

The New Geography of Automobile Production: Japanese Transplants in North America



Andrew Mair; Richard Florida; Martin Kenney

Economic Geography, Vol. 64, No. 4. (Oct., 1988), pp. 352-373.

Stable URL:

<http://links.jstor.org/sici?sici=0013-0095%28198810%2964%3A4%3C352%3ATNGOAP%3E2.0.CO%3B2-G>

Economic Geography is currently published by Clark University.

Your use of the JSTOR archive indicates your acceptance of JSTOR's Terms and Conditions of Use, available at <http://www.jstor.org/about/terms.html>. JSTOR's Terms and Conditions of Use provides, in part, that unless you have obtained prior permission, you may not download an entire issue of a journal or multiple copies of articles, and you may use content in the JSTOR archive only for your personal, non-commercial use.

Please contact the publisher regarding any further use of this work. Publisher contact information may be obtained at <http://www.jstor.org/journals/clark.html>.

Each copy of any part of a JSTOR transmission must contain the same copyright notice that appears on the screen or printed page of such transmission.

JSTOR is an independent not-for-profit organization dedicated to creating and preserving a digital archive of scholarly journals. For more information regarding JSTOR, please contact support@jstor.org.

THE NEW GEOGRAPHY OF AUTOMOBILE PRODUCTION: JAPANESE TRANSPLANTS IN NORTH AMERICA*

ANDREW MAIR

Universite de Lille I, France and West Virginia University

RICHARD FLORIDA

Carnegie Mellon University

MARTIN KENNEY

The Ohio State University

Japanese automobile firms have constructed substantial complexes of manufacturing plants in North America. The complexes include over two hundred and fifty components factories as well as twelve assembly plants. These "transplant" investments are contributing to a new geography of automobile production. Manufacturing locations have been expressly selected to facilitate the transfer of the just-in-time manufacturing system to North America. Most transplant assembly firms have chosen locations in the Midwest or southern Ontario, in proximity to the indigenous automobile industry's supplier infrastructure. Most have also chosen non-metropolitan areas, in search of rural employees who are thought most amenable to just-in-time techniques. Supplier transplants have been concentrated within one to two hours driving time of the assembly plants but have been dispersed at the local scale so as to minimize labor market overlaps. Since the major concern in location selection has been implementation of just-in-time manufacturing techniques, the large subsidies offered by provincial, state, and local governments to attract transplants have had little or no effect on the overall geographical pattern of investment.

The world automobile industry is currently experiencing a profound restructuring encompassing both new production methods and new geographical patterns of manufacturing [4]. A notable aspect of this restructuring is the investment of over \$8 billion by more than 250 Japanese automobile assemblers and components manufacturers in production facilities, known as transplants, in North America. These investments are especially significant because the Japanese firms are intent upon implementing automobile production methods in North America which were previously unique to Japan.

* We gratefully acknowledge the financial assistance of the Ohio State Board of Regents and the United States Department of Agriculture. Thanks are due to John Stamm of the Ohio Department of Development for arranging interviews at firms, Sandy Krulikowski-Walden for typing, and Gerald Mills of The Ohio State University Department of Geography for drawing the figures. Helpful comments have been made by Gordon Clark, an anonymous reviewer, and the personnel of the Hitotsubashi University Institute of Business Research.

The Japanese "just-in-time" (JIT) manufacturing system differs markedly from the "Fordist" or "just-in-case" system which was the central model of industrial organization for North American automobile manufacturers between the 1940s and the 1980s. Moreover, the JIT system seems to imply a very different geographical organization of production than the Fordist system [29; 72], and so the establishment of Japanese automo-

bile production transplants may have profound implications not only for automobile production methods but also for the geography of the automobile industry in North America.

The aim of this paper is to show how and explain why the transplant investments are indeed creating a new geography of automobile production. The first objective will be to demonstrate that Japanese automobile manufacturing in North America has already moved well beyond the limited assembly of "knocked-down" kits in branch plants which some asserted was the purpose of the transplant investments. It will be shown that automobile production complexes, including substantial components manufacture as well as final assembly, have been constructed. The second objective will be to reveal that the geographical patterns being created by transplant investments differ markedly from expectations of geographical trends associated with the late Fordist period (the 1970s and early 1980s). While the trend in late Fordism was towards geographical dispersal of automobile production at local, regional, and international scales, the predominant trend among the transplants is towards geographical concentration internationally and regionally combined with dispersal at the local scale. The final objective will be to explain why this new geography is being created—precisely to enable Japanese firms to successfully transfer the JIT system to North America.

The paper proceeds as follows. There is, first, a brief overview of the current debate over the future geography of automobile production, which sets a context for analysis of the transplants. The second section then provides a comprehensive description of the growth and extent of the transplant manufacturing complexes to show that they are quite different from "knocked down kit" assembly plants. In the third section, the geography of the transplants is analyzed. Attention is drawn to how the desire to establish JIT relationships between assembly transplants and their suppliers led to a

marked regional-scale concentration of assembly plants in the Midwest and Southern Ontario Region and also to a clustering of transplant suppliers around assembly plants. It is then shown how strategies for securing employees amenable to JIT manufacturing techniques led to a strong tendency to select sites in "greenfield" rural areas and also to a pattern of local-scale dispersal of transplants within the Midwest and southern Ontario. The concluding section of the paper draws out the significant implications of transplant locational patterns for understanding the restructuring geography of automobile production in the post-Fordist era.

FORDISM, JIT, AND THE GEOGRAPHY OF AUTOMOBILE PRODUCTION

For forty years until the 1970s, automobile producers in North America successfully utilized Fordist methods of mass production, characterized by the deployment of machinery dedicated to single tasks, strict job demarcations with multiple skill classifications for the workforce, and clear divisions between employees responsible for mental and manual labor [1; 3; 4; 41; 42; 71]. In the Fordist system high production volumes were necessary to attain maximum scale economies and so reduce unit costs. Relationships between assembly firms and supplier firms were generally conducted at arms length, and large inventories were considered necessary (hence the "just-in-case" label sometimes applied to the system) to avoid disruptions to production. Competitive bidding over price preceded each new supplier contract. While the Fordist system achieved steady productivity increases for over 20 years, since the early 1970s its rates of productivity improvement have declined, as a result of difficult labor relations, technical problems in reorganizing production, and increasingly weak technology and product development [3; 4; 6].

