which is possible because of the practice of value analysis, a technique to study product design, materials, and manufacturing methods to systematically reduce the costs of parts after production has begun (Takeishi 1990, p. 14). Profit sharing and cross equity holdings" provide an incentive for Japanese partsmakers to reduce costs. U.S. firms use competitive bidding to contain costs but allow price increases over the life of the contract for materials and labor cost increases (especially due to cost-of-living adjustments) (Asanuma 1988b, p. 18; Lamming 1989, p. 18, quoted in Takeishi, 1990 p. 10).

The incentive system based on long-term relations, profit sharing, and collective problem solving has encouraged effective delivery (just-in-time) and quality control (zero-defect) unmatched by U.S. firms (Takeishi 1990, p. 15; Nishiguchi 1989, p. 280; Helper 1989).

But the consensus forged from job security and sharing the benefits of prosperity depends not only on steady growth but on the cost flexibility built into the system through the use of contingent workers and secondary and lower tier suppliers. This is the level of the system where more familiar relations of power between capital and labor and between monopoly or oligopoly capital and competitive capital prevail.

Robert Cole estimates that only about 32 percent of Japanese employees in all industries enjoy the benefits of lifetime employment (1979, p. 61). In the auto industry, it is those working in assembly plants or first tier suppliers that are offered lifetime employment. There are approximately 500,000 people employed in the auto parts industry in Japan (JAMA 1987, p. 18). For the following calculations of the relative importance of secondary suppliers and contingent workers to firm flexibility, Toyota is used as an example.

Toyota produces approximately 30 percent of vehicles in Japan; assuming Toyota accounts for 30 percent of parts employment, it accounts for 150,000 auto parts jobs. There are 172 firms in the Toyota Group which includes first and second tier suppliers (Dodwell 1986, p.

31). In a survey of over 500 Japanese parts suppliers (Cole and Yakushiji 1984, pp. 157-161), it was found that very large first tier suppliers had average employment of 3,000 to 6,000 people, while employment in second tier suppliers averaged 340 people, Cole shows the employment distribution by firm size of a representative sample of male members of the workforce (employed or looking for work) in Yokohama, a city with an industrial structure comparable to Detroit (1979, p. 79, Table 11).[10] 39 percent of the workforce was employed in firms of 1,000 or more employees, five percent in firms of 500-999, 13 percent in firms of 100 - 499, and 41 percent in firms with less than 100 employees. The survey of Detroit showed only 25 percent employed in firms of less than 100 employees and 57 percent employed in firms with more than 1000 employees. If people employed by Toyota suppliers were distributed across firm sizes in comparable proportions to the distribution of workers in Yokohama, one would find 61,500 people, 41 percent of Toyota-related partsworkers, employed in third and fourth tier supplier firms (Table 4).

In the survey by Cole and Yakushiji (1984) it was found that employees in second tier suppliers were paid wages that were 87 percent of the average in first tier suppliers. Workers wages in the third tier were paid 67 percent of those in first tier suppliers (Table 5). 11 percent of the workforce in second tier suppliers was part-time and seasonal, compared to 4 percent in first tier suppliers. Presumably there is an even higher proportion of temporary workers among lower tier suppliers. While 100 percent of first tier suppliers were unionized with a 95 percent membership rate, among second tier suppliers, only 50 percent had unions and only 69 percent of employees in union firms were members of the union.

Apparently the assemblers and first tier suppliers are supported by an army of third and fourth tier suppliers that is not involved in planning, does not have exclusive relations with any assembler, and wins contracts through a cost-based bidding process. These contingent workers and suppliers build cost flexibility into a system otherwise characterized by high fixed costs. This too is a crucial part of the Japanese system.

These ***contingent*** **workers and suppliers build cost *flexibility* into a system otherwise** *characterized* **by high fixed costs,**

Technology Transfer or Social Dumping?

Japanese firms have little reason to transfer the carefully constructed long-term relations with first and second tier suppliers, or with banks, to the U.S. But in some cases it makes sense to transfer sourcing of parts for which factor costs outweigh other considerations, those parts which are sourced through market relations.

Every car which Toyota produces in the U.S. is also produced in Japan. Among its Japanese assembly plants are Takaoka which produces the Corolla (the same vehicle assembled at the New United Motors Manufacturing Inc. (NUMMI) plant in Fremont, California) and Tsutsumi which assembles the Camry (also assembled in Georgetown, Kentucky). Toyota can fully realize much of the strength of the "Toyota production

TABLE 4
Estimated Toyota Parts Employment by Firm Size

Tier	Firm Size	Number of Firms	Percentage Share of Employment	Employment
1st	1 000+	50	39%	58,500
1st	500-999	10	5	7,500
2nd	100-499	115	13	19,500
3rd/4th	99 or less	4,000	41	61,500
Total		4,176	100	150,000

Source: Compiled by author, based on Cole (1979, Table 1 1, p. 79) and Dodwell (1986, p. 31).

If the synergy *with* suppliers *can* take place in *Japan,* if *all the* parts are designed there, there is *little* need for those relations *in the U.S.*

system," the close relationship between assemblers and suppliers, the team approach to design, the troubleshooting role played by production workers, through its operations in Japan. Since it produces the same vehicles in Japan it can work out any bugs in the production process there. If the synergy with suppliers can take place in Japan, if all the parts are designed there, there is little need for those relations in the U.S. In fact, if Toyota began to dismantle its system and moved parts to the U.S. it would weaken relations with long-term suppliers.

On the other hand, Toyota can transfer a debugged assembly line to the U.S. and use its U.S. production workers in standardized, low-skill jobs on the assembly line. Since the assembly process is among the most mechanized and hence immutable parts of the production process, there is less room for worker input than is the case of batch production or in the design process. If the Japanese assembly workers make necessary changes during the start-up process in the sister plant in Japan, then the American production workers can be reduced to machine tenders.

Even the presence of teams would not necessarily indicate that the industrial relations system was being transferred. While teams can provide a format for discretionary worker input into the production process, they also serve a supervisory function. Teams are still the most cost-effective system for monitoring workers. If the reward structure is even partially based on team performance and if workers monitor one another, teams can eliminate the need for a supervisor. But that does not imply that they have discretionary roles in a constantly evolving production process.

Neither does the fact that transplants source parts just-in-time from hundreds of U.S.-based suppliers imply a transfer of the sourcing prac-

TABLE 5
index of Hourly Wages
in Japanese Auto Parts, 1983

Tier	Firm Size	Index of Wage Rates
1st	5oot	100
2nd	100-499	a7
3rd/4th	30-99	67

Source: Compiled by author from Cole and Yakushiji (1984, p. **160).**

tices. There are many parts in a vehicle which do not require collaborative engineering between assemblers and suppliers. Those parts are traditionally purchased through a standard bidding process in Japan from nonexclusive suppliers. These are "third tier" suppliers; they do not work closely with assemblers in the design and development of parts; their function is to absorb the costs and risks of holding inventory and supplying just-in-time.

Evidence from the transplants supports the hypothesis that substantive technology transfer is not occurring. Plant level productivity data suggests that transplant assemblers are less productive than their Japanese counterparts in the actual assembly process. However, firm and industry level data show that considerably more Japanese production and white-collar labor hours go into the average vehicle built in Japan, relative to American hours in the same vehicle assembled in the U.S. Both facts suggest that crucial aspects of the Japanese system are not being transferred to the U.S.

Crucial aspects **of the Japanese system are not being transferred to the** US,

Transplant Productivity

If Japanese firms are successfully transferring their production system to the U.S., the transplants should have levels of productivity similar to those in Japan. In the long run, if U.S. firms are learning from transplants, the productivity gap between U.S. and Japanese firms should narrow. There are many aspects of the Japanese system which should contribute to higher levels of productivity. Because both capital and labor are used more intensely in a flexible production system, per unit use should be lower. The just-in-time inventory system and quality control systems should be reflected in lower real materials input per unit.

Total factor productivity — the average product of all inputs — is the theoretical best measure of productivity. Its measurement is so problematic, however, that the inferior measure of labor productivity, the average product per worker or per hour of work, is more commonly used." Nevertheless, only measures of labor productivity are available to compare Japanese transplant, Japanese home plant, and U.S. plant productivity. Labor hours per vehicle should provide some indication of the extent to which aspects of the system have been transferred, including work incentives and the coordination of production and process design. Labor productivity differences may arise from differences in intensity or intelligence of work effort; differences in design of the vehicle which reduce the amount of labor embodied in like operations; or differences due to the labor-saving effect of just-in-time inventory control.

At the assembly level the average Japanese plant required 33 percent fewer hours to assemble an automobile than the average U.S. plant.

Labor productivity in the auto industry has been measured at the industry, firm, and plant level. The most accurate measure is vehicles per hour worked. The Telesis study (1984) found that there were 15 percent fewer total labor hours in a Japanese subcompact car than in a similar U.S.-built car, and about 32 percent fewer Japanese hours at the assembly level. More than half of the hours per vehicle difference was attributed to product design (as it affected manufacturability), line balancing, and automation. Just under one-third was attributed to the use of "just-in-time" inventory control, different quality control systems, and differences in lines of demarcation in the skilled trades. These findings suggested as early as 1984 that the solution to the productivity dilemma lay less in the industrial relations system than in the design of the product and the production process. It would not be sufficient to train U.S. workers in Japanese production techniques; U.S. managers and engineers would have to be exposed to the product and process-design techniques.

Recent work by John Krafcik and John Paul MacDuffie (1989) confirms these earlier findings and extends the research to measure productivity differences between U.S. plants, transplants, and Japanese plants. They found that at the assembly level the average Japanese plant required 33 percent fewer hours to assemble an automobile than the average U.S. plant. However, the average Japanese transplant required only 13 percent fewer hours to assemble a vehicle than the average U.S. plant, and 30 percent more hours than the average Japanese plant."

Through statistical analysis, Krafcik and MacDuffie determined that labor hour differences were primarily due to differences in the level of automation (11.5 hours between the highest and lowest degrees of automation), secondarily to management practices (9.8 hours difference between the worst and the best), and third, but less statistically significant, to the age of the product design (7.8 hours more for a ten-year-old product compared to a new product).

Automation levels measured the number of operations which were automated in each plant. The only measure for manufacturability is the age of the product design. Unfortunately age of product design masks

important differences in the capabilities of the design staffs of the companies. Because the Toyota design process is organized to ensure manufacturability at the earliest stages of design, a year-old Toyota design will be more manufacturable than a year-old General Motors design.

Three more specific indices measuring factory practice, work organization, and human resource management policy were aggregated into a management practices index. The first, factory practice, measured a set of production practices which are indicative of the degree to which the overall production philosophy is one of just-in-time production (what they refer to as a "lean" factory) or "buffered" production.

The second index, work organization, measured the degree of teamwork, employee involvement, job classifications and rotation, involvement of production workers in inspection, and configuring or programming of flexible automation. Work organization is a measure of intensity-the extent to which work is smoothed through broad job definitions to reduce down time for individual workers. It is also a measure of the use of the full range of skills of the worker. The third index, human resource management, measured screening policies, performance incentives, and continuous training, all policies which are said to contribute to the development of a flexible workforce.

Transplants are slightly more productive ***than U.S. plants, and that*** are ***considerably*** less productive than Japanese ***plants.***

From the Krafcik-MacDuffie study we learn that transplants are slightly more productive than U.S. plants, and that they are considerably less productive than Japanese plants. Automation and age of product design explain two-thirds of the difference, management practices about one-third. But "management practices" is too aggregate a concept for measuring how important industrial relations practices are relative to other production practices such as just-in-time inventory systems or even for measuring the effects of hiring policies which may screen out older or less "cooperative" workers. What the study does suggest by the narrow productivity advantage of transplants over U.S. firms is that a lot of details that may make the Japanese system more productive are probably not being transferred. Perhaps the explanation of the weak transplant performance is that the intensity of work in U.S. transplants is low relative to Japan. But, on the other hand, it may be that many of the more intelligent parts of the system related to design, quality control, inventories, and worker participation are not being successfully transferred.

Differences in labor hours per vehicle at the regional level support the conclusion of limited transfer. Toyota employs 65,000 white-collar and production workers in Japan designing, manufacturing, and assembling 3.6 million vehicles (Toyota Motor Corporation 1987). In the U.S., Toyota ultimately plans to employ approximately 5,500 people when it reaches full production of 550,000 cars in the mid-1990s. Each Toyota employee in Japan produces 55 cars annually. Each Toyota employee in the U.S. will produce 100 cars annually at capacity.

The difference in cars per worker is not a measure of productivity di ferences. Rather, it is clear evidence of the difference in levels of integr tion between U.S. and Japanese operations. Given that American assen bly workers in the NUMMI plant in California require only about 20 pe cent more hours to assemble a car than Japanese assembly workers in tl Takaoka plant in Japan (Krafcik 1987), the overall difference in hours especially striking. Therefore, for each vehicle produced, there must b substantially more labor involved in the "system" work — design, eng neering, high-technology parts fabrication, and research and develo ment — in Japan than in the United States. More hours are required the assembly level, apparently due to differences in automation and ma agement practices for Japanese plants in the U.S. compared to Japanes plants in Japan. Yet Japanese transplant production in the U.S. requir almost twice as many total hours of labor (including white collar) to b performed in Japan. Together these facts suggest that Japanese firms a not successfully transferring the system to the U.S., in part because the are not trying to transfer it. The apparent difference in productivity rea ly reflects the difference in the role of Japanese and U.S. production in th Toyota production system. The U.S. operations are branch assembl plants. U.S. production is a marginal part of the "Toyota production sy tem"; however, U.S. sales are a crucial part of worldwide Toyota sales.

The U.S. operations are branch assembly plants.

Industrial Relations

Because Japanese labor productivity, by various measures, is said t exceed that of U.S. labor productivity and because those productivity di ferences have been attributed (perhaps erroneously) to differences i industrial relations systems, there has been a great deal of interest in th transferability of the Japanese industrial relations system. If the Japanes industrial relations system does account for some of the productivity di ferential, then researchers should be concerned with the transfer of thos aspects of the system that account for greater productivity and the mea sure of successful transfer should be higher productivity related to th industrial relations system.

Though the Krafcik-MacDuffie study is the most comprehensive wor that has been done on automotive labor productivity, it does not provid an answer to the question of whether the industrial relations system i being effectively transferred to the U.S. through transplants. There is n independent measure of the weight that team organization, employe involvement, reduced job classifications, cross-training, and multi-task ing carry in determining the number of hours required to assemble motor vehicle. It is necessary to explain not only why transplants requir fewer hours than a traditional U.S. plant, but also why they require mor hours than a Japanese plant. Perhaps the Japanese firms have been abl to transfer only the appearance, not the effects of the work system an human resource management policies.

Richard Florida, Martin Kenney, and Andrew Mair (1988, p. 7) claim that "transplants are successful because they tap the full capabilities of shop-floor workers" through the use of teams and job security. Yet Laurie Graham (1991) suggests that the cooperation, trust, and loyalty so central to the industrial relations system in Japan are not being successfully transferred despite the fact that the associated institutions of teams, *kaizen* (continuous improvement), and consensus decision-making apparently are. The author, who spent six months working at the Subaru-Isuzu (SIA) plant in Lafayette, Indiana, concluded that successful transference at one level of measurement is not synonymous with successful <adaptation of worker behavior on the shop floor. This "raises the question of whether the existence of formal structure is a reliable measure for determining the successfulness of intraorganizational transference, particularly when a distinctive feature of that organization is employee commitment, identification and loyalty" (Graham 1991, p. 38). She illustrates the two-sided character of these institutions as mechanisms to both ensure control and elicit cooperation. For example, *kaizen* is possible because workers identify their interests with those of the firm and its success. But continuous improvement occurred in the SIA plant even without cooperation because teams monitored one anothers' behavior, team leaders were constantly observing each worker's performance, and there was a rigorous application of time and motion studies.

> *Kaizening provided a mechanism for keeping decisions under tight control of the company. Workers were seldom allowed to make even the most inconsequential decision on their own ... it was nearly impossible to reach a consensus that involved little more than token input from workers. Decisions tended to conform to management's wishes and the topics raised for discussion were shaped by management....*
>
> *Kaizening is not only designed to capture a worker's secrets for gaining spare time; once management appropriates that knowledge, it controls when, where and how these ideas are implemen fed. (Graham 1991, pp.35-36)*

At another transplant, workers boycotted quality circles for several months. "People got tired of puking up ideas to take a few more people off an operation, in exchange for a cup of coffee," claimed the local union president. "The company decided what ideas would be used. They would snap up any ideas to increase productivity, but ignore any suggestions that might make our jobs a little easier.""

Even if there are tremendous productivity advantages related to the organization of work and incentive systems, we still do not know whether it is a revolutionary system based on the willing cooperation of the workforce or merely a system of "management by stress" which marshals group pressure to speed up the work process and discipline the less productive workers (Parker and Slaughter 1988; Dohse, et al. 1988). A system of management by stress may have within it the seeds of its own undoing. Though efforts by the United Automobile Workers (UAW) to organize Honda and Nissan have thus far been unsuccessful, the 1989

A system of **management by stress may have** within it **the seeds of ifs** own **undoing,**

campaign at Nissan revealed health and safety abuses and evidence of a debilitating pace of work which may not be sustainable as the young workforce ages. Though the press treated a 69 percent vote against union representation as a clear indication that things were good for workers at Nissan, one could also view the 31 percent vote for representation as a heroic act by 800 people in spite of fear of possible reprisal.

The health and safety issues raised at Nissan may be far more than a convenient organizing tool. The same local union president quoted above, argues that the biggest problem in his plant is *"kaizen,"* the concept of continuous improvement. "They give us 90 percent of the people, 90 percent of the machines and 90 percent of the tools required to do the job and as soon as we figure out how to do it they take away another 10 percent. Every job is tough. Within two years," he argues, "people have repetitive motion injuries." Because there are no job classifications and only limited transfer rights, people are unable to transfer out of unhealthy jobs. This union official claims that they have tremendous problems with the medical department which regularly denies S&A (sickness and accident leave) to people who have used up their allotted sick days. Since employees can be fired for excessive absences, they are faced with a choice of continuing to work on a job which is making them sick, or running the risk of being fired. "In the long run," he claims, "people are chewed up and spit out in two to three years. Why do you think the Japanese build plants in Tennessee and hire young people fresh off the farm with no auto experience? They buy their first car, get locked into monthly payments, and they'll do anything."