The major differences between Fordist methods of producing automobiles and the "just-in-time" methods developed by

Toyota and widely adopted in Japan are now well known [2; 4; 24; 31; 41; 54; 71; 75]. In contrast to Fordism, JIT involves: (i) smoothing production to virtually eliminate in-process inventories; (ii) using flexible machinery quickly adaptable to various products, which allows manufacture of relatively small lots; (iii) deploying teams of production workers who are able to rotate job tasks, to resolve minor problems without resorting to a separate engineering staff, and to undertake in-process quality control; and (iv) maintaining close relations between assembly firms and components suppliers, in which the suppliers are integrated into the overall JIT production system.

By the early 1980s, JIT had become the world-best standard for automobile production [4], which in turn led to speculation about whether it could be successfully transferred outside Japan. Many analysts of the world automotive industry doubted that Japanese firms would invest heavily overseas or would be able to transfer the JIT system to other countries [8, pp. 95-96; 50, pp. 134-5, 161]. In general, the development of a peculiarly Japanese manufacturing system was said to result from cultural attributes particular to Japanese people, and the absence of these cultural attributes in other countries supposedly would make the diffusion of JIT very difficult [15; 23, p. 14; 36, p. 29; 60]. More specific arguments focused on the employee-management relations necessary to operate the JIT system and on JIT relations between assemblers and suppliers. Thus, Dohse et al. [26], Hayashi [36, p. 25], and Monden [54, p. 9] each forecasted resistance to JIT, especially its employee flexibility requirements, from labor unions in North America and Europe; Dohse et al. argued that labor resistance would be entirely prohibitive. Further, Cusumano [24, p. 383], Dohse et al. [26, p. 119], and Sinclair [76, p. 69] each suggested that JIT assembler-supplier relationships could not be maintained if Japanese firms moved production overseas. The general consensus of the early 1980s about the transferability

of JIT techniques to other countries was succinctly expressed by the Toyota engineer responsible for the original development of the JIT production system:

We have a slight doubt whether our just-in-time system could be applied to the foreign countries where the business climates, industrial relations, and many other social systems are different from ours [54, pp. i-ii].

The possible impact of the international diffusion of JIT on the geography of automobile production nevertheless has been a subject of recent debate among economic geographers. The source of discussion is the marked difference observable between industrial location trends during the late Fordist period—especially the tendency towards geographical dispersal of automobile production sites at local, regional, and international scales, a strategy which firms have used to (i) help restructure locally “ossified” [16] labor relations and (ii) increase economies of scale [10; 11; 17; 74]—and the apparent benefits of geographical concentration in places like Japan’s Toyota City for optimal operation of the JIT system [29; 52; 75; 78]. Thus, Schoenberger [72] has described contradictory geographical tendencies now present in the automobile industry towards both concentration and dispersal. While a new trend towards concentration might be expected to accompany any international diffusion of JIT assembler-supplier relations and JIT production processes in which skilled and unskilled jobs are not physically separated, Schoenberger cautions that dispersal still might be preferred as a means to maintain control over labor. There is, thus, an apparent trade-off between the advantages of concentration and those of dispersal. The result, according to Schoenberger, is that while the different geographical tendencies present can be analyzed, the empirical outcomes cannot be forecast.

Others have been less reticent in making predictions about future geographical patterns of automobile production. Estall

[29] and Holmes [41] argued that adoption of JIT in North America would result in a trend towards geographic reconcentration of production in the traditional automobile production regions. Rubenstein [66; 67; 68] also predicted renewed concentration. This view was criticized by Glasmeier and McCluskey [33], who presented data on recent location patterns among U.S. automotive supplier firms which appear to show a trend towards continued dispersal into southern states. Glasmeier and McCluskey have argued that future geographical concentration of automobile supplier firms to accommodate JIT components deliveries would be unnecessary because most were already within one-to-two-days driving time of assembly plants, which they suggested satisfies JIT delivery requirements for maintaining minimal inventories.¹ Finally, Hill [38; 39] predicted future dispersal of production out of traditional automobile communities, in states like Michigan, into new concentrated "Toyota City" complexes in states like Missouri, Kentucky, and Tennessee where lower wages can be paid.

It is in this context of uncertainty about the international transferability of JIT and the future geography of automobile production that we now turn to examine the Japanese transplants and their geography.

JAPANESE AUTOMOBILE PRODUCTION COMPLEXES IN NORTH AMERICA

Despite the doubts over whether Japanese automobile firms would locate manufacturing plants in North America, during the 1980s there has been a substantial wave of transplant investments. By the

¹No dates are specified in Glasmeier and McCluskey's discussions of "recent" plant openings, leaving the reader uncertain as to whether the data presented refers to the years around 1980 or to the mid 1980s. This is unfortunate, since these periods may straddle a crucial watershed in automobile production location trends. Moreover, our research leads us to believe that JIT inventory control requires suppliers be within one to two *hours* driving time and that one to two *days* is not adequate [63].

early 1990s, there will be over 250 Japanese-owned automobile assembly and components production plants in the United States and Canada, all but a handful constructed since 1980. It is widely assumed that Japanese firms eventually invested in North America largely in order to circumvent the threat of protectionist trade legislation which followed rapid increases in Japanese automobile exports to North America during the 1970s and early 1980s [8, pp. 95-96; 24, p. 383; 27; 38; 39; 50, p. 135]. The threat of protectionism, especially the 1981 Voluntary Restraint Agreement under which Japanese firms agreed not to further increase their exports to the United States [27; 80, pp. 6.9 6.10], certainly seems to have accelerated the decisions of the more conservative Japanese firms (e.g. Toyota) to establish transplant production.² Another commonly cited factor in decisions to locate manufacturing plants in North America has been the sharp rise in the value of the yen during 1987, which dramatically increased the costs of exporting both components and finished automobiles from Japan to North America.

However, it is also necessary to interpret the establishment of transplants in the context of the long-term corporate strategies of Japanese automobile firms. Honda and Nissan, which were the first assembly firms to establish North American transplants, long had been faced with very difficult competition in a Japanese market dominated by Toyota. The eventual establishment of North American production facilities represented a competitive strategy designed to circumvent Toyota and take advantage of the relative stagnation of the North American Fordist production system during the 1970s, which was already making the market there highly profitable for Japanese producers.³ For many Japanese supplier

²It has also been argued that Japanese automobile firms, intent upon manufacturing in North America, broadcast the argument of U.S. and Canadian protectionism domestically in order to defend overseas production to critics at home [85].

³It is no coincidence that Honda and Nissan were

firms, establishing transplants has also served their long-term expansionary strategic goals. Others moved because they found it hard to maintain JIT supplier relationships with the transplanting assembly firms from Japan. In general, then, the establishment of Japanese transplants can be explained in terms of: (a) the highly competitive market in Japan; (b) the stagnation of Fordism in North America during the 1970s; (c) the still-increasing productivity of Japanese manufacturers; and (d) the consequent massive growth of the Japanese market share in North America during the course of the decade (from 4 to 23 percent in the United States [4]), as well as (e) more immediate concerns such as protectionism and currency fluctuations (which are themselves largely due to the first four factors anyway).

Both Nissan and Honda had considered the establishment of North American automobile assembly facilities as early as 1970 [15; 34, p. 588; 69, p. 201]. In 1977, Honda announced that it had selected a site in the small Midwestern town of Marysville, Ohio, for a factory to assemble motorcycles. Motorcycle production would test the ground for the possible manufacture of automobiles, an experiment deemed necessary because internal feasibility studies had predicted financial losses from transplant automobile production [43]. Soon after the motorcycle plant opened in 1979, however, Honda announced construction of a \$250 million automobile assembly plant adjacent to the Marysville facility. Two years later, in November 1982, the first Honda automobile was assembled, and by 1984 almost the full production rate of 150,000 automobiles per year had been achieved.

After many years of internal debate, Nissan announced that it too had selected a site for North American production.

Nissan's factory was to be located in the small southern town of Smyrna, Tennessee. Like Honda's motorcycle plant, the Smyrna plant was viewed as experimental, with the initial products to be pick-up trucks. Manufacture of pick-ups was seen as less risky in terms of customer perceptions of products if, as Nissan feared, it would prove difficult to manufacture high-quality vehicles employing North American workers [34, p. 635]. The first trucks were produced in 1983, but Nissan quickly decided to assemble automobiles as well, starting in 1985.

The establishment of these two assembly transplants marked the beginning of a wave of investments by assembly firms (Table 1). By 1991, eight of the nine Japanese automobile producers will have assembly operations in North America.⁴ Japanese firms will soon be managing twelve automobile assembly plants, four of them in joint ventures with North American firms. Eleven of the twelve plants are new factories; the exception, the plant occupied by the Toyota-GM joint venture New United Motor Manufacturing, Inc. (NUMMI), was completely refurbished.

The total investment in assembly plants that are 50 or 100 percent Japanese owned will exceed \$5.7 billion (Table 1). By 1991, nearly 30,000 employees will assemble 2.26 million vehicles per year, of which 1.89 million will be automobiles and the remainder light trucks or minivans. To place these numbers in context, total North American production of automobiles and light trucks/mini-vans (all production in the United States, Canada, and Mexico for sale in the United States and Canada) in 1986 was 12.8 million [14], while total consumption in the United States and Canada has recently fluctuated around 16 million. Even bar-

⁴Daihatsu's cancelled plans for a joint venture with Quebec-based Bombardier makes it the only exception [13; 82]. Of all the Japanese assembly firms, Daihatsu is least dependent upon exports and sells few vehicles in North America [25]. It should also be noted that the Korean firm Hyundai plans to open a 100,000-car-per-year assembly plant in Quebec in early 1989 [88].

also the first Japanese firms to move towards manufacturing automobiles in Europe—Honda via joint agreements with the British firm BL (later Rover) [69, pp. 23–25, 245–247] and Nissan by constructing its own plant in Britain [32].

TABLE 1
NORTH AMERICAN ASSEMBLY PLANTS OF JAPANESE AUTOMOBILE FIRMS

	LOCATION	PARENT'S	PRODUCTION START DATE	ANNUAL CAPACITY	PROJECTED EMPLOYMENT	INVESTMENT \$U.S.MILLIONS
HONDA	Marysville, Ohio	Honda (100%)	1982	360,000	5,000	590
NISSAN	Smyrna, Tennessee	Nissan (100%)	1983	240,000	3,300	879
NUMMI	Fremont, California	Toyota (50%) GM (50%)	1984	250,000	2,600	450
HONDA	Alliston, Ontario	Honda (100%)	1986	80,000	700	160
MAZDA	Flat Rock, Michigan	Mazda (100%)	1987	240,000	3,500	550
TOYOTA	Georgetown, Kentucky	Toyota (100%)	1988	200,000	3,000	800
TOYOTA	Cambridge, Ontario	Toyota (100%)	1988	50,000	1,000	320
DIAMOND- STAR	Bloomington Normal, IL	Mitsubishi (50%) Chrysler (50%)	1988	240,000	2,900	700
CAMI	Ingersoll, Ontario	Suzuki (50%) GM (50%)	1989	200,000	2,000	416
SUBARU- ISUZU	Lafayette, Indiana	Fuji Heavy Indus.(51%) Isuzu (49%)	1989	120,000	1,700	500
HONDA	E. Liberty, Ohio	Honda (100%)	1990	150,000	1,800	380
NISSAN- FORD	Avon Lake, Ohio	Nissan (?%) Ford (?%)	1991	130,000	1,300	700
TOTALS				2,260,000	28,800	6,445

Notes: 1. Source: Industry and trade reports; announcements as of December 1988.