It may be that workers are willing to accept a more stressful doily work environment in exchange for the long-term job security.

On the other hand it may be, as Clair Brown and Michael Reich (1989) suggest in the case of NUMMI, that workers are willing to accept a more stressful daily work environment in exchange for the long-term job security. Anyone who has been to NUMMI, where many of the production workers were formerly employed in the same plant under Chevrolet management, knows that a lot of people in that plant prefer the new system to the old (Milkman 1988; author's interview, November 15, 1988). I was told by workers at the NUMMI plant that people prefer to work in teams and to have some input into the work process. There were also people who felt that the new system was more equitable; now everybody was expected to put in eight hours of work for eight hours of pay. NUMMI is unique, of course, in that it is the only plant for which the majority of the workforce had previously worked in a Big Three plant.

Finally, there is some doubt that U.S. workers are being taught new skills. Production workers may be working in an environment which they prefer, but can one really argue that they are learning new skills? What about upper- and middle-level management and skilled workers? Japanese investors, like any foreign investors with which the U.S. has commerce treaties, are legally allowed to rely heavily on upper- and middle-level managers and technical "trainers" brought in from Japan during the start-up phase of their operations. The Japanese firms are also

required to train U.S. nationals to assume responsibility for these tasks. Yet, there are still large numbers of Japanese nationals in both high- and middle-level management positions in most of the Japanese plants, even those well beyond the start-up phase. Pension fund data submitted to the IRS indicate that there were over 300 Japanese nationals in the Honda plant in 1987 (U.S. IRS 1987). Japanese nationals are being brought in to install new assembly equipment during changeover and maintain the equipment when changeover is completed. Steve Babson (1988) noted a large number of Japanese nationals in the Mazda plant, though none on production jobs, so he assumed they must be managers, specialists, and trainers. Graham claims that all the stations in the SIA plant were designed by a Japanese trainer (1991, p. 6).

Stephen Herzenberg claims that State Department data on visas issued to Japanese nationals

> *appear to* confirm *fhe State Department's assessment (based on information on individual companies) that Japanese companies do not employ Japanese nationals simply to smooth the "launch" of their U.S. transplants. Instead, fhey appear to use them as a significant part (3.5-10 percent) of their permanent workforce.... Several thousand of fhr Japanese nationals at U.S. transplants arc probably "ordinary skilled workers" who do not have significant supervisory responsibilities or specialized knowledge.... Japanese auto assembly and supplier transplants employ over 50,000 workers in fhr U.S.—more than a quarter of fofal employment at all Japanese-owned facilities in this country. Evidence on individual auto plants suggests that the auto sector accounts for an even higher fraction of the Japanese nationals and Japanese skilled workers employed in the U.S. (1990, p. 1)*

A survey of 4,500 Americans employed by Japanese firms in the United States, including one automaker, found that 60 percent felt they were left out of the important decision-making process by Japanese managers." If Japanese transplants continue to rely on Japanese nationals for mid-level management, technicians, and "trainers," it is unlikely that many of these skills will be transferred to the American workforce. U.S. engineers will not be trained in Japanese methods of product and process design; U.S. managers will not be capable of running a just-in-time inventory system; and skilled trades people will not be trained in quick die-change techniques.

If Japanese transplants continue to rely on Japanese nationals for *mid-level* management, *technicians,* and *"trainers,"* it is unlikely that many of these skills will be transferred to the American work force,

Supplier Relations

The real heart of the vehicle-the engine, transmission, suspension, steering, and electronic controls-are complex, engineering-intensive, and difficult to manufacture.[15] Their development must take place as the car itself is being designed. The earlier suppliers are involved in the design process, the lower the overall development and manufacturing

costs and the shorter the lead-time necessary for product development. For Japanese firms the typical lead-time is four years compared to eight years in U.S. firms. Those components are integral to the identity of a vehicle. Such complex parts are generally delivered as part of a system. The supplier must coordinate other suppliers and be involved in the design process of the vehicle. The collaborative relationship between Japanese assemblers and suppliers in the design and development of parts gives Japanese firms an enormous competitive advantage in terms of cost, lead-time, and quality.

Those **parts that** are being **sourced** in **the U.S. are** being **purchased almost** exclusively from **Japanese** suppliers,

These components are not being built in-house by the transplant assemblers, nor are they being sourced from outside suppliers in the U.S. They are being designed and largely manufactured in Japan. On average, the transplants are performing only assembly and stamping at their twelve assembly plants. Six of the twelve plan to do some form of engine production, but only Honda plans to actually cast and machine the major engine components (engine blocks, cylinder heads) in their U.S. facilities. Honda also plans to cast transmission cases and assemble transmissions in the U.S. Toyota plans to cast cylinder heads and intake manifolds at a new aluminum foundry in Missouri. The remaining companies which plan engine production will at most assemble or simply "dress" the engines (Table 6). Less than one quarter of the cost of engine production lies in the assembly of the engine.

As is typical of Japanese manufacturers, all other parts are outsourced. But most are being sourced from Japanese suppliers in Japan. Only hardware (door handles, locks, seat adjustors, mirrors, etc.), soft trim, plastic trim, glass, batteries, mufflers, tailpipes, tires, wheels, brake parts, seats, and windshield wipers are being bought in the U.S. from U.S. suppliers.[16] These parts all have in common that they are relatively easy to manufacture, require little engineering, are generic in nature (the same part can fit on several vehicles), and the identity of the vehicle is not defined by these parts.

Those parts that are being sourced in the U.S. are being purchased almost exclusively from Japanese suppliers which have established branch plants in the U.S. (and in some cases formed joint ventures with U.S. firms). The transplant suppliers are thus setting up a second supplier industry in the U.S. for the simple parts which are traditionallv outsourced, parts for which there is already excess US. supplier capacity.

Florida, Kenney, and Mair (1988) concluded from a survey of 73 transplant suppliers that "the Japanese supplier system is being successfully transferred to America.... The great bulk of deliveries conform to `just-in-time' inventory requirements.... Engineers from assembly plants help suppliers overcome quality and production problems.... [Our] survey also indicates that assemblers and suppliers interact quite frequently and commonly engage in joint problem solving. More than two-thirds said they participate closely with assemblers in the development of new products" (p.8).[17]

TABLE 6
Transplant Drivetrain Sourcing

Transplant Firm	Drivetrain Sourcing
CAMI	drivetrain imported
Diamond Star	engine assembly
Ford-Nissan	engine assembly from Nissan U.S.
Honda U.S.	engine and transmission manufacture
Honda Canada	engine from Honda U.S.
Hyundai	drivetrain imported
Mazda	half engines imported; half from Ford
Nissan	car engine assembly; truck engine import
NUMMI	drivetrain imported
Subaru-Isuzu	drivetrain imported
Toyota	engine assembly; some casting

Sources: Compiled by author from Ward's Automotive Reports and Automotive News, various issues.

The transplant suppliers are thus setting up a second supplier industry in the U.S. for the simple parts which are traditionally outsourced, parts for which there is already excess U.S. supplier capacity,

Akira Takeishi (1990) came to less optimistic conclusions in a survey of the sourcing practices of U.S. firms, Japanese firms operating in the U.S., and Japanese firms operating in Japan. He found that because "most of the product and process engineering is still carried out in Japan...the limited engineering capability of Japanese auto and parts transplants...prevents them from achieving a target price ratio equivalent to that in Japan" (p. 55-56). "Since one critical source of cost reduction in Japan is design changes based on value analysis, . . . the lack of engineering capability of Japanese supplier transplants makes it difficult to carry out VA [value analysis]" (p. 60). He finds that transplant costs are higher and price reductions slower than in Japan. Takeishi does conclude that this is a transitional impediment to Japanese transplant supplier success. But Takeishi's survey covers only four parts-instrument panels, seat assembly, gauge assembly, and shock absorbers. If even in these cases engineering is not being transferred to the U.S., then what of the engineering-intensive parts?

Susan Helper (1990a) concludes from a survey of 453 auto parts firms in the U.S., most of which sold something to Japanese transplants, that the U.S. firms expected the relationship to be temporary, lasting until a Japanese supplier relocated to the U.S. They were allowed to sell only single components, not systems; they were not given substantial technical assistance by the customer; nor did the customer accept design modifica-

tions from the supplier. In summary,

> *... fhese conclusions are not surprising given the nature of the relationships between Japanese automakers and their suppliers. Much of the success* of the *Japanese industry has been based on automakers' long-term commitment to their suppliers. Now that political and economic pressures have caused the automakers to start producing in the United States, they must walk a tightrope between alienating their new hosts in North America, and abandoning their tradifional suppliers, particularly small suppliers, and employees, who cannot easily follow the assemblers to the U.S. (pp. 1-3)*

Automotive News reports that

> *few American company executives are willing to publicly complain for* fear of harming business opportunities, but many of them *argue that the Japanese carmakers and their fradifional Japanese suppliers are so closely tied in ozonership that if is nof in fheir financial interest to szoifch to American suppliers .... An Acustar (Chrysler parts division) insider claims that one transplant purchasing executive he approached said there was no way in hell' Acusfar would ever do business zoifh the carmaker. The transplant's posifion, fhe parts executive relates, was fhaf Acustar is too closely tied zoith the competition and is not part of fhe carmaker's traditional family of parfs suppliers. (June 11,* 2990, *p. 22)*

In the U.S., transplants **buy** *low* **value-added, standardized ports** from nonunion **transplant suppliers,**

Just as the use of teams, consensus decision-making, and *kaizen* do no provide a measure of the transfer of the industrial relations system, th fact that transplants source parts just-in-time from hundreds of U.S. based suppliers cannot be taken as evidence of the transfer of the suppli er system. In the U.S., transplants buy low value-added, standardizec parts from nonunion transplant suppliers which pay an average hourly compensation rate 40 percent below the average for the auto parts secto as a whole. These are "third tier" suppliers; they do not work closely with assemblers in the design of parts; their function is to absorb th costs and risks of holding inventory and supplying just-in-time.

Exports in Transfer Clothing

Despite the claim that Japanese firms spend more money training American workers, pay American workers higher salaries, give them more job security, and make them far more productive than American firms, on closer examination, these factors do not add up to the transfe of a superior production system to the United States.

Japanese investment in the U.S. auto industry does not fit the profile of foreign direct investment which has been promoted by Graham and Krugman, Reich, and Lawrence. It is unlikely that there will be positive externalities for the U.S. economy. In fact, the investment practice o Japanese automakers differs little from imports. Japanese firms have cir-

cumvented the restrictions of the voluntary restraint agreement without really abandoning integrated production in Japan. The "Japanese production system" remains in Japan while something very close to the end product is exported to the U.S.

Furthermore, it appears that Japanese firms have not sacrificed the factor cost advantages associated with the dualistic structure in Japan when they come to the U.S. In the next section, I show that there are real differences in factor costs facing U.S. and Japanese firms. The differences in factor costs are based primarily on differences in benefit costs which occur when new plants are built in an industry populated by older plants and an aging workforce. Japanese firms are able to employ a segment of the labor force which is not currently available to the Big Three. There are additional advantages derived from the tax system and from low wage rates in the secondary sector of the industry.

The ***location*** **policies and hiring** ***practices*** **of some** ***transplants*** **seem to be designed** ***to*** **avoid employing minorities, women, older workers,** ***and*** **people with union experience,**

Transferring Dualism and the Transplant Cost Advantage

The cost differences follow from the different structures which prevail in U.S. and Japanese-parent auto production in the United States. U.S. parent assemblers have an older workforce and source a higher proportion of parts in-house and from unionized parts suppliers. Japanese firms have younger workforces and outsource a large proportion of their parts, both from Japan and from very low-wage, nonunion Japanese parent parts suppliers in the U.S. There is little wage differential at the assembly level, but there is a very large benefit-cost differential. At the supplier level, there is a huge differential both in wage rates and benefit costs.

U.S. firms are comprised of assembly-centered firms with varying degrees of vertical integration." General Motors produces about 50 percent of its parts in-house, Ford 40 percent, and Chrysler about 30 percent. The remainder of the parts are sourced from outside suppliers, located largely in the United States. All in-house parts employees are covered under the Big Three contracts and are compensated at the same rate as assembly workers. Only 36 percent of the workforce of independent (non-Big Three) suppliers were still unionized in 1985 (Herzenberg 1989, Table 48); the unionization rate is undoubtedly lower now.

The average compensation for workers in the parts sector (including workers in the Big Three) was about $16.88 in 1986, 75 percent of compensation in the assembly sector; average compensation in the independents was about $13.00 or 58 percent of compensation in the assembly sector (and 77 percent of the average for the parts sector), as shown in Table 7."

The U.S.-parent firms operate approximately 70 assembly plants in the U.S. and Canada, most of which are 30 or more years old. There are about 200 in-house parts plants. The workforce in the Big Three plants, now comprised largely of workers with at least 10 years seniority, averages 45 to 50 years of age.

Japanese firms now operate 11 assembly plants in the U.S. an Canada. With the exception of the NUMMI plant (the General Motors Toyota joint venture) which is a retrofitted postwar General Motors plan no transplant is more than 13 years old, and most are three to five year old. Workers in transplant assembly operations are paid wages compara ble to those in Big Three assembly plants (*Automotive News,* July 2, 1990) This is not surprising since three of the plants are organized by the UAW and the rest are trying to avoid unionization. The average age of th workforce in these plants is 25 to 30 years (U.S. IRS 1987).

Japanese operations in *the U.S.* are *essentially* assembly operations,

The location policies and hiring practices of some transplants seem t be designed to avoid employing minorities, women, older workers, an people with union experience. Plants have been located in rural areas far from traditional manufacturing centers, far from concentrations o minorities, and where wage levels are well below those of Midwestern auto communities. Transplants have hired blacks in proportions substan tially below their population ratios (Cole and Deskins 1988). In 1988 Honda was ordered to pay $6 million to 377 blacks and women for dis criminatory hiring practices at its Marysville, Ohio plant. Honda wa also charged by the Equal Employment Opportunity Commissio (EEOC) with age discrimination and forced to hire with back pay an seniority 85 workers aged 40 and over who unsuccessfully applied fo jobs in 1984 and 1985 (Tolchin and Tolchin 1988).[20]

Japanese operations in the U.S. are essentially assembly operations On average, about 50 percent of the value of parts used in transplants ar imported from Japan.?' U.S.-sourced parts are either purchased from out side suppliers or manufactured within the assembly plant. The vas majority of parts purchased from outside suppliers are purchased from U.S. subsidiaries of Japanese parts manufacturers. These "transplan suppliers" are exclusively nonunion and compensation rates are about 4 percent of compensation rates in Big Three parts plants and 58 percent o compensation rates for the parts industry as a whole (see Table 7).

The 300 Japanese transplant parts firms are located largely in the upper South and Ontario, around the transplant assemblers. The center of gravi ty of auto production is clearly shifting toward the upper South and Ontario. While some researchers attribute the motive behind the new concentration of automotive production in the upper South to economies of agglomeration, equally important is the fact that suppliers have been located at sufficient distance from the assembly plants and from one another to avoid the concentration which has traditionally facilitated unionization in this country In an industry where wage rates were taken out of the calculus of assembly plant location decisions long ago, Japanese firms are successfully bringing compensation back into competition.

These structural differences account for the enormous cost differential between U.S. and Japanese firms. There are three sources of the cost advantage: first, a minor but much publicized advantage comes from the tax breaks and subsidies offered by localities in the bidding war for

TABLE 7
Hourly Earnings and Compensation Rates in the Auto Industry, 1986

Sector	Average Hourly Earnings	Index	Total Compensation	Index
Big Three Assembly and Parts	**$15.00**	**100**	$22.50	**100**
Transplant Assembler	**15.00**	**100**	**17.50**	77
Parts:				
Total	**12.69**	**85**	**16.88**	75
Independents	10.40	**69**	**13.00**	58
Transplants	8.00	**53**	**10.00**	44

Source: Author's calculations as explained in endnote **19.**

The far greater advantage comes from *the* tremendous *savings* in fringe benefit costs *associated* with *the* use of a youthful nonunion work force.

Japanese investment, subsidies which are not available to the Big Three to upgrade their existing facilities. The second and far greater advantage comes from the tremendous savings in fringe benefit costs associated with the use of a youthful nonunion workforce. The third cost advantage comes from use of low-wage third and fourth tier suppliers.

State Subsidies

In order to attract new assembly plants, state governments have engaged in an elaborate bidding war. Typical incentives have included job training funds and infrastructure improvement. Roads, sewers, and bridges have been built, and plant sites have been purchased by the states. Up to 100 percent tax abatements for 15 to 20 years, and in one case 40 years, have also been offered. The typical direct incentive is now averaging $50 to $100 million per plant; Indiana spent $85 million to get the Fuji-Isuzu plant. The indirect incentives such as tax abatements and loans can reach $50 to $100 million. Kentucky offered Toyota a total package of direct and indirect incentives worth more than $300 million (Glickman and Woodward 1989).[22] A state subsidy of $200 to $300 million is a hefty subsidy for the typical investment of $500 million in a "greenfield" plant at a new location. Some of the states are paying as much as $100,000 per job. That is equivalent to paying the entire wage bill for two to three years.

State subsides are, however, a relatively small part of the cost adv tage on a per vehicle basis, averaging about $50 to $75 per car annu over a lo-year period. The biggest advantage associated with greenfi ing is the opportunity it affords to use a young, nonunion labor f with low fringe-benefit costs.

The Pension Cost Advantage

Consider the pension cost differences. The Big Three have defi benefit pension plans. Each employee is guaranteed a monthly incom as much as $1,500 after 30 years of employment. The companies n contribute to the fund whatever amount is necessary both to meet current obligations and guarantee that the fund will be adequa financed to cover future obligations. As the domestic industry declined, an ever-smaller base of workers has funded, through t hourly compensation, a pension fund which must support an ever-la pool of retirees. The companies did not anticipate in the 1970s that t would be supporting a retiree population as large as their active w force by the mid-1980s. As a consequence, the cost of supporting th funds as a portion of active hourly labor costs, has escalated over the ten years.[23] In 1987, the Big Three paid between $2,300 and $6,600 i the pension fund for each hourly worker, the equivalent of $1.10 - $3 per hour, assuming 2080 paid hours per year.

There is a tremendous ***labor cost savings in benefit costs, especially for pension and*** **medical insurance,**

Even if a transplant pays UAW-level assembly base wages, there tremendous labor cost savings in benefit costs, especially for pension medical insurance. Take the example of Toyota where employees covered by a defined contribution pension plan. Under the terms of plan, the company will match contributions of the employee up to f percent of wages. If the employee contributes four percent of his or wages, the maximum company contribution per employee will be $1,3 a year or 61 cents per hour, roughly 19 to 55 percent of the hourly p sion cost to the Big Three."

The cost of a defined contribution plan is driven by the savings beh ior of employees, but only to the limit of the cap on the contribution the company. According to Teresa Ghilarducci (1991), young workers not inclined to save under the plans. Hence, the cost to the company probably considerably lower than 61 cents per hour. Unlike the case defined benefit plans, costs for companies with defined contribut plans are unlikely to escalate unexpectedly. Costs rise only with w rate increases, improvements in the negotiated benefits, or changes in savings behavior of employees, all predictable and controllable events.

However, the transplants have lower pension costs even when th use defined benefit pension plans. Mazda, Diamond Star (DSA), Niss and Honda all have defined benefit plans (Table 8). Mazda and DSA both union plants. They probably negotiated defined benefit pl because the union pressured them to adopt plans comparable to the I

TABLE 8
U.S. Motor Vehicle Assemblers' Pension Plans, 1987

Firm	Date	Type	Benefit Formula
Chrysler, GM	1950	DB	32 percent of preretirement earnings Ford, and for a 30-year veteran.
Honda	1982	DB	2.5 percent of career average salary for every year of service.
Nissan	1983	DB	Maximum 50 percent of salary [including Social Security) for 30 years of service.
NUMMI[b]	1985	DC[a]	Maximum three percent of salary contributed to match employee's contribution.
Mazda	1987	DB	0.9375 of career average salary plus 0.9375 of salary above one half social security maximum earnings base. Approximately 1.5 percent of career average for every year of service.
Toyota	1986	DC	Limit three percent of earnings contributed to match employee's contribution.
Diamond Star	1989	DB	NA
Subaru-Isuzu	1990	DC	NA

Notes: DB = defined benefits.
DC = defined contribution.
NA = not available.
[a] = Changed to DB in 1989.
[b] = Toyota-GM joint venture.

Source: Compiled by Ghilarducci (199 1) from 1987 IRS Form 5500 for each company.

TABLE 9
Pension Cost Per Hour, 1987

Firm	Hourly cost per worker	Hourly cost per participant	Ratio participant/ worker
Chrysler	**$2.90**	$1.55	1.80
Ford	**2.63**	1.45	1.81
GM	**0.95**	**0.58**	1.62
Nissan	NA	NA	NA
Honda	0.50	0.50	1.00
Toyota	0.43	0.43	1.00
NUMMI	0.39	0.39	1.00
Mazda	NA	NA	NA

Notes: NA = not available.
Participants include all those eligible to receive a pension now or in the future: workers, retirees, survivor spouses and those eligible in the future but not currently employed.

Source: Based on Ghilarducci (1991, Table 3, p. 10);
Original source: 1987 IRS Form 5500 for each company.

Three. Honda and Nissan, the first transplants in the U.S., probably adopted defined benefit plans to avoid any obvious differences between compensation packages in their nonunion plants and those in union plants. Though the benefits to the workers will be comparable to those in Big Three plants, the cost of funding the plans will be much lower because there are no current obligations to a large pool of retirees. It will be a very long time before these plants see active/retiree ratios comparable to those of the Big Three. All workers now legally vest (have the right to a pension) after five years of service, but the level of the benefit and the cost of provisions increases with years of service.

NUMMI, Toyota, and Subaru-Isuzu (SIA), negotiated defined contribution plans, though NUMMI switched to a defined benefit plan beginning in 1989 (see Table 8). Since Toyota and SIA are latecomers, perhaps they realized the threat of unionization was fairly minimal, especially after witnessing the repeated failure of union drives at Honda and Nissan.

Participant-worker ratios differ greatly between firms, especially between transplants and Big Three firms. Participants include all retirees

or their survivors, those eligible to receive a pension in the future but no longer working for the company, and current workers. Because of the accounting method used which attributes all pension costs, both present and future funding, to the current cost of labor, a large pool of retirees (reflected in high participant to worker ratios) implies high pension costs per hour of labor.

Hourly pension costs per worker for Honda, NUMMI, and Toyota in 1987 were fifty cents or less, while Big Three costs ranged from nearly $1 to almost $3 (see Table 9). The large difference between General Motors, on the one hand, and Ford and Chrysler, on the other, is in part due to the proportionately smaller pool of General Motors retirees. It may also reflect changes in investment return assumptions which reduce the current liability for the company. NUMMI is an interesting footnote. Although the average age in the plant is probably comparable to the age in a General Motors plant (since most of the workers were drawn from among those employed in the plant when it was a Chevrolet plant), hourly pension costs are low because General Motors absorbed the accrued pension liabilities when it entered into the joint venture with Toyota. For the purposes of pension cost to NUMMI, these workers are 25 to 30 years old.

With escalating health care costs in the U.S. the transplants' savings in medical insurance **costs associated with a** young labor force have been **spectacular.**

Health Care Costs

The costs of funding a large number of retirees from the hourly labor costs of an ever shrinking base of active workers is even more staggering in medical insurance. Of course, one could not have predicted how large this factor would be today back in 1982, when Japanese firms began to build plants in the U.S. But with escalating health care costs in the U.S. in the last decade, the transplants' savings in medical insurance costs associated with a young labor force have been spectacular. Even if the transplants have exactly the same medical benefits as a typical Big Three firm, for a workforce with an average age of 25, the cost will be half that of a workforce with an average age of 45. The average age at Honda was 30 years after seven years of operation, the average age at Mazda, less than 30. The average age of the Ford production workforce in 1989 was 48 years.

In 1988, the cost of medical benefits at the Big Three averaged $3 to $4 an hour. Each firm was spending almost $6,000 to $8,000 per year per active employee, or $520 to $660 per month to cover health insurance for both an older active workforce and a large population of retirees.[26] An adequate individual insurance policy for a healthy person cost about $300 a month as of 1990. Suppose transplants were spending $300 a month ($3,600 per year) on insurance for healthy young workers and a negligible retired population at that time, their hourly health insurance costs would have been approximately $1.75 per hour for a 2080-hour year. Since there are insurance discounts for large institutions, the actual cost would probably have been lower.

These estimates are confirmed by an internal Chrysler memo (1990) which compared the hourly health care costs at NUMMI ($1.70) and Chrysler ($4.20). Health care costs were probably higher at NUMMI than at the average transplant because the workforce is older.

Supplier-Related Cost Advantages

Transplant assemblers enjoy an hourly labor cost advantage of between $2.50 and $5.50 an hour over the Big Three, due to the pension and medical benefit cost advantages of building greenfield plants and using a young labor force.

Transplant suppliers have labor costs which are 44 percent of labor costs in Big Three assembly and parts plants and 77 percent of labor costs in the average independent ports supplier.

For the transplants, the benefits of greenfielding do not stop at assembly labor costs. Sixty-five to 80 percent of the cost of a vehicle is in purchased materials including semi-finished materials — steel, aluminum, iron, fabrics, plastic — and component parts. For transplants the purchased materials share is closer to 85 percent. At this point, transplants probably enjoy lower purchased materials costs for several reasons. First, about 50 percent of their purchased components are still imported from Japan where all the cost advantages of the Japanese system, including the use of third tier suppliers, are operative. Second, those components which are purchased in the U.S. come almost exclusively from Japanese suppliers operating in new greenfield plants themselves. Greenfield suppliers enjoy similar cost advantages to greenfield assemblers — a young workforce and lower benefit costs. As noted earlier, transplant suppliers have labor costs which are 44 percent of labor costs in Big Three assembly and parts plants and 77 percent of labor costs in the average independent parts supplier (Table 7).

Suppose, hypothetically, that Big Three firms sourced 50 percent of the parts in-house, paying assembler-level compensation rates of $22.50 in 1986, 40 percent of their parts from independents, paying $13.00 an hour, and 10 percent from overseas where we will assume the same labor compensation rate as for parts from Japan ($7.50). The weighted average labor costs for all labor embodied in the parts would be $17.20 per hour (Table 10). Suppose that transplant assemblers sourced 15 percent of parts in-house, paying $17.50 an hour ($15 an hour in wages and $2.50 an hour in benefit costs). 85 percent of parts were outsourced, half to transplant parts suppliers, where average compensation rates are $10 per hour, half from Japan where average hourly compensation costs for the industry were $7.50 in 1986 (U.S. Department of Labor, BLS March 1989). The weighted average hourly compensation rate for the transplants is $10.06, 58 percent of the rate paid by the Big Three (see Table 10). This *is* a crude estimate, but the labor cost differential is of such a magnitude that any fine tuning of the estimate would not significantly close the gap. Japanese firms retain a very large labor cost advantage due to the kind of investment they undertake in the U.S. market. In fact, since Japanese autoworkers' compensation rates rose to 76 percent of U.S. rates by 1988 (U.S. Department of Labor, BLS March 1989), Japanese firms actually widened the gap through transplant investment.

The Employment Impact Of Transplants

Two issues have dominated the policy discussion of the relative costs and benefits of transplants. One issue is whether transplants will help reduce the trade deficit. The second issue is whether transplants create jobs.

Proponents of FDI claim that Japanese investment will reduce the bilateral trade deficit with Japan. Thus far, no evidence supports that claim. The bilateral automotive trade deficit for 1990 was $31.1 billion. If transplant volume continues to expand and imports remain the same or fall only slightly, then we should expect to see the trade deficit increase. Sean I? McAlinden, David Andrea, Michael S. Flynn, and Brett C. Smith (1991) have shown convincingly that the trade deficit can be expected to reach $38.1 billion (in 1990 dollars) by 1994, an increase of 22 percent in real terms. This study will focus on the employment impact.

The impact of transplants on net U.S. "employment in automotive-related production depends on numerous assumptions including: the period of analysis, the extent to which Japanese transplants are being substituted for imports, and the extent to which U.S.-made parts are used in transplant vehicles. These assumptions vary according to one's understanding of the Japanese strategy in the world market. Some have extrapolated from past and current practice and have attempted to fit Japanese firms into traditional notions of profit-maximizing firms (Lawrence 1990; Fuss and Waverman 1987). Under those assumptions, Japanese firms choose the optimal production location in response to changes in factor and site costs, both of which are greatly affected by currency realignments. Because the relative costs of production have changed in favor of U.S. siting, Japanese firms, following this line of argument, have an incentive to manufacture parts and assemble vehicles in the U.S. market for export to Japan and Europe. If Japanese firms are profit maximizers, they will substitute transplants for imports and increase U.S. content.

On the other hand, suppose that the objectives of Japanese firms are to simultaneously maximize global market share, preserve domestic Japanese employment, and protect the unique relationship between suppliers and assemblers in Japan. Japanese firms would seek the optimal mix of imports and transplants to contain any political opposition to their presence in the U.S., while at the same time keeping enough production in Japan to minimize domestic dislocation and protect their suppliers. High levels of imports and transplants and moderate levels of U.S. content would result. The drivetrain and other high value-added, engineering-intensive components would continue to be designed and largely manufactured in Japan.

The drivetrain and other high value-added, engineering-intensive components would continue to be designed and largely manufactured in Japan,

TABLE 10
Estimated Average Hourly labor Costs for All Production Hours in a Typical Vehicle, 1986

	In-house Assembly and Parts	Outside Domestic	Outside Imports	Total Weighted Averaae	
Big Three Vehicle					
Hourly Compensation	$22.50	$13.00	$7.50	$17.20	100
(weight, in percent)	50.0%	40.0%	10.0%	100.0%	
Transplant Vehicle					
Hourly Compensation	$1750	$10.00	$750	$10.06	58
(weight, in percent)	15.0%	42.5%	42.5%	100.0%	

Source: Compiled by author, based on data from U.S. Department of labor, Bureau of labor Statistics (BLS), Employment and Earnings, March 1989; and Florida (1988).

Prior studies have considered the net effect on employment of transplant investment between 1985 and 1990." In a study done for the UAW in 1986, prior to the appreciation of the yen, it was estimated that by the time transplant sales reached 1.8 million units, as many as 200,000 jobs could be lost (Howes 1986). Under the economic conditions of the time (the yen was still cheap relative to the dollar), it was assumed that every 100 transplants built in the U.S. would displace 100 domestic vehicles and that 37 percent of the average value of a transplant vehicle would be made in the U.S. (37 percent U.S. content).

In 1988, using the same methodology, but assuming a displacement rate of 85 percent and U.S. content of 50 percent, the GAO (U.S. General Accounting Office) estimated that 45,000 jobs would be lost by the time transplant sales reached 1.8 million. In 1988, in response to the GAO report and the altered economic environment, the UAW released a revised study of transplant-related job loss; using assumptions about displacement and content similar to the GAO, the UAW found that 74,000 jobs could be lost to transplants by the time sales reached 1.8 million units (Howes 1988).

In contrast, Robert Lawrence (1990) concluded that transplants would add a net 65,000 jobs to the U.S. economy between 1982 and 1992, in

which year he assumed 2.1 million transplants with average U.S. content of 60 percent would be sold, displacing only 945,000 domestic vehicles (a domestic displacement rate of 45 percent). He also argued that since transplants will generate 196,500 gross jobs, if transplants were prohibited and imports were substituted 196,500 "job opportunities" would be lost."

Because the Lawrence study is the most recent and has attracted much attention, the following discussion focuses on the contrasts between his study and this study. This study estimates that transplants will cost a net loss of 158,000 U.S. jobs between 1982 and 1993 when 2.7 million transplant vehicles with 50 percent U.S. content will have displaced as many traditional U.S.-assembled vehicles." The two estimates use identical methodology but very different assumptions about displacement and local content. The following sections evaluate these assumptions and the associated estimates of job loss.

Increased *transplant* sales entirely displace **domestic products,**

Do **Transplants Displace** Imports or Big Three Vehicles?

Unless the market is growing, every transplant vehicle built and sold in the U.S. will displace either an import or a traditional domestic vehicle. In the best possible world (for American workers and manufacturers), every transplant will be substituted for an import; in the worst, each transplant will displace a traditional domestic vehicle. Domestic displacement measures the rate at which the sale of transplants are substituted for sales of traditional domestic vehicles in the U.S. market. Conversely, import-displacement measures the rate at which transplants are substituted for imports.""

Lawrence argued that the rate at which transplants displace domestic vehicles should be between 0 and 50 percent — for every two transplant vehicles sold, between zero and one domestic vehicles are displaced. He assumed a domestic displacement rate of 45 percent to set an upper limit on job loss. However, as this study will show, for the period 1982-1993, the proper domestic displacement rate should be 100 percent, i.e., increased transplant sales entirely displace domestic products.

Differences exist over the proper measure of displacement partly because there has been no common definition of displacement. Does one measure displacement from 1982 when transplant production began, or from 1986 when imports began to decline? Does one measure import-displacement of same model imports by same model transplants (e.g., a Civic for a Civic), or of same company imports by same company transplants (e.g., a Honda for a Honda), or simply of all Japanese imports by all Japanese transplants? The choice of definition and time frame will affect the measurement of displacement.

Lawrence considered job loss from 1982, the last year before transplant sales began in the U.S., to 1992, when he expected that transplant capacity would peak at 2.23 million units. In practice, the most appropriate time

frame for measuring the final employment implications of transplant production is from just prior to the beginning of transplant production (1982) to the point when planned transplant production reaches capacity.

Lawrence used a "model import displacement rate" — the extent to which transplant production of a particular model (such as a Honda Civic) is substituted for (displaces) imports of the same model. This approach ignores the effect of the Japanese strategy over time to move upscale in the U.S. market and so overestimates the rate of import displacement and underestimates the displacement of domestic products.

Japanese firms reduced their imports of *transplanted* models and introduced new product lines, *constantly* moving upscale *and* into new *market* segments,

The UAW and the GAO both used an "import fleet displacement rate"-the extent to which transplant production of all models is substituted for imports of all models. The "import fleet displacement rate" is the more appropriate measure of displacement. As soon as Japanese firms began to build vehicles in the U.S., they reduced their imports of transplanted models and introduced new product lines in their import fleets, constantly moving upscale and into new market segments. Acura Legends and Integras were substituted for Accords, Infinities were substituted for Sentras, and Lexuses were substituted for Corollas.

But even the displacement rate by company does not capture the full impact of displacement on employment. Each firm is allocated a share of the quota by MITI, based initially on their share of imports to the U.S. market in 1981. But over time, firms which had a small share or no allocation in 1981 have requested a larger share, so that MITI has reallocated shares away from the initial beneficiaries. The firms which have lost quota share will be more likely to replace imports with transplants but the total displacement of imports by transplants across all firms will be less than the company rate of displacement, especially for Honda and Toyota.