2. Canadian dollars converted to U.S. dollars at \$1 Canadian to \$0.8 U.S.

3. Table does not include Honda Anna engine plant or Toyota engine plant. These would bring total employment by Japanese assembly firms to 30,800 and investment to \$7,445.

ring any future decline in overall demand, the transplants will soon be able to supply over 13 percent of the automobiles, light trucks, and mini-vans sold in North America. If transplant production is added to the 3.7 million automobiles and light trucks imported annually from Japan, Japanese firms will potentially be able to supply over 36 percent of the North American market by the early 1990s.⁵

The wave of assembly transplant investments is not over. Capacity at Honda's Marysville plant has already been more than doubled since the factory was initially opened, and announcements are expected during 1989 of plans to double capacity at the other two of the first three plants to open; Nissan is likely to double its capacity to 480,000 vehicles [91], while

NUMMI will add a second line for assembly of pick-up trucks [90]. Some automobile industry analysts expect Toyota to eventually triple production capacity at its Kentucky assembly plant [20]. Subaru-Isuzu has contingency plans to double its output [99]. Still other reports have suggested that Honda will invest in a fourth assembly plant, perhaps to manufacture down-market sub-compacts [22; 94] or, alternatively, may design and produce a luxury automobile in North America by 1992 [30]. Moreover, the Japanese medium-size truck manufacturers may follow the automobile assemblers to North America [87].

While the assembly transplants represent perhaps the most visible investments, there has also been a very substantial wave of North American investments by Japanese automotive supplier firms (Figure 1). By 1991, there will be at least 250 Japanese automobile supplier production facilities in North America, al-

⁵While vehicle imports from Japan fell slightly during 1988, there is little reason yet to assume that they will be reduced to "compensate" for transplant production.

Start-ups per year

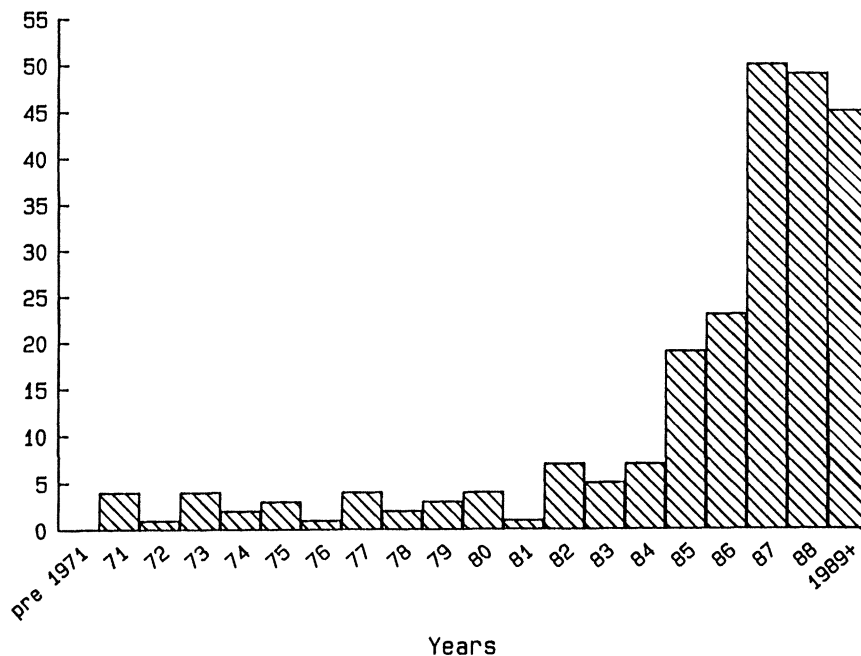


Fig. 1. Dates of production start for 234 Japanese automobile supplier transplants in North America. (Source: See Footnote 6.)

most all newly constructed.⁶ Some supplier transplants started production prior to 1982 (when the first assembly transplant opened), particularly those independent firms establishing North American factories to supply the assembly plants of the Big Three and firms supplying fixtures (e.g. air conditioning) for imported Japanese automobiles. But the vast majority of supplier transplants have been established since 1982. Most moved to North America to supply affiliated assembly firms that were starting transplant production, with some also intending to supply Big Three firms.

The transplant investments of both

⁶Data were compiled from seventeen separate sources, including [5; 46; 80], state governments, national and local newspapers, and industry publications. The accuracy of these sources proved highly variable. Telephone calls were made to the firms, confirming that substantial manufacturing for the automotive industry by totally or partly Japanese-owned firms was or would be taking place at 248 of the 296 sites compiled (data collection up to December 1988).

assembly and supplier firms have been heavily subsidized by state and local governments seeking to entice them to locate in their jurisdictions [28; 53]. Total employment at Japanese automobile firms in North America will exceed 60,000 by 1991⁷ [80, p. 5-4], and securing these jobs has been used to defend a "bidding war" among state and local governments competing to offer grants, tax abatements, and infrastructural improvements. The nature and magnitude of the state-level subsidies is revealed by the sample in Table 2. State government grants have funded transplant labor force selection and training, and state programs (often incorporating federal government funds) have paid for highway improvements and water and sewer extensions. Many local governments have awarded full or partial property tax abatements lasting up to 20 years, often with expecta-

⁷This preliminary figure excludes all suppliers in Canada and any new or expanded plants in the United States announced since 1987.

TABLE 2

STATE GOVERNMENT SUPPORT FOR U.S. PLANTS OF JAPANESE ASSEMBLY FIRMS

Japanese Investor	State	Financial Support (\$ million)	
Toyota	Kentucky	Total support	125.0
		Site acquisition	15.0
		Site improvement	20.0
		Technology center construction	10.0
		Worker training	33.0
		Road improvement	47.0
Diamond-Star	Illinois	Total support	83.3
		Road improvement	17.8
		Site acquisition	11.0
		Water system improvement	14.5
		Worker training	40.0
Mazda	Michigan	Total support	52.0
		Worker training	19.0
		Road improvement	4.0
		Low-interest loans for site and sewerage improvements	20.0
		Loans to small municipalities	0.5
		Federal subsidy	1.0
		Railway improvement	7.5
Nissan	Tennessee	Total support	19.0
		Worker training	7.0
		Road improvement	12.0
Honda	Ohio	Total support	
		None announced, but some believe \$22 million was provided in subsidies.	

Source: Miyauchi [53].

tions of recouping the subsidies through local income taxes on new employees [64].

The Japanese firms have created integrated automobile production complexes with their transplant investments. It is important to stress that whole production complexes are being constructed because there has been a widespread misconception that Japanese transplants are mere assembly platforms at the lower end of a product cycle, whose employees do little more than build knocked-down kits of components imported from Japan [27, p. 244; 33, p. 144, 156; 65; 38; 39; 76, p. 71; 79]. This knocked-down kit argument appears to derive more from an assumption that transplant investments were designed primarily to forestall protectionist trade legislation—and that they would therefore be only as large as necessary to satisfy public relations requirements—than from thorough empirical analysis. It tends to be “confirmed” by extrapolating data on the origin of components in the first years of production at Honda and Nissan [76, p. 71]). After our own analysis of the organization of transplant produc-

tion, we would argue that the only case in which the knocked-down kit argument might have validity (and even here it is dubious) is NUMMI, at which Toyota installed a well-ried assembly system to manufacture a relatively dated model for GM to sell.

The most highly developed transplant complex is centered on the Honda assembly plant at Marysville, Ohio. The two assembly lines at the Marysville plant produce 360,000 automobiles per year, more vehicles than any other assembly plant in North America [61]. Honda is constructing a second plant close to the first which will have an annual capacity of 150,000. The firm is also establishing major R&D and Honda Engineering facilities at its Ohio plants and has purchased an existing automotive test-center, adjacent to the assembly plants, from the state of Ohio for \$31 million. At another Honda plant, in Anna, Ohio (50 miles west of Marysville), components for engines, transmissions, cylinder heads, brakes, suspension systems, and wheels for at least 510,000 automobiles per year will be cast, machined, and assembled. Many other

Honda components are also manufactured in North America. By 1989, at least 29 Japanese supplier firms will have established transplant manufacturing facilities mainly to supply Honda, and a further 33 will be supplying Honda as well as other firms. Many indigenous firms (U.S. and Canadian) also provide components and materials. By 1989, Honda's "local content" ratio (the proportion of automobile production costs for cars assembled in North America which is added in North America) will surpass 75 percent; by some accounts, during the 1990s it will exceed that of Chrysler [100].⁸ According to the president of Honda of America, the corporation aims to establish automobile production facilities in North America that are analogous to Ford's autonomous European division [93].⁹

Many of the other Japanese automobile producers are also creating integrated transplant production complexes. Transplant local content ratios can be expected to rise in steps every few years as new models are introduced [79]. Toyota will assemble engines at a factory adjacent to its Kentucky assembly plant, raising its projected local content to 75 percent [98]. Nissan is adding engine and axle assembly lines to its Smyrna plant, which will increase its local content to 75-80 percent by 1990 [95]. The sharp rise in the value of the yen against the dollar during 1987 accelerated the plans of other firms to increase their levels of local content; thus, Subaru-Isuzu is also considering an engine plant [99], Diamond-Star Motors planned to have 60 percent local content

⁸Local content figures given by firms should be treated with extreme caution. While the figures themselves may well be conservative, they apparently refer not to value added in North America but to expenditures made there. This is important because components bought in North America may themselves have low local content, which means that figures based on expenditure may be substantially higher than figures for value added. However, many of the established Japanese suppliers are now intent on rapidly increasing their own local content levels to at least 70-80 percent, which would reduce the discrepancy between the two measures.

⁹For a detailed analysis of Honda's manufacturing complex, see Mair, Florida, and Kenney [48].

rather than the originally announced 40 percent when its operations started [97], and Mazda's immediate goal for local content was raised from 50 percent to 70 percent [83], with only engines and transmissions imported [92]. By the early 1990s local content ratios for the transplants are predicted to be within 10 percent of the Big Three North American producers, with the former averaging 75 percent, against an average for the latter of 83 percent [79].

Other firms have also followed Honda's lead in establishing facilities for research and testing in North America. Mazda has a \$23 million R&D facility in California [102]. Nissan has opened a \$40 million test facility in Arizona and is boosting its R&D capabilities in Michigan with the aim of independently producing automobiles from conception to manufacturing in North America [101]. A Nissan sports-car model has already been largely designed at Nissan's California facilities [19]. Honda used its California R&D facility to design a sports-compact that has been produced (in Japan) specifically for the North American market [69, p. 243]. While the models produced in North America have generally been the same ones also manufactured in Japan, Honda is now manufacturing a two-door Accord that it makes only at Marysville. The firm intends to export 70,000 of these vehicles per year by 1991, 50,000 of them going to Japan (exports to Japan began in early 1988). Marysville Accords will also be exported to South Korea [88].¹⁰ Nissan may also manufacture a two-door model unique to North America, some of which will be exported to Japan [95].

As Japanese firms continue to expand

¹⁰In part, exports to Japan are designed to ensure that the transplant production facilities attain the high quality standards necessary to sell automobiles in Japan, where demanding Japanese consumers will provide valuable feedback to Honda [94]. Commencing exports to Korea from North America was aimed at circumventing the Korean import ban on Japanese automobiles, allowing Honda to take international competition to the home country of a major competitor.

their transplant automobile production facilities, one firm after another is organizing integrated North American divisions which are substantially adding to production capacity in the United States and Canada. The assembly transplants are linked to extensive networks of suppliers in North America, many also newly arrived from Japan, which allow for steadily increasing levels of local content. Design, R&D, and testing are undertaken in North America, and automobiles are manufactured that in some cases are already being exported back to Japan. The transplants thus represent a wave of new investment in the North American automobile industry with major implications for that industry's future.