The full effect of domestic displacement (one minus the import displacement rate) on net employment and trade is best captured by the use of the "import fleet displacement rate" from the beginning of transplant production to the point when transplants reach full capacity. Early measures of the fleet displacement were guided by expectations about Japanese firm strategy based on oligopolistic rivalry. When transplant production first began in 1982, the Japanese firms were selling 2.2 million imports in the U.S. market. By the mid-1980s, Japanese firms had announced plans to build over 1.8 million transplants in the U.S. by 1990. Since there was no obvious economic incentive to shift capacity to the U.S. before 1986, it seemed likely that the Japanese firms' objective was to guarantee continued expanding access to the U.S. market. Further, based on the ambitions of Toyota, Honda, and Nissan, all of whom planned huge increases in U.S. sales volumes, it seemed probable that rather than substituting for imports, the Japanese vehicle manufacturers would use transplants to add to their volume.

And indeed, between 1982 and 1986, while transplant sales volume grew to 500,000 units, Japanese import sales continued to rise from 2.2

million units to 3.3 million units; with imports growing at the same time, transplants were certainly displacing domestic vehicles. Between 1986 and 1991, imports fell by 1.3 million units while transplants rose by 1.5 million. One would infer that while transplants had failed to displace imports at all until 1986 they are now displacing imports at a rate of almost one for one. But between 1982 and 1991, imports fell by only 200,000 units while transplants rose by 2.0 million units; transplants were displacing domestic vehicles at a rate of 90 percent.

Just as the displacement rate of 1986-1991 could not have been inferred from displacement rates for 1982-1986, neither can future displacement rates be inferred from displacement rates since 1986. First, the enormous growth of imports witnessed between 1982 and 1986 should be viewed partly as a strategy to reserve a share of the market for transplants which would come on-line several years later. It takes several years to build an auto plant but capacity in an existing plant can be expanded with overtime or an additional shift. Between 1986 and 1991, as another 1.4 million transplants were added to the U.S. market, imports were cut back. It would have been imprudent for any Japanese firm to suddenly add 250,000 transplant units (the average capacity of a plant) to the U.S. market without reducing imports.

The enormous growth of imports witnessed between *1982* and *1986* should be viewed *partly as a strategy* to reserve *a* share of the *market* for transplants which would come on-line several years later,

Second, any projections based on recent displacement rates are inconsistent with the plans of Japanese firms for expansion in the U.S. market. Based on their publicly announced plans as of 1988, Japanese firms planned to sell nearly five million units by the mid-1990s, including 2.3 million imports and 2.7 million transplants. These plans were probably in place by 1985. As discussed earlier, once Honda, Nissan, and Toyota had started operations in the U.S., all firms knew there would be unrestrained expansion and that they had better secure a place. Therefore, as the minimum permissible level of imports was expanded under the VRA in 1984 and again in 1985, firms immediately increased imports, many of them knowing that for political reasons they might replace imports with transplants in the long run, but that they would be unable to gain market share if they delayed expansion until U.S. plants were built."'

Therefore, one must really look at the effect both of transplants and imports, since they are both part of an overall strategy in the U.S. market. Imports can be used to penetrate the U.S. market knowing that they will be replaced by transplants once the U.S. capacity becomes available.

Following Lawrence, it is assumed that if the market were constant between 1982 and 1993, the increase in Japanese sales would be exactly equal to the loss or displacement of Big Three sales. (Of course, if the market were to grow, total sales decline would be less and then the total displacement numbers cited here would be "lost sales opportunities," not actual decline in sales). As Table 11 indicates, total Japanese sales increased by 1.8 million units between 1982 and 1991, reflecting a very slight decline in imports and a 2 million increase in transplants. By 1993, or whenever Japanese firms realize their current planned ambitions in

the U.S. market, their total sales will rise to 5 million. While this appears as a slight rise in imports (300,000 units) and an additional increase of 700,000 transplants, actually transplant capacity is planned for 3.2 million so all of the increase could be absorbed by transplants.

Local Content

Most transplants are currently claiming domestic content for their models in the range of 50 to 75 percent, as compared to Big Three models which in 1988 ranged from 86 to over 99 percent.[32] This measure of domestic content, called "CAFE content," is calculated for the U.S. Department of Transportation based on the factory wholesale price.[33] This includes transportation to the dealer, cost of selling (e.g., advertising and dealer prep), and profits, all costs which would be incurred regardless of whether the vehicle was imported or built in the U.S. If local content is to measure the contribution to the U.S. economy of local production relative to imports, it should be based on the cost of production which excludes transportation, selling costs, and profits. Measured on this basis, the contribution of transplants to the U.S. economy is considerably smaller than is implied by their proclaimed content levels.

The contribution of *transplants* to the *U.S.* economy is *considerably* smaller than is implied by their proclaimed content levels,

For example, one transplant which claims to have 60 percent local content, reported to the Foreign Trade Zone Board that only 38 percent (by value) of the merchandise (including parts and materials) which came into the factory in 1988 was purchased from domestic sources. This same company also reported that its domestic content based on cost of production was 44 percent. Therefore, content based on cost of production was 16 percentage points lower than content based on the factory wholesale price. As a measure of benefit to the U.S. economy, if a transplant vehicle with 44 percent U.S. content (based on cost of production) displaces an import vehicle, it is equivalent to replacing an import with 44 percent of a domestic car and 56 percent of an import (Howes 1989).

There is one further twist that makes real content difficult to measure. Many of the parts that are sourced domestically are sourced from transplant suppliers who themselves import components for assembly into parts. "Under CAFE rules, purchases of production parts and components that have received final processing in the United States, regardless of the percentage of their value that originates abroad, are treated as domestic content" (Flynn, McAlinden, and Andrea 1989, p. 34). Alarmed by a U.S. Federal Trade Commission investigation of the anticompetitive implications of the *keiretsu* method of buying among related auto companies, MITI urged Japanese transplant parts suppliers to buy more parts in the U.S. Nippondenso, which has been operating in Michigan for years, has agreed to increase U.S. content from 60 to 80 percent. Akebono Brake has agreed to increase U.S. content from 30 to 80, and Diesel Kiki from 51 to 77 percent (*Automotive News*, April 30, 1990). In June of 1991, preliminary results from a U.S. Customs Service investigation were leaked indicating that American-made engines for the Honda Civic contained just 15

TABLE 11
Estimated Domestic Displacement by imports and Transplants Since 1982
(In millions of units)

	1982	1986	1988	1991	1993[a]
Imports	**2.2**	3.3	2.7	2.0	2.3
Transplants	0.0	0.6	0.8	2.0	2.7
Total	2.2	3.9	3.5	4.0	5.0
Net Increase in Displacement Since 1982		1.7	1.3	1.8	2.8

[a]Estimates for 1993 are based on author's projections.

Source: Estimated by author based on method explained in text.

Content based on cost of production was 16 percentage points lower than content based on the factory wholesale price,

percent by value of North American parts. "The biggest item of local content added at the Anna [Ohio] engine plant was depreciation of the factory's equipment. And most of that machinery had been imported from Japan ..." (*Business Week*, November 18, 1991, p. 106).

Flynn, McAlinden, and Andrea (1989) developed a methodology to estimate real content.'" Figure 6, adapted from Flynn, McAlinden and Andrea, illustrates the calculation of real content for a hypothetical transplant vehicle with a factory wholesale price of $11,000. Sixteen percent of the cost ($1,800) is in marketing, manufacturers' profits, and transportation, all costs which would be incurred regardless of whether the vehicle was imported or assembled in the U.S. These services or operations cannot be imported and hence are "nontradeable." The "tradeable" costs of $9,200 include design, capital costs, management salaries, production labor costs, and materials and parts costs. Twenty-five percent of those costs or $2,300 are incurred in-house, and 75 percent or $6,900 are the costs of sourcing parts and materials from outside suppliers, both foreign and domestic. Of the $6,900 which is outsourced, $4,140 is from domestic suppliers with the remainder ($2,790) imported. However, half of the $4,140 pays for parts from transplant parts suppliers, who are assumed to import half of their inputs (by value).

In this example, the transplant assembler has 75 percent CAFE content, and a real content of 59 percent, 16 points below the CAFE content."' The difference comes from two factors. First, the CAFE content calcula-

tion includes the $1,800 of marketing, profits, and transport costs even though these costs are not really tradeable. And second, the CAFE calculation ignores the fact that the transplant parts suppliers import a significant portion of *their* inputs.

McAlinden, Andrea, Flynn, and Smith (1991) found that Honda imported 48 percent of its parts in 1989, similar to the first scenario above. While Honda was at the time claiming just under 75 percent U.S. content, its "real" local content was 62 percent. All other transplants for which data were then available imported 60 percent or more of purchased parts and materials.[36] Their "real" local content was probably in the range of 48 percent while reporting CAFE content of 60 percent and above. Therefore, as of 1988, it is probable that the real content of U.S. transplants averaged about 50 percent.

As of *1988, it* is probable that the real content of *U.S. transplants* averaged *about* 50 percent,

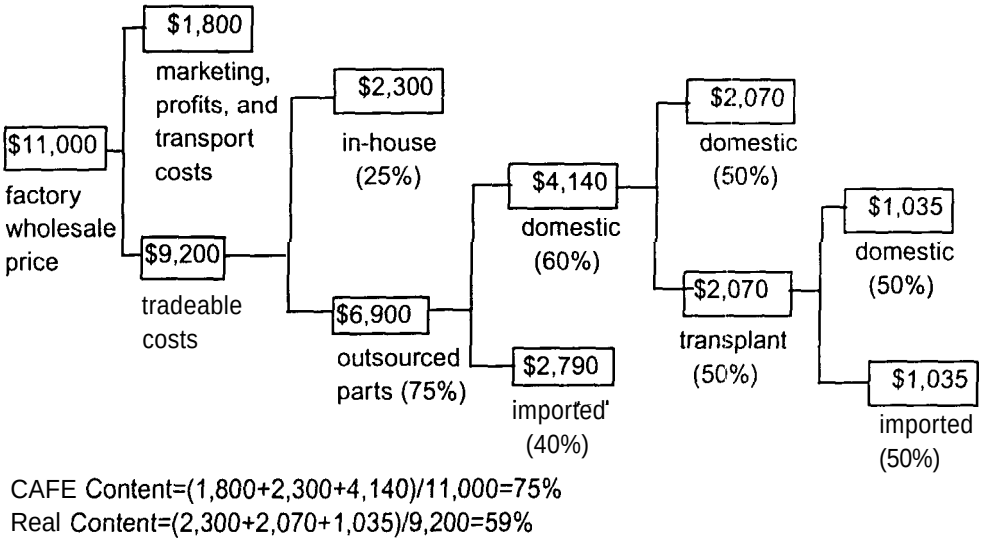
Lawrence believes that, by 1992, the average transplant will be purchasing 60 percent of components and materials in the U.S., the equivalent of 75 percent CAFE content. In order to achieve CAFE content levels of 75 percent, transplants must produce drivetrains in the U.S. Only Honda has plans for local manufacture of engines and transmissions, including casting and machining of engine blocks, cylinder heads, and transmission cases. Toyota plans some casting. Other manufacturers plan engine assembly at most, an operation which represents only a fraction of the value of the drivetrain. Only Honda's claim that it will achieve 75 percent CAFE content (59 to 64 percent real content) is credible. Those transplant assemblers which plan only engine assembly in the U.S. are unlikely to purchase more than 50 percent of parts in the U.S. and are unlikely to achieve real content levels in excess of 55 percent. Those with no plans for engine assembly will achieve content levels below 50 percent. Based on the stated plans of transplants for drivetrain sourcing, I estimate that on average, transplants will purchase only 50 percent of components and materials in the U.S. By the time all 3.2 million units of transplant capacity are in place, the average transplant will have a real content level of about 53 percent (see Table 12).

Estimating Job Loss, Dislocation, and Income Distribution

The estimates of the potential impact of transplant sales on U.S. automotive manufacturing employment, including white-collar and production employment, in this paper use the same methodology originally developed for the UAW (Howes 1988) and subsequently used by the U.S. General Accounting Office (1988) and Lawrence (1990). Potential job loss is calculated holding sales constant to provide a measure of "pure job loss" unaffected by the business cycle. If the market is larger in 1993 than it was expected to be when these estimates were made, fewer jobs will actually be lost; if the market is smaller then more jobs will actually be lost. Therefore this is not a measure of actual job loss but rather an estimate of "employment opportunities" that might have existed in the absence of transplant production.

Figure 6

Official CAFE Content Versus Real Domestic Content of a Transplant Vehicle



Source: Estimated by author, based on method explained in text.

Briefly, the estimated employment effects are based on assumptions about the number of vehicles produced per U.S. worker in traditional domestic plants and in transplants in 1993.[37] Traditional domestic job loss is the volume of traditional domestic vehicles displaced, divided by vehicles per traditional domestic worker. Transplant job creation is measured as transplant production, divided by vehicles per transplant worker.[38] The difference between traditional job loss and transplant job creation is the net employment effect of transplants.

Job loss attributable to sources other than transplants, such as productivity growth and outsourcing should be netted out, as the following hypothetical case illustrates. Suppose 3 million units of sales are lost to Japanese competitors between 1982 and 1993. And suppose in 1982 it took 300,000 U.S. workers to produce 3 million vehicles (10 cars per worker), but by 1993, because manufacturers had reduced the number of people required to do the same tasks and outsourced other tasks to foreign operations, those same 3 million cars will be produced with only 222,000 workers (13.5 cars per worker). Though 300,000 jobs have actually been lost, only 222,000 can be attributed to a loss of sales to Japanese competitors.

The period of analysis is 1982 to 1993, stretching from the beginning of transplant production through the year in which Japanese firms were expected to complete current planned investment and reach full capacity. Lawrence uses a time frame which is similar to the one used in this study, starting in the last year before transplant production began and carrying

TABLE 12
Transplant Content (In percent)

Transplant Firm	Planned CAFE Content	Probable CAFE Content	Probable Real Content	Drivetrain Sourcing
CAMI	75%	62%	48%	drivetrain imported
Diamond Star	75	69	53	engine assembly in U.S.
Ford-Nissan U.S.	80	75	53	engine assembly from Nissan
Honda US.	75	75	59	engine and transmission manufacture in U.S.
Honda Canada CVA	50-60	75	59	engine from Honda U.S.
Hyundai	60 CVA; 50 NAC	62	48	drivetrain imported
Mazda	75	69	53	half engines imported; half from Ford
Nissan	75	68.5	50.5	car engine assembly in US.; truck engine imported
NUMMI	75	62	48	drivetrain imported
Subaru-lsuzu	50-60	62	48	engine imported
Toyota	75	69	53	engine assembly and some casting in U.S.

Notes: CVA = Canadian value added.
NAC = North American content (U.S. and Canadian combined).

Source: Compiled and estimated by author based on reports in Ward's Automotive Reports, Automotive News, Ward's Auto World, Detroit Free Press, Detroit News, New York Times (from 1984-l 992).

through the entire expected period of transplant investment. He assumed that transplant production would peak at 2.23 million units in 1992.

This study assumes that the transplants will reach their total planned capacity" of 3.2 million units and sell a volume of 2.7 million units in the U.S. by 1993. Because previous studies were completed before the current magnitude of investment was known, they assumed smaller numbers.

The domestic displacement rate is assumed to be 100 percent for the period 1982-1993. For any period beginning in 1982, it would be appropriate to assume the same displacement rate. For the period since 1986, however, it is appropriate to assume the smaller displacement rate of 48 percent. The UAW and GAO studies assumed displacement rates of 85 percent. These proved inaccurate for the 1985-1990 period but fairly accurate for the displacement that is expected to occur between 1985 and 1993. Lawrence assumed a domestic displacement rate of only 45 percent for the period 1982-1992. As argued above, and as shown in more detail in the appendix, Lawrence's assumption is ungrounded.

I estimate that between 1982 and 1993, about 158,000 net jobs will have been lost due to transplants.

Employment per plant is a measure of the total employment generated per plant in the end year of the study-1990, 1992, or 1993. It is the total assembly, parts, and materials employment generated for every 200,000 vehicles manufactured in the U.S., assuming all parts and materials are sourced in the U.S. Since two percent annual productivity increases are assumed, total employment in 1993 will be 98 percent of employment in 1992 and 94 percent of employment in 1990. The same assumptions are made across all studies."' As discussed earlier, the transplants are assumed to have a domestic sourcing ratio (DSR) of 50 percent, and traditional domestic producers are assumed to have a DSR of 87 percent. This is close to the assumptions in the GAO and UAW studies. Lawrence assumes a transplant DSR of 60 percent and a traditional domestic DSR of 84 percent. Unlike Lawrence, I believe that Big Three offshore sourcing has slowed to a trickle. There are some components which will continue to go to Mexico, but they will be balanced by other parts coming back to the U.S. Table 13 summarizes the assumptions and the results from the four studies discussed here.

Once the full volume of transplant investment is considered and using realistic and empirically verified assumptions about domestic content and displacement, I estimate that between 1982 and 1993, about 158,000 net jobs will have been lost due to transplants. Table 14 shows the detailed calculations for the four studies-GAO, UAW, Lawrence, and this study. It also includes an estimate of the employment impact between 1986 and 1993.

Lawrence's assumptions about ultimate transplant volume and displacement ratios lead him to the conclusion that the equivalent of only five Big Three assembly plants will close while 11 transplants will open. This study finds that 13.5 equivalent Big Three assembly plants will close while 13.5 equivalent transplants will open. Given his assumption about

sourcing ratios, Lawrence concludes that 17,620 jobs are created by every transplant assembler and associated parts producers, approximately 2,800 more jobs per plant than this study.

Had both studies used the displacement and sourcing ratios assumed by Lawrence, differing only on the assumption of volume, this study would have found a net job gain of 80,000, compared to Lawrence's 65,000. Had both studies used Lawrence's sourcing ratio, while varying their assumptions about volume and displacement, this study would have found a net job loss of 116,650. The displacement assumption explains 180,000 of the 225,000 job difference between the studies. Adding the differences in content assumption explains the final 40,000 employment impact differences. So the displacement assumption is the single most important assumption for explaining the difference in employment impact.

The *aggregate* net job loss predicted here has ***already*** **largely occurred,**

The aggregate net job loss predicted here has already largely occurred. By 1986, 179,000 jobs had been lost to imports. Many of those imports will have been displaced by transplants between 1986 and 1993. Since imports are expected to fall by 1 million units while transplants rise by 2 million over the next few years, the two will offset one another. Between 1986 and 1993, there will in fact be a small increase in net employment of approximately 21,000 jobs (leaving aside any lingering effects of the 1990-91 recession).