TRANSPLANT GEOGRAPHY

The locations selected for assembly and supplier transplants have created distinctive and novel geographical patterns of automobile production. Eleven of the twelve assembly transplants are located in a region stretching from southern Ontario south through Michigan, Illinois, Indiana, Ohio, and Kentucky to Tennessee (Figure 2). This "Transplant Corridor" is organized principally along several interstate highways, especially I65, I75, and I401. The single exception to the pattern of regional concentration is the NUMMI joint venture between Toyota and GM, which reopened a previously closed GM plant in Fremont, California. There has also been a strong tendency to select assembly transplant locations in rural areas. Of the eleven assembly plants along the Transplant Corridor, nine are adjacent to small towns at a distance from major metropolitan areas. The exceptions to this pattern are the Mazda plant at Flat Rock, Michigan, which is in metropolitan Detroit, and the Nissan-Ford plant near Cleveland, Ohio.

The pattern of supplier transplant locations follows closely that of the assembly plants. While most of the small group of early supplier transplants were located either close to North American assembly

firms or near ports of entry for imported automobiles, almost without exception supplier firms establishing facilities since 1982 have selected locations along the Transplant Corridor (Figure 3). By late 1989 there will be at least 52 Japanese supplier firms with production facilities in Ohio, 33 in Kentucky, 31 in Indiana, 32 in Michigan, 19 in Tennessee, 17 in Illinois, and 14 in Ontario. There will also be twelve supplier transplants in California, the location of NUMMI and the point of entry for many imports. Only 38 (15 percent) will be located in other states and provinces.

Most of the Japanese supplier firms have also followed the assembly firms in selecting sites adjacent to small towns in rural areas. As Figure 4 reveals, there has also been a marked tendency for supplier firms to cluster around the particular assembly firms they supply or alternatively to locate in areas readily accessible to a number of assembly plants (e.g., southeastern Indiana). However, where there are particular concentrations of the new Japanese factories, as in western Ohio, they are often separated from each other by 20 to 30 miles.

The geographical pattern of transplant locations revealed in Figures 2, 3, and 4 is a direct result of the desire of Japanese automobile producers to gain competitive advantages over Big Three firms by transferring their JIT manufacturing techniques to North America. Manufacturing locations were selected expressly to ease adoption of JIT. This explanation holds true for the concentration of most assembly transplants within the Midwest and Southern Ontario Region, for the international migration of 250 Japanese supplier firms to North America, and for the subsequent regional-scale concentration of the supplier transplants around the assembly plants they supply. The explanation also holds true for the rural locations selected by the majority of assembly and supplier firms and for the local-scale dispersal of suppliers to be generally 20 to 30 miles apart. While they certainly recognized that transferring JIT techniques to