However, while in aggregate, no more U.S. jobs will be lost, the dislocation continues. Total Japanese sales are expected to rise by one million units, displacing the equivalent of five traditional domestic assembly and numerous associated parts plants. One hundred and thirty thousand more people will lose high-paying jobs in the Midwest. Many of them will be over 40, and many of them will be black, two groups which have had a difficult time finding new jobs in the auto industry.

By 1993, 357,000 high and medium-wage assembly and parts workers will have been displaced by imports and transplants. Transplants will create 200,000 new jobs. Approximately $10 billion in gross compensation will be lost annually. If these jobs are lost to young people in auto plants in the Upper South, earning comparable wages in assembly plants but much lower wages ($8 an hour) in parts plants, only $3.8 billion in new income will be generated. There will be a net income loss of $6.2 billion to workers in the industry."' If the value of benefits (measured, by cost to the employer) is added, the gross income loss rises to $13.85 billion, while $4.88 billion in new income is generated. The net loss would be as much as $8.97 billion.[42] It is a redistribution from the older rust belt cities of the North Central region of the country to the new auto belt of the Upper South, and from older workers to younger largely white male workers. But most importantly, it is a redistribution from auto workers to transplant auto company profits."

TABLE 13
Assumptions for Employment Impact Studies

	GAO	UAW	Lawrence	This study
Period of analysis	1985-1990	1985-1990	1982-1992	1982-1993
Transplant volume (millions)	1.8	1.8	2.23	2.7
Displacement rate (percent)	85%	85%	45%	100%
Employees per plant[a]	23,879	31,533	30,283	29,620
Transplant DSR	50%	50%	60%	50%
Domestic DSR	87	87	84	87
Annual production increase (percent)	2	2	2	2
Net Job Impact	-45,000	-74,000	+65,148	-158,306

Notes: DSR = domestic sourcing ratio (expressed as a percentage).

[a] = Assumes DSR of 100 percent.

Sources: Calculated by author from U.S. GAO (1988), Lawrence (1990), and Howes' (1988) study done for the UAW, plus new estimates done for this study.

Toward A Policy For U.S. Autos

U.S. firms have lost 2.3 million units of sales to Japanese firms since 1978. While imports are now 300,000 units higher, 2 million transplant vehicles were sold in the U.S. in 1991, all assembled in plants built since 1981. The U.S. had a bilateral manufacturing trade deficit with Japan of $70 billion in 1989; $31 billion of the deficit was in automotive products. According to McAlinden, Andrea, Flynn, and Smith (1991), the bilateral trade deficit in automotive products will grow to $38.1 billion in constant dollars by 1994. Approximately 300,000 jobs have been lost in the industry in the last 10 years. There is an annual net $6 billion transfer of income from autoworkers in Big Three plants who lose their jobs to the Japanese transplants.

U.S. firms face a foreign rival that is superior by all reasonable measures — productivity, cost, and quality. The Japanese came to be superior

TABLE 14

	Volume (millions)		Displacement ratio		Displacement (millions of cars]		Cars per plant /millions]		Number of plants
GAO [Most likely] 1985-l 990									
Domestic	-1.8	x	85%	=	-1.53	/	0.2	=	-7.65
Transplant	t1.8	x				/	0.2	=	9.00
Net effect	-44,721								
UAW (Most likely) 1985-l 990									
Domestic	-1.8	x	85%	=	-1.53	/	0.2	=	-7.65
Transplant	t1.8	x				/	0.2	=	9.00
Net effect	-74,447								
Lawrence 1982-l 992									
Domestic	-2.23	x	45%	=	-1.0	/	0.2	=	-5.0
Transplant	t2.23	x				/	0.2	=	11.15
Net effect	65,148								
This Study-l 982-l 993									
Domestic	-2.7	x	100%	=	-2.7	/	0.2	=	-13.5
Transplant	t2.7	x				/	0.2	=	13.5
Net effect	-158,306								
This Study-l 986-l 993									
Domestic	-2.1	x	48%	=	-1.0	/	0.2	=	-5.04
Transplant	t2.1	x				/	0.2	=	10.5
Net effect	21,156								

Notes: [a] = Sum of assembly jobs per plant plus domestic parts jobs per plant,
[b] = number of plants times total domestic. jobs per plant. Negative numbers are job losses.

Source: Calculated by author based on methodology discussed in this report,

Estimates of Employment Impacts

Assembly jobs per plant	Total parts jobs per plant		Domestic sourcing ratio		Domestic parts jobs per plant	Domestic jobs per plant[a]	Total U.S. jobs	Cars/ U.S. Job
4,068	19,811	x	83%	=	16,443	20,511	-156,911	9.70
2,560	19,811	x	50	=	9,906	12,466	112,190	16.04
5,372	26,161	x	87%	=	22,760	28,132	-215,216	7.11
2,560	26,161	x	50	=	13,080	15,640	140,767	12.78
5,159	25,124	x	84%	=	21,104	26,263	-131,315	7.61
2,545	25,124	x	60	=	15,075	17,620	196,463	11.35
5,046	24,574	x	87%	=	21,379	26,425	-356,743	7.56
2,412	24,574	x	50	=	12,287	14,699	198,437	13.61
5,046	24,574	x	87%	=	21,379	26,425	-133,184	7.56
2,412	24,574	x	50	=	12,287	14,699	154,340	13.61

because of a fortuitous sequence of events. First, they developed an industry in the 1950s and 1960s behind a wall of absolute protection. There was a complete prohibition on imported vehicles or investment by foreign firms until the 1970s. As a consequence, despite the fact that Japanese vehicles were low quality and high cost throughout the early years, they had a market which guaranteed steady growth.

Second, because Japan was a small, crowded island, with a shortage of skilled labor and an underdeveloped metalworking industry, firms (especially Toyota) were forced to be inventive. What they invented was an inventory, industrial relations, and sourcing system which turned out to be the "best-practice" system by the 1980s, given the nature of demand in the world market. Just-in-time inventory, permanent employment, and collaborative relations with suppliers allow Japanese firms a remarkable degree of flexibility which permits them to bring new products to the market and recover their investment in half the time and with a fraction of the production volume required by U.S. firms. This is a system which required over twenty years to perfect. There are enormous economies of learning which were realized only because Japanese firms had a protected home market and expanding foreign markets at the same time.

U.S. firms face a foreign rival that is superior by all reasonable measures — productivity, cost, and quality.

Hence, it is a system which is dependent on continued growth in foreign markets, not only to achieve economies of learning, but also to elicit necessary cooperation from workers, technicians, and engineers. Japanese firms must be able, not only to guarantee continued employment, but also to guarantee expanding opportunities for promotion which is possible only when sales continue to grow. Japanese firms must promise their suppliers long-term growth prospects, and assure banks, which provide the capital for expansion, a long-term return on their investments.

Since the U.S. market is the most open and the largest market in the world (an integrated European market will be slightly larger, but not as open), it is on this market that Japanese firms depend for continued growth. Japanese sales in the U.S. market (including imports and transplants) have grown from 1.2 million in 1973 to 1.7 million in 1978 and 4 million units in 1991. The cumulative plans of Japanese firms as of 1987 were to sell 5 million units in the U.S. market by 1995. That represents roughly one third of the U.S. market.

Against this backdrop, trade between the U.S. and Japan will proceed on a path toward liberalization only if the underlying conditions which put U.S. firms at such a disadvantage in international competition are corrected. U.S. firms must have the opportunity to upgrade their production facilities, retrain their engineers, management, and production workforces, and develop collaborative relations with suppliers. Short of that, as U.S. firms inevitably continue to lose market share to Japanese rivals, there will be more excess capacity, plant closures, and high unemployment rates in the traditional auto-producing states. The trade deficit will grow and trade tensions will not abate.

Productivity does not come cheap. If productivity and growth now depend more on the ability to adapt quickly to changes in the market than the ability to achieve minimum efficient scales in a mass production industry, then relations between suppliers and manufacturers, firms and workers, and firms and financial institutions must change. Japanese firms have shown that the collaborative relations necessary for the successful late twentieth century "mass" producer require both time to build and a measure of market stability which U.S. firms have not enjoyed for over a decade.

U.S. firms need time and market stability. Without stability, they will never be confident of earning a sufficient return to justify new investment. Without some confidence that new investment will bring renewed success in the market, these firms will be unable to offer the necessary assurances to workers and suppliers that their contributions will be rewarded with growth and security, not downsizing.

U.S. firms must have the opportunity to upgrade their production facilities, retrain their workforces, and develop collaborative relations with suppliers.

Some have argued that transplants will accomplish what U.S. firms have been unable to accomplish-upgrade the workforce, transfer superior technologies to the U.S., increase the competitiveness of U.S. industry, and reduce the trade deficit. This is a misreading of the Japanese strategy in the U.S. market. The shift in market strategy from imports to transplants can hardly be interpreted as a commitment to localization.

It also ignores the consequences of the probable competitive response of U.S. firms. Proponents of free trade and the free flow of investment reason that Japanese competition will prod the sluggish American auto industry into action. This suggests that U.S. firms have failed to acknowledge the competitive challenge they face. U.S. firms have been responsive, developing new products, shedding excess labor, and restructuring their relationships with suppliers. But the dualist aspects of the Japanese system, especially as practiced in the U.S. through the use of low-wage transplant suppliers, creates an especially strong incentive for U.S. firms to seek the low-wage, short-run, quick-fix strategy-offshore sourcing of parts and small cars, and sourcing parts from low-wage, nonunion suppliers-a strategy which may limit flexibility, collaborative relations, and quality control in the long run.

Already U.S. firms are making investment decisions which cause enormous dislocation. Assembly plants in Mexico and Brazil and contracts with Korean and Japanese firms to build subcompact vehicles with U.S. nameplates for sale in the U.S. have cost many U.S. jobs. In this respect, the U.S.-Mexico Free Trade Agreement will only worsen the tendency to shift production to low-wage locations. Twelve percent of all vehicles imported in I989 were captive imports — foreign-built cars with U.S. nameplates. And certainly U.S. firms have abandoned older urban plants when new plants were built in low-cost areas offering generous tax abatements. Saturn, the new General Motors plant in Springhill, Tennessee (and the only new Big Three plant that has opened in the last seven years), has negotiated the most generous tax abatement in the history of greenfield assembly plants.

U.S. Policies Toward Trade and Investment

But what of the dismal performance of U.S. firms under the VRA? There is, of course, experience with protecting the U.S. industry which has not delivered satisfactory results. The recession beginning in 1980 brought on the first efforts to regulate imports as the Japanese share of the car market soared to 21 percent in 1980. A voluntary restraint agreement was proposed by the administration in 1980, largely to derail anticipated congressional efforts to enact domestic content legislation.

The *VRA* did apparently lead to higher prices without great improvements in performance because the *VRA* did not provide sufficient *market stability.*

The usual charge against the VRA is that because the supply of Japanese cars was restricted, both U.S. and Japanese firms were able to raise car prices leading to record profits by 1985. This charge ignores the fact that motor vehicle firms price over the business cycle in order to make high profits in recovery years to offset losses in downturns. Toyota was in the position to assume price leadership in small cars by the early eighties and the Big Three quite rationally followed any leadership toward profits which would help them finance their revitalization. But the real point is that the VRA did apparently lead to higher prices without great improvements in performance, not because protection was misplaced, but because the VRA did not provide sufficient market stability.

The VRA negotiated in 1981 restricted Japanese car imports to a level of 1.65 million units, a level which was ratcheted up several times in the next four years to 2.3 million units by 1985. But the VRA, so defined, did not actually restrict all Japanese imports, only certain types of imports. Because the VRA did not cover trucks, not only did pickup truck imports increase, but many sport utility vehicles were imported as trucks to circumvent the restrictions. As the total value of imports was not limited, Japanese firms quickly began to move upscale into the high-margin segments, further eroding the profit base of U.S. firms. By 1982, the first Japanese assembly plants were opening in the U.S. Because there was no restriction on parts imports, Japanese firms shifted their import strategy to knock-down kits for final assembly in U.S. plants. By 1991, the equivalent of 3 million vehicles was being imported, 2 million in built-up vehicles, and the equivalent of another 1 million (by value) in the form of parts for assembly into 2 million transplant vehicles.

The VRA simply forced the Japanese firms to adopt a more palatable form of imports. It did not provide market stability. If anything, it further eroded market stability because it hastened the entry of Japanese partsmakers into the U.S. market. Whereas, under the built-up vehicle import strategy, U.S. partsmakers were losing market share mainly because U.S. assemblers were losing market share, after Japanese partsmakers began to build plants in the U.S., U.S. parts firms faced direct competition for contracts from U.S. assemblers. The relations between assemblers and their domestic suppliers grew increasingly acrimonious.

The policy toward inward foreign investment is even more permissive. Despite the problems associated with current foreign investment, it is U.S. policy to be neutral toward foreign firms operating in the United States and to pursue market opening strategies with our trading partners. Neutrality requires that foreign firms face no greater obstacles in creating, expanding and operating new or existing businesses in the United States than those faced by U.S. firms. The exceptions to neutrality, which are justified on national security grounds, occur largely in sectors subject to federal regulation, Foreign participation is restricted in the domestic transportation, communications, and energy industries, and in defense contracting work (Graham and Krugman 1991). Market opening is analogous to neutrality. The United States expects to have the same access to foreign markets that foreign firms have to the U.S. market. Hence, its negotiating posture is to set the norm for access in the U.S. market and then try to negotiate similar access to foreign markets.

The policy toward inward foreign investment is even more permissive.

However, as concern has risen over the volume of foreign investment in the U.S., legislators have responded to calls for increased disclosure and screening and, to a lesser extent, to proposals for performance requirements. At the height of U.S. concern over foreign influence and the huge trade deficit, Rep. John Bryant (D-Texas) proposed in an amendment to the Omnibus Trade and Competitiveness Act of 1988 that foreign investors in the U.S. be required to register with the U.S. government and provide information which would be available to the public. The amendment was dropped but has since reappeared in various legislative packages.

Screening was initiated in the early seventies when, reacting to concern over Arab efforts to buy U.S. energy assets, Congress established the Committee on Foreign Investment in the United States (CFIUS). The committee, comprised of members from the Treasury, State, Commerce, and Defense Departments, was charged with monitoring foreign investment in the United States, but given no power to take any substantive action. In 1988, the Exon-Florio amendment to the Omnibus Trade Act, extended the federal ability to restrict FDI in areas beyond federally regulated sectors. The Exon-Florio amendment makes CFIUS responsible for screening proposed acquisitions by foreign agents for national security hazards. It gives the president the power to block acquisitions.

Under current procedures, any direct party to a transaction, or any member of CFIUS can formally notify the committee of cases of potential concern to national security. To date CFIUS has launched only 12 investigations (Business Week, December 10, 1990, p. 28). Exon-Florio has many shortcomings. Review is at the discretion of CFIUS, investment in new facilities (transplants) is not covered, and Exon-Florio creates no agency, staffed with experts, to help answer such difficult questions as what constitutes national security.

The U.S. policy of neutrality toward foreign investment has precluded any federal performance requirements as a condition of foreign direct

investment in the U.S. In fact, in its diplomatic efforts with its trade and investment partners, the U.S. has opposed performance requirements in principle. Only state governments have occasionally made performance requirements a condition of state subsidies and other incentives for new investment.'"

European Policies Toward Japanese Autos

The European *treatment of Japanese autos* provides a striking contrast to *that of the* United *States.*

The European treatment of Japanese autos provides a striking contrast to that of the United States. As in the United States, Japanese imports and foreign direct investment threaten to transform competitive conditions in the European auto industry. Competition from Japanese carmakers has forced the European Community (EC) to consider many of the same responses pondered by U.S. policymakers-import and direct investment controls, state aid to foreign investments, and domestic content. Against this background, discussions of a car industry policy for the 1992 barrier-free market were conducted.

Five countries had national quotas on Japanese imports, including Britain, France, Italy, Spain, and Portugal. British and German carmakers wanted to see a community-wide quota, while France, Italy, and Spain wished to continue national quotas. As member nations became alarmed with the prospects of unrestrained Japanese investment, transplants entered into the calculus of the Japanese share of the European market. The discussion of quotas was broadened to a discussion of the local content of Japanese transplants.

Europe resolved the problem of competition for new investment fairly quickly. In 1984, when Nissan decided to locate in Britain, it received 125 million pounds in government aid as part of the inducement. This set off a tremendous row in the EC over the competition between governments for foreign investment. Ultimately, the European Economic Commission changed the regulations on state aid to preclude such competition. In January 1989, the Commission brought into force rules requiring that any vehicle assembly or engine production project involving state aid of more than 8 million British pounds must receive prior commission approval (Financial Times, London, January 26, 1989, p. 1). The maximum that can be advanced is 30 percent of investment in parts of the country designated as development areas and 20 percent for intermediate areas. Certain conditions must be met to qualify for assistance, including jobs — there is a cost-per-job ceiling on the aid level -- and evidence that the project will go ahead only if it is assisted by government (Financial Times, London, January 27, 1989, p. 4).

There are no specific rules on EC content for autos. Community rules state only that for an item to qualify as an EC product, its "last substantial manufacturing operation" must have been performed in the EC. European carmakers have argued that "if the so-called Japanese 'transplant' assembly operations cannot be kept out, they should have at least a

European cost base imposed on them to ensure adequate benefits for the European Community in terms of employment, component purchasing and the transfer of technological knowledge" (Financial Times, London, February 27, 1989, p. 4).

Nonetheless, through the conflict between Britain, where all Japanese investment has occurred, and France and Italy, which have tried to restrict imports of British-built Nissans, an implicit domestic content policy has evolved. With each firm the British government has reached an agreement that the vehicle will be considered as UK-built and therefore qualify for free access to EC markets under current rules, when it reaches 60 percent local content, but that the local content must be raised to 80 percent within a transition period of two to three years (Financial Times, London, February 27, 1989, p. 4). As of January 1989, Britain claimed that Nissan had a local content of 70 percent to be raised to 80 percent in 1990.