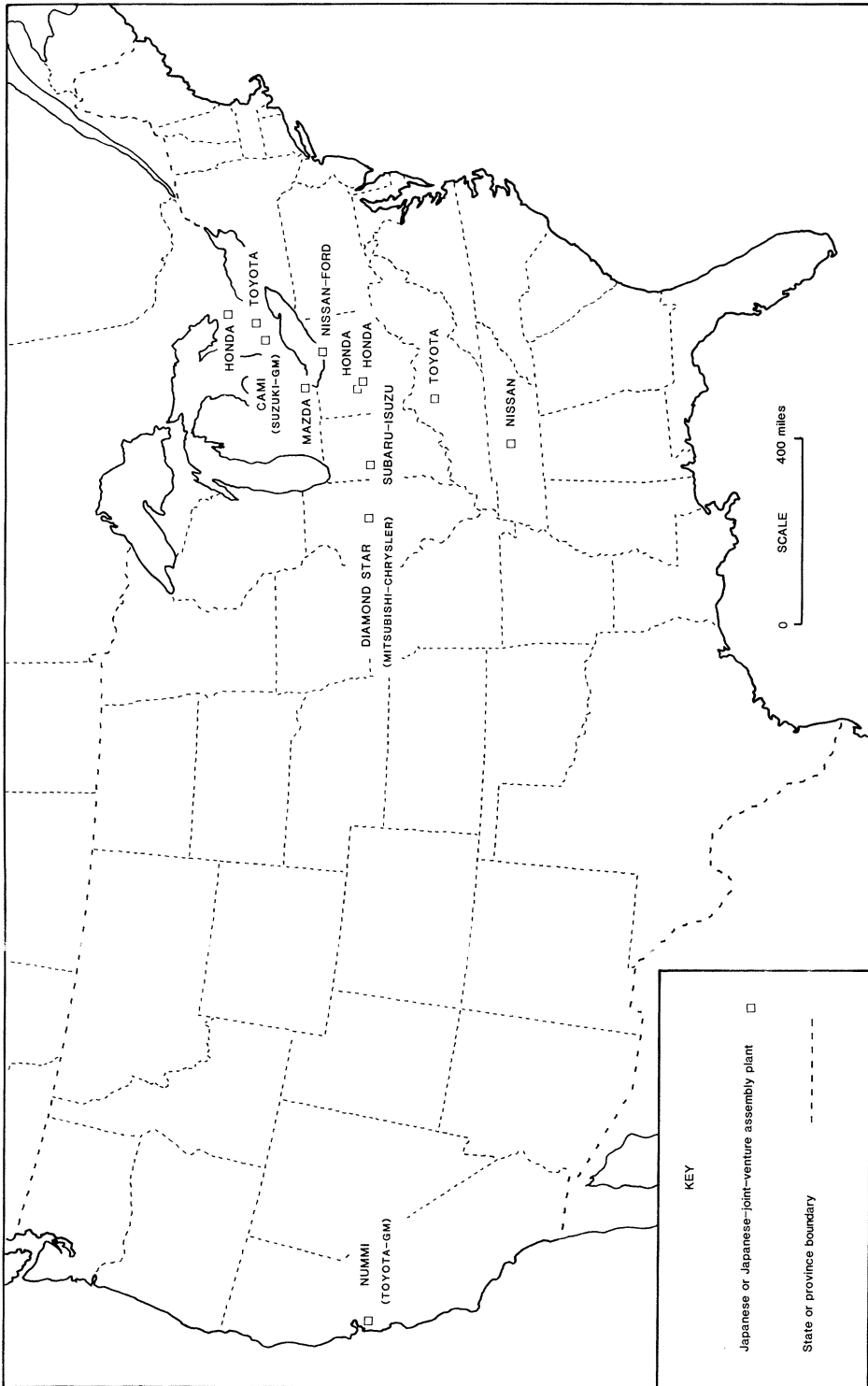


Fig. 2. North American assembly plants of Japanese automobile firms.

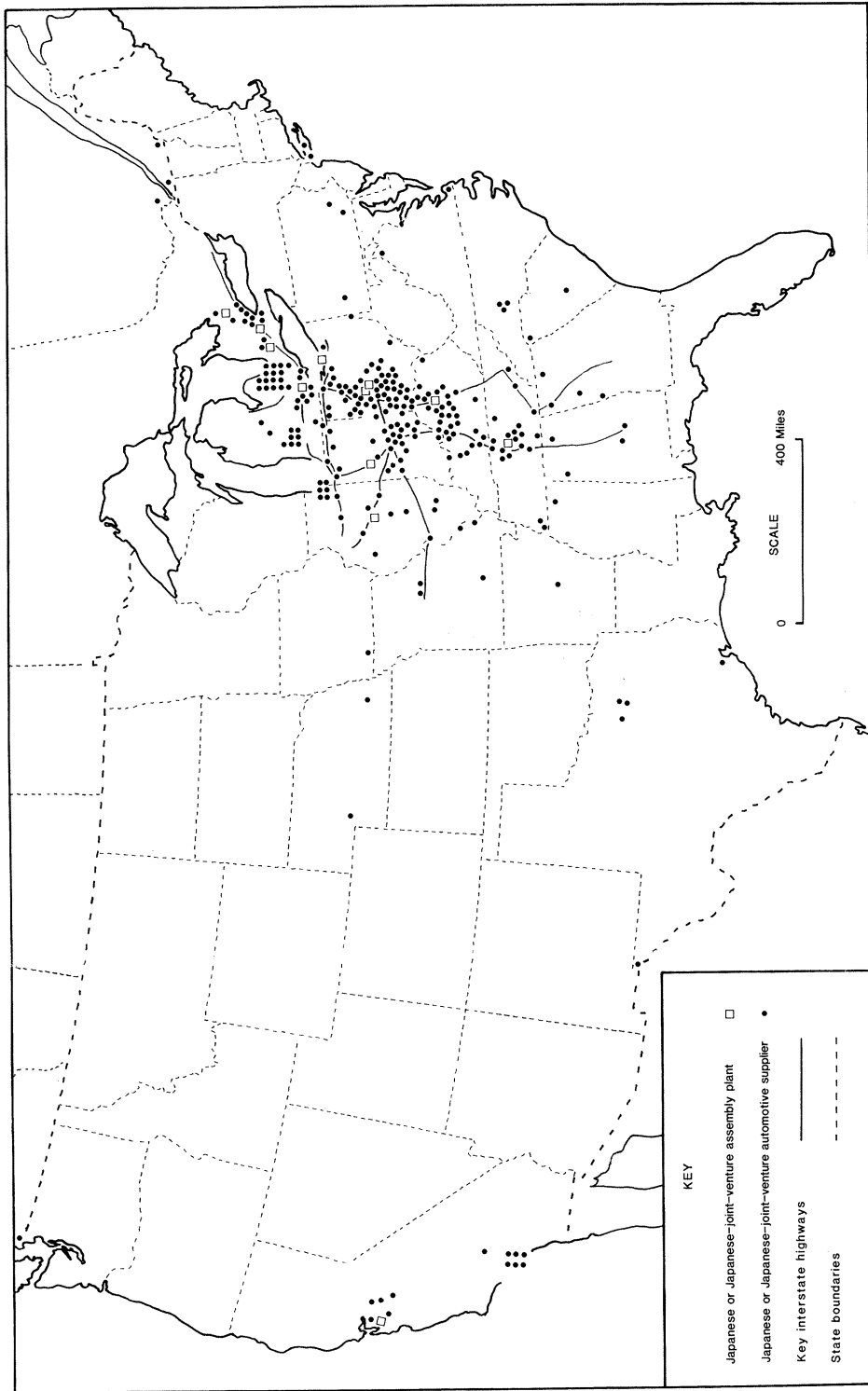


Fig. 3. North American automobile assembly and supplier manufacturing plants of Japanese firms (Source: See Footnote 6.)