In late 1991, the European Commission agreed to take the position in negotiations with MITI that total imports and transplants coming into the European market for a lo-year transition period after 1993 will be limited to 16 percent of the market (Ward's Automotive Reports, January 13, 1992, p. 4).

The European agreement *was* able to preserve the spirit of *neutrality.*

The European agreement was able to preserve the spirit of neutrality. Restrictions on state aid were not limited to Japanese investment but to investment by any nation, European or otherwise. Britain's domestic content agreements were similarly neutral. Any firm would be expected to achieve 80 percent EC content as a condition of local assembly and sales.

A New U.S. Policy for Trade and Foreign Investment in Autos

An effective policy for the U.S. auto industry must accomplish three things. First, it must provide a stable market environment in which U.S. firms can invest in new products, technologies, facilities, and training programs, with some confidence that their investments will be rewarded. Otherwise, they will be unwilling to make the investments and unable to elicit a commitment from workers and suppliers. Second, an effective policy must limit the possibility of competing on the basis of wages and benefits, working conditions, or site costs, in order to promote competition on the basis of innovation. Third, an effective policy must include strict performance requirements under which U.S. firms are forced to upgrade as a condition of continued sector adjustment assistance.

As long as firms can seek tax abatements and nonunion labor to reduce the private costs of production, foreign firms building new capacity in the U.S. will have a cost advantage unrelated to productivity differentials. U.S. firms' only recourse will be to renege on commitments to wages, pensions, and health care provisions for their current and retired workers. Tales will abound of U.S. firms seeking long-term tax abatements from local governments as a condition of continued operation in

the community. Not only does this competitive strategy undermine the confidence necessary from workers and suppliers to pursue a high- productivity path to restructuring, but the overall social costs are likely to exceed the private benefits to the firm. To assure that it is the technologies, organizational talents, and production techniques that are being transferred, not an inferior social welfare system, something must be done to move wages, benefits, and site costs-the new arbiter of location and competitiveness-out of the competitive calculus.

From the toolbox of trade and investment policy instruments sanctioned through past use by Japan and Europe, a U.S. policy for the auto industry can be fashioned which provides stability, an incentive to follow a high-wage restructuring path, and adequate performance requirements, all the while preserving the principle of neutrality. From Europe, we can borrow the policy to restrict foreign market-share during a necessary period of adjustment and the policy to regulate state competition for new investment. From Europe and Japan, we can borrow the concept of performance requirements including local content requirements in exchange for sectoral aid." Neutrality is preserved by imposing these policies on all firms, regardless of nationality.

An effective policy must include strict performance requirements under which *U.S.* firms are forced to upgrade *as* a condition of continued sector adjustment assistance,

Market stability

1) Quotas. The combined market share of transplants and imports should be strictly limited to 3.9 million units for five years with possible renewal for an additional five years while the U.S. industry adjusts to the new competition from Japanese firms, reorganizing ineffective bureaucracies, developing new products, adopting new technologies, and retraining its workforce for the new skills required. In addition, following Luria (1990), the real dollar value of imports should also be limited to current levels, to preclude upscaling.'"

   Given that Japanese success suggests the importance of market growth to constructing collaborative relations with workers and suppliers, all growth in the market should be available to recovering U.S. firms for the next 10 years, unless or until U.S. firms have been able to sell similar volumes of vehicles in Japan.

2) **Loan Guarantees.** The federal government should provide substantial long-term loan guarantees and subsidies for new investment. To gain freedom to make investments for which returns will be realized in the distant future, and perhaps in the form of increased market share rather than higher profits, U.S. firms must have some relief from the need to raise capital either internally (through high prices and profit margins) or externally through capital markets requiring high short-term returns on investment.

Limiting Competition on the Basis of Factor Costs

To ensure that competition is based on relative quality and productivity, rather than cost advantages gained through erosion of employees' benefits and local tax bases in the U.S., the following regulations are necessary.

1) Socialization of Benefits. To eliminate some cost advantages gained from discriminatory selection of the workforce, benefits should be socialized either at the industry or national level. An industry or national pool for pensions and national provision of medical insurance would eliminate differences between firms based on the age of their workforce and the size of their retiree population. Under the present conditions there is tremendous pressure on firms to reduce retiree benefits or to declare bankruptcy to liberate themselves from pension and medical benefit obligations. The costs are being passed on to families and government agencies.

2) Prohibit State Competition for New Investment. To protect the local tax base from unnecessary erosion, states should be prohibited from bidding for new investment. As in Europe, any incentives for new investment should be allocated from a national fund, and should be given only if the investment is necessary and would not otherwise take place. This will insure that new investment does not lead to an unnecessary transfer of income from state taxpayers to firms. Further, this will eliminate the incentives which currently distort the real costs of investment in new plants relative to retrofitting existing plants.

3) Regulate Greenfield Investment. To bring the private costs of new investment in line with social costs, cost-benefit analysis should be used to determine whether the national economy is better served by greenfield investment in assembly and parts facilities or revitalization of existing brownfield plants. In the event that underutilized capacity exists in the industry and revitalization of existing plants is deemed more cost effective than building a new plant, firms should be required to consider the possibility of retrofitting existing facilities before being permitted to build new plants. On the cost side, the analysis should take account of: the private costs to competing companies of closing still useful facilities; the loss of income by workers in the auto industry to profits (which in the case of foreign firms may be repatriated); the costs to state and federal agencies of supporting workers who are left without jobs; the long-run costs to states of supporting employed workers in new plants who are underinsured against sickness and old age; and the cost to states of any investment incentives.

The **combined market share of transplants *and* imports should be *strictly*** *limited to* **3.9 million units for five years,**

4) Local Content Requirements. All firms assembling in the U.S. should be required to source a minimum percentage of parts from local U.S. suppliers. Furthermore, specific high-technology parts, including all major components of the drivetrain should be sourced from U.S. parts firms. The special problem of exclusive sourcing from established supplier networks (keiretsu) is not likely to be resolved through antitrust or dumping prosecution since, in many cases, Japanese suppliers are the lower cost suppliers. However, as the Japanese demonstrated in the 1950s, when Japanese firms were not permitted the foreign exchange necessary to import cheaper foreign parts, a good strategy for develop ing an effective local parts source is to nurture it, rather than force it to compete with firms which have an insurmountable technological lead. If foreign firms or U.S. firms were obliged to source from existing U.S. partsmakers, they would quickly find it in their interests to transfer their best technological and organizational know-how.

5) Local Labor Requirements. To assure that skills are transferred to U.S. personnel, all firms should be required to use minimum levels of U.S. personnel in all occupations.

All firms assembling in the U.S. should be required to source a minimum percentage of parts from local U.S. suppliers,

Performance Requirements

Performance requirements are necessary to solve both a political and behavioral problem. The political problem is the public perception that the auto industry is the industry least deserving of relief. Public support is contingent on some assurance that the industry will be forced to use its protection wisely. The behavioral problem is, of course, that using protection wisely is not always the preferred strategy for firms.

Performance requirements should be imposed along three dimensions: productivity, pricing, and income differentials.

1) Productivity Growth. U.S. firms should be required to narrow the productivity gap with foreign competitors by 10 percent annually measured by a three-year average. [47]

2) Price Moderation. Real prices should fall annually, measured over a three-year average, at a rate which is less than the rate of productivity increase. This would allow firms to gradually reduce their dependence on external financing while sharing the rewards in the form of lower prices with consumers who have been asked to make some sacrifice in terms of choice over a substantial period of time. "

3) Narrow Income Differentials. The income gap between executives and production workers should be greatly narrowed to the point where within a few years the gap is comparable to Japanese compensation differentials. Annual compensation increases should also be sufficient to maintain the current standard of living of autoworkers. **As long as** real prices are falling at a rate less than the rate of productivity growth, the difference can be split between increased internal financing (retained profits) and labor compensation increases.

Differentials in U.S. executive compensation greatly outpace differentials between U.S. and Japanese production workers. U.S. autoworkers also enjoy a significant but narrowing pay differential over average manufacturing wages. While attention has recently turned more toward the executive-production worker pay differentials, autoworker-manufacturing worker pay differentials have been a target of criticism since the early 1980s. One can certainly argue that multimillion dollar compensation packages exceed the rewards appropriate to the contribution made by executives. On the other hand, incomes averaging between $25,000 and $30,000 for production workers seem closer to a fair living wage. Rather than encouraging the further erosion of the living standard of autoworkers, the focus should be to narrow differentials between production workers and executives.

The income gap between executives *and* production workers should be greatly *narrowed.*

Conclusion

Contrary to what some have claimed, Japanese investment in the U.S. auto industry is not a solution to our declining competitiveness in that sector. Japanese transplants are not necessarily transferring new production and management techniques, training our workers and suppliers in the use of Japanese technology, or breathing new life into an uncompetitive oligopoly. Nor is foreign direct investment a panacea to the dislocation thus far caused by imports, substituting for and replacing jobs previously lost to imports.

Japanese ***investment in the U.S. auto industry is not a solution to our declining*** competitiveness ***in that*** sector,

The widely praised "transfer" of Japanese skills and techniques is deformed by the reluctance of Japanese firms to look beyond their traditional supplier families, and their own skilled workers and managers in Japan. Many of the tasks and skills we hope to learn from Japanese investors, such as product design, production design, and high value-added component design, are still being performed in Japan or by Japanese nationals in the U.S. It is the opportunities offered by huge regional income differentials rather than a skilled and underutilized workforce that Japanese firms mainly exploit when they invest in the United States.

The opportunities to exploit the interregional compensation differentials are greater for Japanese firms which are not burdened by the excess capacity that plagues U.S. firms. They are free to build greenfield plants knowing they will not have to take losses on older plants. They will not have to help cover the high benefit costs of an older active and retired workforce remaining in less efficient plants. But American capital has certainly exploited those differentials as well, both within the United States and in its own patterns of foreign investment.

Japanese firms fail to transfer their superior production system to the United States because to a large extent it is not transferable, and because to the extent that they do transfer it, they undermine the conditions of their successful productive system in Japan. Those conditions included a protected stable market along with access to foreign markets over the period of industry development when firms were achieving economies of scale, scope, agglomeration, and learning. Japanese firms surpassed U.S. firms in terms of productivity and cost by the mid-1970s, and in quality by the 1980s. For U.S. firms to overcome the first-mover advantage enjoyed by Japanese firms will require a policy environment similar to that which nourished the Japanese industry — stable markets, patient capital, and temporary protection from superior rivals.

Obviously, the auto industry presents a huge and complex problem. We need to develop sector-specific trade and investment policies which encourage and promote the industry's transition to superior production techniques and organizational forms while minimizing the social costs of that transition. Clearly, the hands-off policies toward foreign direct investment and half measures with respect to imports do not help. We should follow the precedent set by the European Community which has concluded that, for the sake of the community, it is necessary to regulate the flow of imports as well as both domestic and foreign investment in autos.

Appendix

Estimating the Displacement Of Imports By Transplants

As shown in the section on the impact of transplants on employment, the assumption about the extent to which transplants displace imports or Big Three domestic vehicles is the most important factor accounting for job loss. Hence, it is worth considering why estimates of displacement vary so much. While the UAW and the GAO both used domestic displacement rates of 85 percent, Robert Lawrence argues that the domestic displacement rate should be between 0 and 50 percent. Commenting on the previous studies by the UAW and the GAO, Lawrence wrote, "it is generally bad economics to assume a fixed coefficient for a result which is determined by a complex set of demand and supply-side factors."

Lawrence proposes a more "realistic" displacement rate which he derives from his own assumptions about consumer responsiveness to changes in the price of Japanese vehicles (the price elasticity of demand) and supplier responsiveness to the prices that consumers are willing to pay (the supply elasticity). This Appendix will show why Lawrence's method is flawed and will present alternative estimates based on more realistic assumptions.

Lawrence assumes that the demand for foreign nameplate cars is relatively price-elastic (elasticity of between 1 and 2) and that the supply of these cars must also be relatively elastic (elasticity around 1.7).[49] Given these parameters, as transplants are added to the total supply of foreign vehicles, the price of vehicles will fall and the Japanese firms will reduce their supply of imports. The extent to which transplants will displace imports will depend on the actual value of these elasticities. Lawrence chooses elasticities which lead him to the conclusion that the rate of displacement is 45 percent. However, the evidence suggests that neither the demand nor the supply of Japanese vehicles is very sensitive to price.

Lawrence backs into his own estimates of displacement by first explaining why there cannot be an 85 percent displacement rate, using the model shown in Figure A-l. In Figure A-l, S^I is the supply-of-imports curve which is nearly vertical at 4.8 million units. S^T is the total supply curve for foreign nameplate vehicles including both imports and transplants. The supply of total foreign nameplate vehicles is relatively elastic since transplants face no binding noneconomic constraint. D^I represents the demand for foreign nameplate vehicles which is downward sloping, price sensitive, and of unitary elasticity at a volume of 6.6 million units (point A).

Lawrence assumes that because consumers have a taste for foreign nameplate vehicles which does not discriminate between transplants and imports, transplants are substitutes for imports rather than domestic vehicles. He then assumes that the elasticity of demand for foreign vehicles must be 1.[50] Given these assumptions, he argues that an 85 percent displacement rate must imply the following (Figure A-l.):

- If in 1990, 1.8 million transplants and 4.8 million imports are being sold in the U.S. at an average price of $10,000 (point A), and if transplants were then eliminated, imports would increase by 270,000 units (15 percent of 1.8 million) to 5.07 million (point B).
- With a price elasticity of demand of 1, the 23 percent decline in foreign nameplates from 6.6 million (4.8 million imports plus 1.8 million transplants) to 5.07 million (4.8 million plus 270,000 imports) would lead to a 23 percent price increase.
- The 5.6 percent increase in imports (from 4.8 million to 5.07 million) in response to a 23 percent increase in price, implies an elasticity of supply of imports of 0.24 (5.6 percent/23.2 percent).

Lawrence argues that this scenario makes no sense. A supply elasticity of 0.24 would imply that imports were subject to a binding constraint under the VRA. As transplants were added to the supply of Japanese nameplate vehicles, they met a demand previously held in check by supply constraints and diverted sales from American cars. But if the supply of Japanese vehicles had been so constrained, Lawrence argues, the shortfall in the supply could be expected to cause a rise in the price "which would make U.S. sales extremely attractive.... Since foreigners can always divert sales away from their home and other export markets to the United States," the Japanese would have found some way to meet the shortfall. Therefore, he contends, a supply elasticity of 0.24 is too low.

Since Lawrence does not conceive of a scenario in which there was a real shortage of Japanese vehicles, he concludes that transplants must have displaced domestics at a far lower rate than the 85 percent suggested by the UAW and the GAO. "More reasonable parameters," he argues, "suggest a displacement coefficient of around 0.45" (Lawrence 1990, p.46).

Lawrence's 45 Percent Domestic Displacement Rate

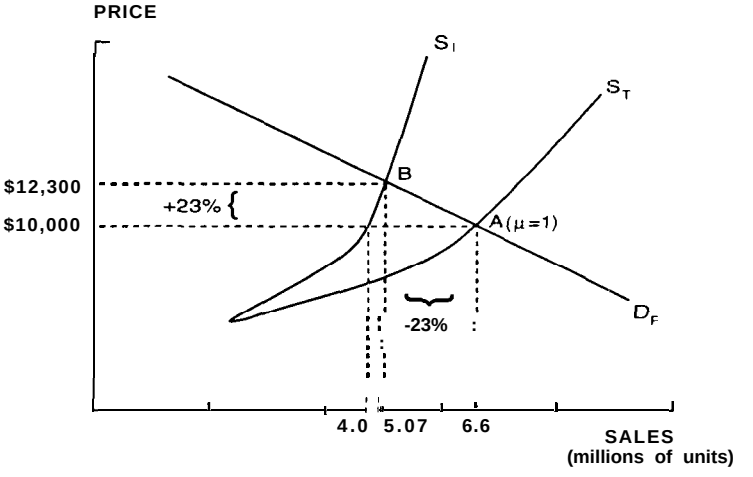
Lawrence suggests an alternative scenario (Figure A-2):

- If in 1990, 1.8 million transplants and 4.8 million imports are sold in the U.S. at an average price of $10,000 (point A), and if transplants are then eliminated, imports would increase by 990,000 units to 5.79 million.
- With a price elasticity of demand of 1, the 12 percent decline in foreign nameplates from 6.6 million, would lead to a 12 percent increase in prices.
- The 20 percent increase in imports (from 4.8 million to 5.79) implies an elasticity of supply of 1.7 (20 percent / 12 percent).

The supply elasticity of 1.7 implies a 45 percent domestic displacement rate. If transplants are eliminated, Lawrence argues, 55 percent of the shortfall in supply will be compensated by imports, 45 percent by domestic vehicles.

But this is not a very intuitive way to think about the rate of displacement. The question is not what would happen to imports and sales of traditional domestic vehicles, if the 1.8 million transplants being manufactured in the U.S. were suddenly eliminated. The question is rather, what happens to imports and domestics if we reverse the

Figure A-1



D_F = Demand for Foreign Vehicles

S_I = Import Supply

S_T = Total Supply (imports and transplants)

scenarios and add transplants to the market, moving now from point B to point A. In Scenario 1, the case where displacement is 85 percent, as transplants are added to the market and prices fall by 19 percent, imports decline by only 6 percent because the supply curve is inelastic or unresponsive to price changes. In Scenario 2, the case of 45 percent displacement, imports decline by 17 percent as prices fall by 11 percent because supply is relatively responsive to price changes.

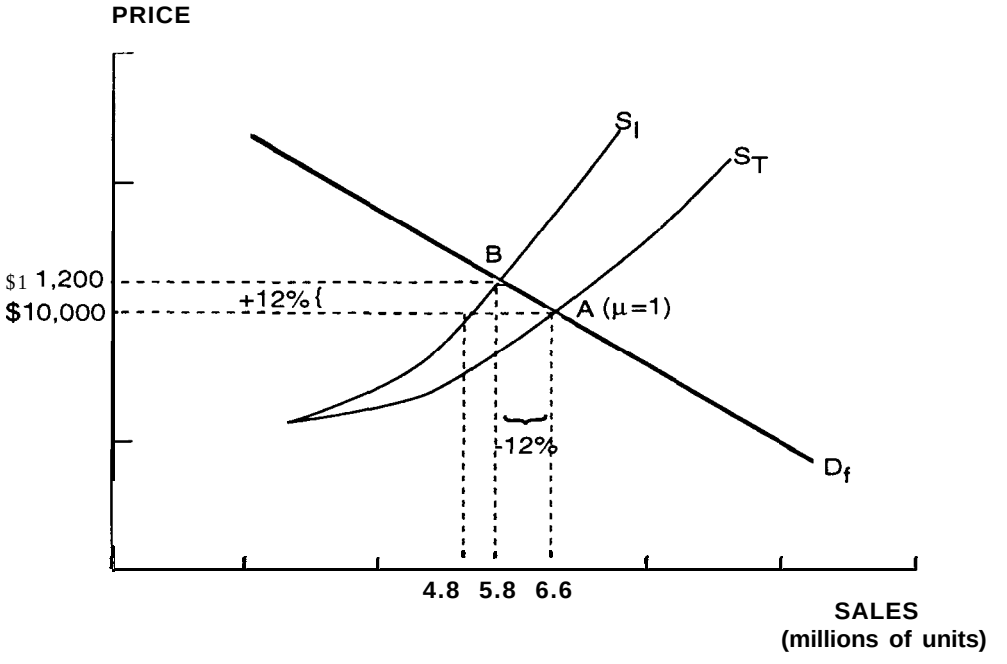
Both scenarios depend on the assumption that the demand for and supply of Japanese vehicles are highly price sensitive. In both scenarios, the price of Japanese nameplate vehicles must fall as the supply increases with transplant production. In both scenarios, Japanese imports are cut back as the price falls. Imports decline more in Scenario 2 than in Scenario 1 because the supply is relatively more price responsive.

Both stories are implausible. The price of Japanese cars has not fallen since 1982; the price for comparable cars has risen by about 50 percent in real terms and by about 5 percent relative to comparable American vehicles. At the same time, demand for Japanese vehicles has risen by about 129 percent while the overall market has increased by only 55 percent.

A Plausible Scenario for High Displacement

Consider an alternative scenario in which the demand curve for foreign nameplate vehicles moves out as the supply increases (Figure A-3). There is a binding constraint on supply which is loosened in increments as the quota is expanded and transplants are added. Supply increases, not because of shifts along the supply curve in response to price increases, but because of outward shifts in the supply curve. The total market for domestic and foreign vehicles remains constant. Such a scenario might lead to both the increasing sales and the increasing relative prices for foreign nameplate vehicles which

Figure A-2



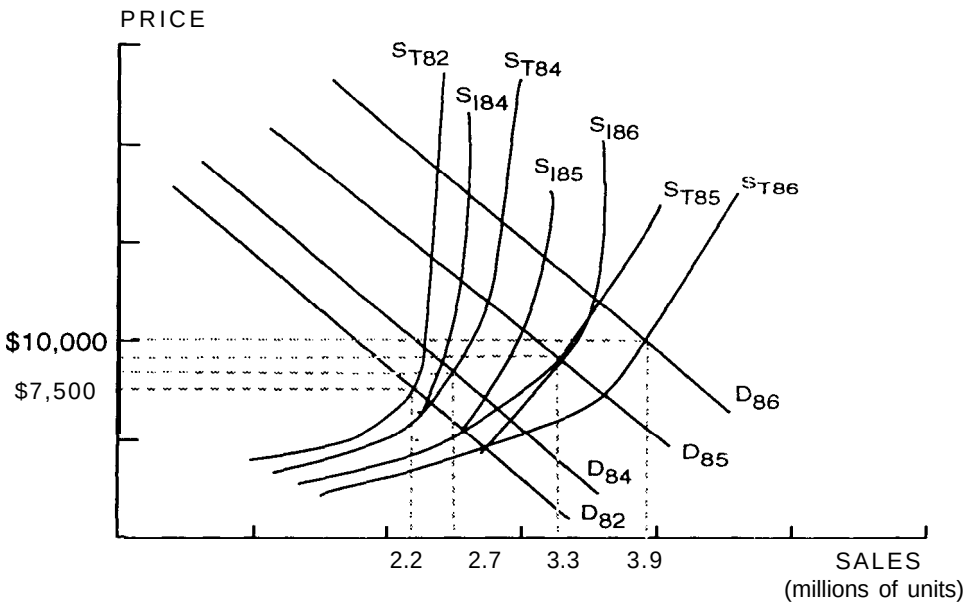
we have witnessed. Under this scenario, when transplants became available they would generally displace domestic vehicles as consumers shifted to foreign purchases. This is a scenario consistent with a high domestic displacement rate.

This scenario is more consistent with the facts until 1986. As the quota increased and as Japanese firms expanded transplant capacity, they introduced new product lines in their import fleets. With new product lines came new demand for Japanese products, pushing out the demand curve. The introduction of the Acura, Lexus, and Infinity lines created new demand for luxury Japanese vehicles which did not exist before 1984. There were no falling prices to explain the increase in demand. As Figure A-3 illustrates, the demand curve for Japanese nameplate vehicles shifted out at the same time that the supply was shifting out. Since the total U.S. market was expanding at a much slower rate than the demand for Japanese cars, Japanese transplants (and imports) were displacing U.S. cars.

The short-run supply curve for Japanese imports was extremely inelastic during this period." As argued earlier, the demand curve was also probably quite inelastic. It is even possible that Japanese firms were able to price their vehicles high because of the binding limit on supply and the inelastic demand, though Japanese firms are not known for short-run profit maximizing behavior."

But the elasticity of supply and demand are utterly irrelevant to the determination of displacement in this case. Given that prices were rising as the supply of Japanese nameplate vehicles was increasing, it can only be the case that the demand curve was shifting out as the supply of Japanese nameplate vehicles grew with the addition of transplants. In a stagnant market, if the demand for foreign nameplate vehicles increases as the supply increases, domestic vehicles must be displaced.

Figure A-3



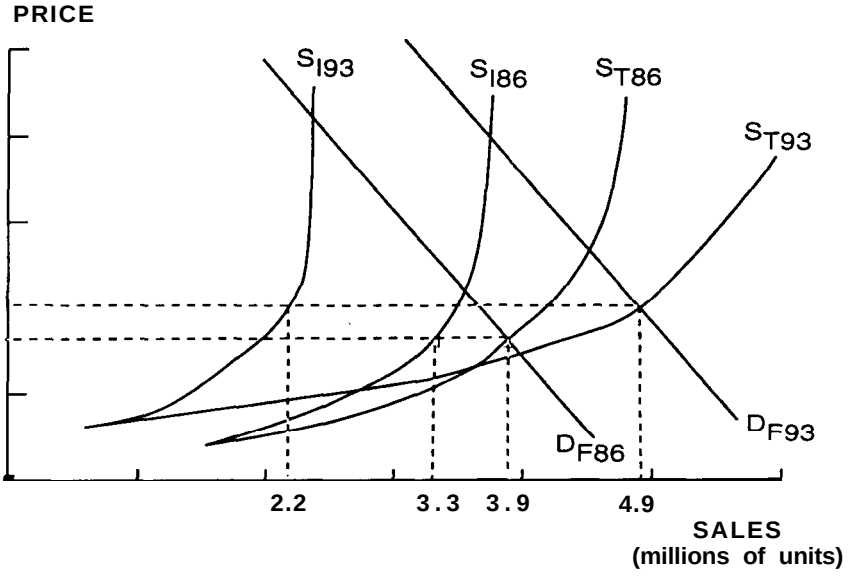
In fact, between 1982, the year before Honda began production of the Accord in Marysville, and 1986, transplants and imports both grew and transplant production displaced domestic vehicles exclusively (see Table 11). Until 1986, transplants were simply being added to import volume at the rate of one transplant for every two imports during this period.

Between 1986 and 1991, total Japanese sales declined temporarily from 3.9 million in 1986 to 3.5 million units in 1988, but rose to 4.0 million by 1991. Imports fell from a peak of 3.3 million in 1986 to 2 million in 1991, while transplants rose from 0.6 million to 2 million. Looking toward the near future, Japanese firms have declared their intention to sell 5 million vehicles in North America by 1995, a scenario which will require imports to continue at or slightly above their current level while transplants reach their capacity of 3 million, Japanese firms' plans suggest that transplants will continue to displace domestic vehicles. Transplant sales will increase from 2 million in 1991 to at least 2.7 million in 1993, an increase of 0.7 million units, while imports are not expected to fall.

Figure A-4 illustrates the supply and demand conditions for 1986 and projections through 1993. After 1986, as the yen appreciated, the supply curve for Japanese trucks shifted up.[53]

The supply curve for cars also shifted up, as the supply of transplants increased. Again, it is not the kind of scenario Lawrence envisions in which the price of foreign nameplate vehicles falls as the total supply increases, pushing import supply back along a relatively elastic supply curve. As discussed earlier, each Japanese firm had expanded its imports to the maximum possible under the quota before 1987 to ensure a place in the market for its transplants. As they began to bring transplants on-line, some firms cut back imports intentionally.

Figure A-4



Some Japanese firms have reduced imports temporarily because they are holding room in their allocation to introduce new products. There is evidence that these same firms intend to fully utilize their quotas in the future. Some have decided to source primarily through transplants and may even give up their quota allocation. Some have simply faced a temporary weakness in product which has limited their ability to export.

As Table A-l illustrates, there was a 350,000 vehicle shortfall in shipments of cars for the Japanese fiscal year 1989 compared with the 1990 allotments.

Toyota accounts for 60,000 units of the shortfall. If Toyota was not planning to use that quota in the long run, the company had a perfect opportunity to give it up in 1990 when smaller companies were begging for reallocation. But Toyota intends to achieve a total volume of 1.5 million units of sales in the U.S. market by the mid-1990s (up from 1 million in 1989), including 750,000 imports and 750,000 transplants. To do so, Toyota will have to increase imports by nearly 100,000 units, a plan that can easily be achieved with the two or three additional models of the Lexus now planned and perhaps the addition of a pickup truck.

Honda plans to sell 1.1 million units in the American and Canadian markets, a plan which will succeed only with the full use of its quota. Mitsubishi and Mazda both plan to use their entire quota. Only Nissan and two smaller firms, Subaru and Suzuki, may fail to use their full quotas over the next few years as they substitute a domestic production strategy for imports.

Thus, while the supply of Japanese vehicles has declined, it is not related to a fall in prices but rather to a deliberate strategy on the part of Japanese firms to temporarily reduce imports while bringing transplants on-line. Based on the public ambitions of these firms in the U.S. market, there is little reason to believe that there will be any significant further decline in imports as more transplants are brought on-line.

As Table 11 shows, by 1993 Japanese firms collectively plan to sell 5.0 million cars

TABLE A-1
Japanese Car Exports to the U.S.

Company	1990 Allotment	1989 Shipments
Toyota	610,000	551,329
Honda	422,000	409,500
Nissan	470,000	354,099
Mazda	245,000	226,116
Mitsubishi	175,000[a]	162,084
Subaru	158,000	60,813
Isuzu	127,000[b]	124,210
Suzuki	75,000	54,192
Daihatsu	18,000	12,026
Total	2,300,000	1,954,369

Some makers have a "van" allocation in addition to above; for example, Isuzu has a 3,000-unit van allotment, although it does not offer a van in the U.S.

Notes: Allotments are estimates from Ward's sources in Japan.
Allotment is cars authorized for export to U.S. by MITI. The 1990 allotment refers to April 1990 - March 1991; 1989 shipments are for April 1989 - March 1990.
[a] = Includes 95,000 for Chrysler.
[b] = Includes 70,000 for GM (Geo Storm).
[c] = Includes 55,000 for GM.

Source: Ward's Automotive Reports, May 28, 1990.

and trucks in the U.S. market. Imports may fall another 300,000 units from 1989, but transplants will increase by 1.5 million units, suggesting that 1.2 million additional domestic cars may be displaced between now and 1993. If these projections are correct, the rate of displacement between 1986 and 1993 will be 48 percent.

Lawrence's Empirical Work

Lawrence buttresses his argument with a description of "what actually happened to imports as transplant production increased" (p. 47). Lawrence defines the transplant displacement of imports as the displacement of same model imports by same model transplants. By that logic, since the supply of imported Civics declined by 90,000 units between 1985 (the year before U.S. Civic production began) and 1989 while the supply of transplant Civics rose by 174,000 units, the transplants displaced imports at the rate of 52 percent, and domestic vehicles at the rate of 48 percent (assuming the market did

TABLE A-2

Lawrence's Method of Calculating Displacement Rates, 1982-1989 (Percentages)

Model	Share of U.S. Built	Displacement Rate
Honda Accord	34%	78%
Honda Civic	28	48
Nissan Sentra	17	31
Nissan Trucks	21	1a
Total	100	49

Source: Lawrence (1990).

not grow or that the Civics did not displace imports from other countries).[54] This is the "model displacement rate."

Lawrence calculated the model displacement rate for each of four vehicles-the Honda Civic, the Honda Accord, the Nissan Sentra, and the Nissan pickup-representing 49 percent of total transplant sales. He then calculated the weighted model displacement rate for the four vehicles to be 49 percent between 1982 and 1989. Based roughly on these calculations, Lawrence concluded that the displacement rate for the entire Japanese fleet and for the period through 1992 should be 45 percent (1990, p. 56). Table A-2 shows Lawrence's calculation of the weighted model displacement rate of Honda transplant vehicles.

Lawrence concludes that

> *the historical ratio of imports and transplant production is useful, but it can overstate the displacement ratio when overall demand is growing (and understate if when overall sales are falling).... With a growing market,... the historical record gives an upper bound on the displacement coefficient.. . All of these considerations suggest that a displacement ratio far lower than 85 percent is warranted. Indeed if is likely to be between 0 and 50 percent. (1990, p. 48)*

But as noted earlier, it is inaccurate to measure displacement based on the substitution of a transplanted Civic for an imported Civic. When Honda began to produce transplant Civics, it also replaced Civic imports with other models such as the Acura Integra and Legend. And as larger companies built transplant capacity in the U.S., they ceded some of their quota allocation to companies with smaller allocations so that when Honda reduced imports of the Civic, they were just as likely to be replaced by imported Subaru Justys. Therefore, only a measure of the rate at which Japanese transplants are displacing vehicles in the Japanese import fleet as a whole (the fleet rate of displacement) gives us an accurate measure for calculating the rate at which transplant production is displacing jobs in the U.S. or jobs in Japan.

Endnotes

[1] Economic theory recognizes various types of economies in production. The most commonly recognized economy is that associated with scale. Mass producers are said to realize a cost advantage over batch producers in the same industry due to economies of scale in production. The advantage comes from the opportunity to spread the fixed costs of machinery, product design, and administration over a larger volume of output. Economies are also associated with producing a range of related products for which common inputs can be purchased or produced (economies of scope). Firms which produce in close geographic proximity to other producers of competing or complementary goods often find that the scale economies associated with a large local market for purchased services and inputs reduces the unit cost of those inputs. These are known as external economies or economies of agglomeration. Economies of scale, scope, and agglomeration are static economies — the cost advantage associated with a specific scale, scope, or degree of agglomeration is said to be invariant over time, unless the technology underlying those economies changes. There are also economies which have a dynamic quality. Particularly when considering different types of firm and production organization, there appear to be economies of learning. As time elapses or as the firm accumulates experience in production, the ability to exploit the potential of specific production and organizational techniques improves.

[2] Total factor productivity (TFP) measures the output per unit of weighted aggregate inputs. It is considered to be a superior measure of the productivity than the more commonly used labor productivity because it controls for the fact that apparent increases in labor productivity may simply reflect the substitution of machines for labor, thereby increasing output per unit of labor only by increasing another input. TFP is difficult to measure. In order to construct an aggregate measure of inputs, one has to assign a weight to each input which reflects its relative contribution to output. Nonetheless, this measure of productivity is increasingly coming into common usage.

The overall U.S. merchandise trade deficit improved somewhat to $73 billion in 1991, largely as a result of the depressing effect of the recession on demand for imported goods as well as the falling dollar. Data for 1990 are used here because they were the most current international trade data disaggregated by product at the time of this writing.

[4] Regional production shares are calculated for peak industry production years — 1925, 1937, 1955, 1965, 1973, and 1986. Until the 1970s, global production was cyclical only because North American production was cyclical. Western Europe began to experience cycles comparable to those of North America after 1973. Japanese production has grown steadily, unperturbed by cyclical behavior, due partly to its reliance on exports for the last 40 years.

[5] Interested parties and their supporters in Congress recognized that local assembly did not necessarily guarantee high levels of local parts production. So in 1981 and again in 1982, some members in Congress attempted to enact legislation which would require minimal levels of domestic content. The bill passed twice in the House but was defeated in the Senate.

[6] There was a 25 percent tariff on truck imports. Since Japanese production costs were well below those of U.S. firms, it was not an enormous barrier. After the dollar began to appreciate, it was no barrier at all.

[7] Actual transplant production volumes in 1993 may be below capacity if economic growth in the U.S. economy remains sluggish.

[8] When some firms in an industry have a cost or quality advantage over their competitors which allows them to earn profits in excess of those normally earned in the industry, economists refer to those excess profits as "economic rents."

[9] Twenty percent of first tier suppliers are affiliated (Takeishi 1990, p. 10).

[10] Of course this is only a proxy for a comparison of automotive supplier structures.

[11] Labor productivity is grossly misunderstood. First, it may have little to do with overall productivity differentials. A study of total factor productivity differentials between U.S. and Japanese auto firms found that though labor productivity differentials were large, because labor costs are small relative to the costs of materials, labor productivity accounted for only a small part of the total factor productivity differential (Howes 1991). Most of the difference lay in the more efficient use of purchased inputs by Japanese firms, a result which can probably be attributed to the more frugal design of the vehicle, to the just-in-time inventory control system, and to zero-defect quality control.

[12] The Telesis (1984) study compared two plants, one in Japan and one in the U.S., producing a similar subcompact vehicle. The Krafcik-MacDuffie study was based on a sample of 52 plants which included 8 Japanese plants, 3 transplants, and 10 U.S. plants. The latter study did compare products standardized by size, options, levels of vertical integration, worker relief periods, and absenteeism. In other words, they were measuring the hours worked on a similar product in 52 plants.

[13] Interview with author, by telephone, May 5, 1990.

[14] Survey by a research team from Teikyo University in Japan, reported in *Automotive News,* May 28, 1990.

[15] These are the components which every emerging auto-producing country wants to build because they embody the most sophisticated product and production technologies. Mexico, for example, requires domestic production of engines and transmissions as a condition of sale in the local market.

[16] This conclusion is confirmed by data from McAlinden, Andrea, Flynn, and Smith (1991).

[17] But as they indicate in Table 4 (p. 9), of the 229 transplant suppliers they identified in the United States, 61 percent are Japanese owned, 25 percent are U.S.-Japan joint ventures, and 14 percent are "other," a category which includes suppliers of unknown ownership and Japanese joint ventures with other foreign corporations.

[18] Vertical integration measures the extent to which parts and services are produced in-house or purchased from outside suppliers.

[19] Average hourly earnings in Table 7 come from an unpublished 1985 BLS study of average hourly earnings in independent parts suppliers and published BLS data for average hourly earnings in SIC 3711 (automotive assembly) and SIC 3714 (automotive parts and accessories) in 1986 (U.S. Department of Labor, BLS, *Employment and Earnings*). The BLS study showed average hourly earnings at independent parts

suppliers (not owned by one of the Big Three) to be 82 percent of earnings in SIC 3714, which included Big Three automotive parts production. Average hourly earnings in SIC 3714 were $12.69; 82 percent of $12.69 is $10.40; assuming a roll-up (negotiated and statutory benefits) of 33 percent in total parts, and 25 percent in independent parts, total hourly labor costs in the independent parts sector would be $13.00, and in SIC 3714, $16.88.

Average hourly earnings in SIC 3711 (assembly) were $15.00; the roll-up in Big Three plants is 50 percent so average hourly compensation is $22.50. Transplant assembler wages are comparable to those in the Big Three (*Automotive News*, July 2, 1990), but the cost of benefits is only $2 to $3 per hour.

Earnings and compensation for transplant parts come from a survey done by Florida, Kenney and Mair (1988) which finds that "total wages and benefits per worker per year" average $21,268 which they divided by 40 hours times 52 weeks (2,080 hours per year) to obtain $10 per hour. The figure of 2080 hours is probably too low if workers are working overtime. The typical automobile worker in Japan works 2,300 hours per year (IMF-JC 1985). The contract at Mazda U.S. mandates overtime of two hours per day plus two out of three Saturdays. Ten hour days with two out of three Saturdays for 52 weeks a year is 3010 hours per year. So total compensation could range from $10 per hour (52 40-hour weeks) down to $7 per hour (52 58-hour weeks).

The Survey shows that the average starting wage at transplant suppliers was $7.21 in 1988, reaching $8.01 after one year, and that total wages and benefits were $21,268 ($10.22 per hour). So benefit costs were $2 to $3 an hour.

[20] Robert Cole, who published the initial study alleging possible discriminatory practices, believes the situation is now improving.

"You're seeing substantial change in minority hiring at the transplants," Cole told *Automotive News* (April 4, 1990). "It's largely because of all the negative public attention they received."

[21] See the discussion of "local content" in the section on the employment impact of transplants.

[22] Canada provides similar incentives. Denis DesRosiers, a Canadian auto analyst, claimed that with the incentive package it received, Hyundai could have built the plant, never produced a vehicle, and still made money (conversation with author 1988).

[23] It is important to note that the hourly labor cost of pensions (and other benefits also paid to retirees) is partly an accounting artifact. If a large part of the hourly cost of pensions is attributed to the cost of supporting retiree pensions, there is no obvious reason (excepting where increased costs result from bargaining increased benefits for retirees) why this should be part of hourly labor costs, rather than part of the overhead costs of operating the firm.

[24] According to Automotive *News* (July 2, 1990), the top hourly wage rates including cost of living ajustment (COLA) for Toyota production and maintenance workers in 1989 were $14.23 and $16.28, respectively. The average of the production and maintenance wages was $15.25. Four percent of $15.25 is 61 cents; for employees who work 2080 hours (40 hours per week times 52 weeks) and contribute 4 percent of their wages, the company will contribute $1,269 per year.

[25] The defined contribution plan is not only less expensive for the employer, but of less value to the employee. If a Toyota employee contributed $1,269 annually to his or her retirement fund, matched by a contribution from the company, after 30 years, the fund would be worth about $120,000, which would, at a seven percent annual rate, pay out $703 a month.

[26] I estimated hourly health costs from the fraction of total company health care expense in the U.S. which is attributed to hourly workers, divided by estimated hours. Company health care expenses come from Bernstein Research (1990). The fraction due to hourly workers is estimated from the share of hourly workers in the total labor force.

[27] The UAW and U.S. General Accounting Office both measure displacement from 1985 through 1990 (Howes 1986; U.S. GAO 1988). Because the original UAW study was undertaken in 1986 to estimate future job loss, the UAW used 1985 as the base year. The UAW used 1990 as the end year because at the time, all planned transplant investment was scheduled to be operating by 1990. The GAO used these same dates to permit comparison to the UAW study.

[28] For purposes of comparison to the UAW and GAO estimates, Lawrence also estimated the net job impact due to transplants between 1985 and 1990; he found that there would be a net gain of 51,000 jobs (Lawrence 1990).

[29] This estimate was prepared before the severity and persistence of the 1990-91 recession was known. The estimate was based on pre-recession forecasts of transplant auto production for 1993. While the degree to which the U.S. economy will recover in 1993 remains unclear as this report goes to press, the estimated job loss for 1982 to 1993 may be regarded as the ultimate impact of the transplants once the recovery is complete.

[30] Analysts have generally assumed that the total increase in Japanese sales (imports plus transplants) equals the total fall in U.S. sales (assuming no impact on sales from other countries). If the market is growing then the increase in Japanese sales can be viewed as a combination of actual lost sales and lost "sales opportunities." Since transplants are assumed to be a substitute for imports, the practice has been to estimate the rate of decline of imports as transplants grow (the import displacement rate) and assume that the displacement of domestic vehicles can be measured by 100 percent minus the import displacement rate. If two transplants displace one import and one domestic vehicle, the domestic displacement rate will be 50 percent. If three transplants displace one import and two domestics, the domestic displacement rate will be 66 percent. If two transplants displace two domestics and no imports (that is, imports do not decline), the domestic displacement rate will be 100 percent. And finally, if imports and transplants are both growing, that is domestics are being displaced by both imports and transplants, the domestic displacement rate will exceed 100 percent.

[31] As political opposition to the large Japanese presence in the U.S. market has increased during the prolonged U.S. recession, Japanese firms have recently made a commitment to reduce car imports into the U.S. market. The recent revision of the minimum permissible level of car imports to 1.85 million units under the VRA will not greatly affect the level of car imports currently at 2 million units. It is possible that Japanese firms will delay their collective commitment to achieve five million units of sales in the U.S. market by the mid-1990s. Fearing protectionist legislation, Toyota has recently backed off its plans to sell 1.5 million vehicles in the U.S. by 1995, up from 1 million last year. According to insiders "that's not to say it won't grow, it will just wait until

the political crisis passes" (*Ward's Automotive World*, May 1992, p. 25). An equally likely response will be to import more so-called trucks, including vans and sport utility vehicles, which are increasingly popular and earn very large profit margins.

[32] A range is given for the Big Three because separate computations are made for each model. Under U.S. fuel economy regulations (see next note), all firms which sell vehicles in the U.S. must report the domestic content of each vehicle model to the Department of Transportation for the purpose of classifying the vehicle as part of the domestic or import fleet. The above figures are for domestically-assembled vehicles only. The Big Three sold roughly 500,000 "captive import" vehicles in 1988, which reduced their total fleetwide domestic content slightly. However, to correct the impression that Honda — unquestionably the most American of the transplants — is somehow more American than Chrysler, a generous fleetwide estimate of the U.S. content of Honda's U.S. sales in 1989 would be 43 percent as compared to Chrysler's 86 percent.

[33] Under the Environmental Protection and Conservation Act of 1975, all motor vehicle producers which sell vehicles in the United States are mandated to achieve minimum levels of fuel efficiency measured separately for domestic and import fleets. As required under the Corporate Average Fuel Economy (CAFE) regulations which implement the law, each firm reports the domestic content of its vehicles for the purpose of assigning the vehicle to the import or domestic fleet. This measure of domestic content is referred to as CAFE content.

[34] The authors refer to this measure as the domestic content of the "tradeable portion" of the factory wholesale price. They note that the "CAFE calculation of domestic content includes some items, such as marketing expenses and manufacturing profit that will be 100 percent domestic" (p. 34).

[35] The model's prediction that real domestic content will be in the range of 16 points below CAFE content is consistent with the finding of Howes (1989) based on actual measures of the share of foreign parts coming into transplant foreign trade zones. Since the actual measures could not account for the indirect import content in transplant parts, the real content of transplant assemblers may diverge even more than the predicted 16 points from the CAFE content of 75 percent.

[36] Howes (1989); original source: Foreign Trade Zone Board (FTZB), Annual Report to Congress, and unpublished FTZB data.

[37] Vehicles per worker was calculated in the original study for 1985 and then deflated by a factor of 1.02" to reflect the assumption of a two percent annual productivity growth rate over eight years. I used 1985 as the base year because it was the peak production year for U.S. manufacturers and therefore the year most likely to provide estimates of productivity at peak capacity utilization. Also, by that time at least Ford and Chrysler had reduced their workforces sufficiently for productivity to be higher than in 1978, the previous peak year.

[38] Note that vehicles per U.S. worker is not a measure of productivity. While the ratio increases as productivity increases, it also increases as components are sourced offshore. Therefore, a group of firms such as the transplants, which import half their components, will have levels of vehicles per U.S. worker nearly twice those of U.S. firms, regardless of productivity differentials.

[39] This assumes that there will be no additional capacity beyond that which has currently been announced by Japanese firms.

[40] Employment for 1990 is somewhat lower in the GAO study than in the UAW study because the GAO made a computational error when it calculated the manufacturing multiplier for auto employment. GAO intended to use numbers which reflected the same employment used by the UAW, Lawrence, and this study.

[41] In 1988, the average hourly earnings for production workers in SIC 3711 (motor vehicle assembly) was $15.50 (U.S. Department of Labor, BLS, Employment and Earnings, March 1992). If production were paid for an average of 2080 hours a year, their annual income would be $32,400. For workers in SIC 3714 (automotive parts), the average hourly earnings of $13.21 provides an annual income of $27,476. Therefore, if 19 percent of the 357,000 displaced workers were assembly workers, a total of $2.198 billion in assembly employment income and $7.940 billion in parts employment income will be lost, annually.

[42] This estimate is a bit high because some of the benefits associated with the costs of these employees are benefits provided to retirees. Unless they declare bankruptcy, the companies will have to continue providing retiree benefits spreading the cost of those benefits over an ever shrinking pool of active workers.

[43] Transplants claim to be losing money in the U.S. There is some suspicion, especially on the part of the IRS, that they are engaging in transfer pricing practices to avoid paying taxes in the U.S. They may also be writing off the investment very quickly-treating it as a cost.

[44] It was a condition of Indiana's aid to Subaru-Isuzu that the firm eventually build capacity for 240,000 vehicles and cut back imports before domestic production, in the event of a sales slump.

[45] Bills are currently being drafted in House and Senate Committee (H.R. 4100, sponsored by Rep. Richard Gephardt (D-MO) and Sander Levin (D-MI); and S. 2145) which would require a 20 percent annual reduction in the bilateral automotive trade deficit over five years. At any point if that target is not attained, a quota of 2.3 million imports and 3.8 million total Japanese sales (imports and transplants) will automatically be imposed. The quota would be reduced by 250,000 units annually for five years. In addition, 60 percent of all parts in transplants would have to be sourced from traditional U.S. partsmakers. No performance requirements are imposed on U.S. companies, but Commerce would be required to report annually to Congress on the extent to which U.S. companies have reinvested profits in local production.

Senator Max Baucus (D-MO) has proposed alternative legislation to cap sales of imports and transplants at 3.6 million vehicles. The bill would require improvements in American quality-as measured by the quality standards applied to applicants for the Commerce Department's Baldridge awards-a.s a condition for renewal of the car sales limits every two years (*New York Times,* February 21, 1992, p. C16). Both bills would provide some measure of relief but neither -in itself is sufficient to stem the slide in competitive status of U.S. car companies.

The Gephardt-Levin approach is most comprehensive in creating a stable environment. But the primary focus is on reducing the trade deficit. In theory, this approach would provide the greatest flexibility in the adjustment process. Japan could commit to significant increases in imports of automotive products from the U.S. or reduce exports of parts or vehicles or all of these. One problem with this approach is that past experience with open commitments by Japan has not produced concrete results. Second, the trade deficit is an unreliable operating target because it could fall due to a recession in the U.S. Third, it does not provide enough stability at the level at which investment decisions are made. U.S. firms will not know whether to reduce or expand assembly capacity or parts capacity. A more explicit restriction which clearly defines where Japanese capacity will be-parts or vehicles-as would be the case in the fallback option of the Gephardt-Levin bill, is preferred.

[46] Luria (1990) has suggested allowing the dollar value of transplant and import volume to rise annually by the rate of growth of GNP plus inflation. This would allow rapid expansion of imports in a recovery and require unwieldy contraction in a downturn.

[47] Luria (1990) has proposed that U.S. firms show productivity improvements which, over a three-year moving average, are twice the rate of productivity growth for the economy. While this is a good principle, in practice the goal must be to close the productivity gap with foreign competitors.

[48] Luria makes a similar proposal that prices rise at less than half the rate of inflation, measured by the Consumer Price Index (CPI).

[49] Elasticity measures the responsiveness of demand to price changes. A price elasticity of 1 suggests that, if the price increases by 1 percent, demand will fall by 1 percent. Analogously, supply elasticity measures the responsiveness of producers to changes in the market price. A supply elasticity of 1.7 suggests that a price increase of 1 percent will lead to an increase in output of 1.7 percent.

[50] This assumption is based on several studies which found price elasticities between 1 and 2. Lawrence used an elasticity of 1 which he thinks is appropriate based on his observation. But most of these studies used pre-1984 data. As Lawrence himself acknowledges, the elasticity of demand for Japanese vehicles fell substantially between the decade of the 1970s and the early 1980s. There is no reason to believe that elasticities remained stable into the mid-eighties. In a recent effort to estimate demand elasticities for Japanese imports, Flynn, McAlinden, and Andrea (1989, pp. 63-65) were unable to obtain a significant coefficient for either relative (to domestic vehicles) price elasticity or own price elasticity. They concluded that they must be observing oligopolistic pricing strategies and that Japanese vehicle prices had reached the inelastic portion of their demand curve in the U.S. since 1985.

[51] There was a shifting but absolutely binding constraint on car imports due to the VRA. Truck imports increased rapidly during this period from 400,000 units in 1982 to nearly 1 million in 1986. This is the only source of supply which was flexible, but trucks represented a maximum of 25 percent of total supply during the period. Trucks, however, are substitutes for only limited car models such as station wagons. It is not true, as Lawrence argues, that the Japanese firms were easily able to shift volume from their domestic or other export markets. The VRA was binding and there was no capacity in other regions to build the kind of vehicles that the Japanese were shipping to the U.S. market.

Moreover, MITI tries to control Japanese exports to the U.S. market, not only directly through the VRA, but also indirectly through restrictions on new capacity. Since 1985, despite the fact that the administration refused to request renewal of the VRA, MITI has nonetheless continued to renew it. In 1990, as Toyota, Mazda, and Daihatsu are planning to open new plants in Japan, MITI asked them to scrap some existing facilities, citing concern that automotive plant investment will lead to increased exports and more trade friction (*Ward's Automotive Report*, January 29, 1990, and February 26, 1990).

[52] In the mid-1980s, when Japanese firms were trying to increase sales in their domestic market, they priced vehicles at or below cost of production. As a consequence, during the first few years of the decade, it was said that Japanese firms made nearly all their profits in the U.S. market, and lost money in their domestic market. Since the appreciation of the yen, the profit margins in the U.S. have deteriorated. Japanese firms lost a total of $4 billion in the North American market in 1989 (Economic Strategy Institute 1992).

[53] The supply of trucks is price sensitive. In 1982, Japanese firms faced their first competition in the U.S. light truck market. Intent on maintaining market share and armed with the advantage of an undervalued currency, they adopted such an aggressive pricing strategy that analysts and U.S. firms suspected dumping. After 1986, as the yen began to appreciate, the same truck which had sold for $5,000 in the U.S. market and grossed 1.2 million yen in revenue now grossed only 700,000 yen in revenue. The Japanese firms had the option to raise their prices or take significant losses to continue their market penetration strategy. Since they were threatened with dumping charges, they opted to abandon their truck import strategy in the U.S. market and switch to transplants and other high-margin car imports. Hence, the Japanese were operating on an elastic part of their supply curve for trucks. However, the elasticity is probably more a function of the politics of the situation-the threat of dumping charges-than the price. See Howes (1987), The New Imports, Part III-Light Trucks.

[54] The rate of import displacement is (90,000/174,000) = 52 percent. The rate of domestic displacement is (100-52) = 48 percent. (Some confusion arises from the fact that Lawrence's Table 3, "Displacement of Japanese Imports by Transplants," actually measures the displacement of *domestics* by transplants.)

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