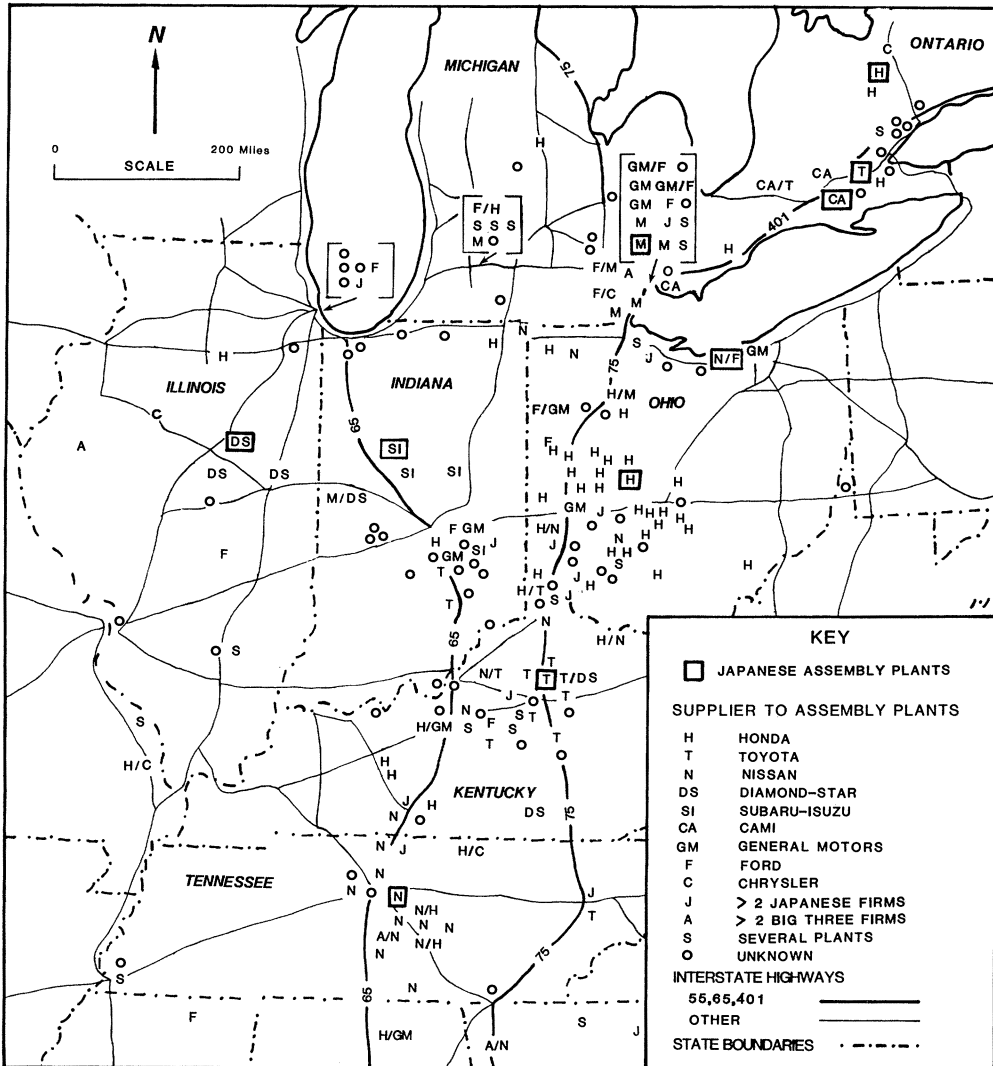


Fig. 4. Japanese automobile production complexes in the Midwest and southern Ontario (Source: See Footnote 6.)

North America did not rest solely on geography, the Japanese firms saw location decisions as among the crucial determinants of success in this regard.

When the assembly firms considered constructing transplants in North America, obtaining JIT deliveries of components and materials was clearly a potential problem. One means of obtaining high quality parts and materials for the assembly transplants was to import bulky, low-cost items from traditional

suppliers in Japan. For example, Mazda was initially unable to identify North American suppliers of adequately high quality steel for body panels and therefore imported even steel from Japan [92]; NUMMI was still importing half of its steel in 1986 [40]. However, while those who argued that the Japanese transplants were mere knocked-down kit assembly platforms might have expected this pattern to prevail, importing components from Japan has undermined the JIT inven-

tory control system and is therefore seen as highly problematic. Parts and materials imported from Japan must often be trucked to the Midwest from the West Coast and can take from four to six weeks to arrive at plants [63]. Even NUMMI's deliveries from Japan to California take up to two weeks [61]. Imported components must also be carefully and expensively packaged to avoid damage [61]. The result is that JIT is effectively sabotaged for imported components. And if these difficulties were not enough, the 1987 rise in the value of the yen dramatically increased the financial costs of importing components and materials.

To counter the problems entailed by importing components from Japan, the transplant assembly firms originally hoped to establish JIT relationships with a number of indigenous supplier firms. Indeed, it was the history of the Midwest and Southern Ontario Region as the geographical heart of North American automobile production and locus of an infrastructure of automotive supplier firms that first drew most of the assembly transplants to the region, in order to be close to suppliers for JIT parts deliveries. Honda, for instance, selected an Ohio location precisely in order to establish JIT linkages with Midwestern supplier firms [61].

Most indigenous suppliers, however, were largely unfamiliar with JIT quality and delivery requirements. While Honda's expectations were not very high, quality turned out to be much worse than expected [61]. Even obtaining basic items such as glass and steel proved quite problematic [63]. The attitude and responsiveness of potential indigenous suppliers towards JIT has been central to their evaluation and selection by assembly transplants. To improve the situation, NUMMI has organized a "supplier council" composed of over 70 firms to encourage suppliers to share lessons among themselves [47]. Those indigenous firms which have been selected to supply the assembly transplants were forced to change decades of business practices in

order to gain the new business [5].

Yet, some indigenous supplier firms have apparently continued to resist adopting JIT. Even by 1988, Mazda, which located its assembly plant in metropolitan Detroit in large part to obtain easy access to suppliers, reported that its biggest single problem remained obtaining materials of adequate quality [92; 96]. Mazda executives were surprised to discover indigenous suppliers unwilling to reduce initial defect rates rather than simply replace defective parts. These supplier firms preferred not to do business with Mazda rather than alter their manufacturing practices [58]. In some cases the assembly firms have turned to indigenous firms hitherto outside the automobile industry for parts; thus a producer of plastic small toys and tubular children's furniture now supplies Honda with air ducts [21], while a lawn seed testing firm now assembles Honda's radio speakers [81].

As a result of these problems maintaining JIT deliveries of imported components or establishing JIT relationships with close-by indigenous supplier firms, the assembly firms have encouraged many of their Japanese suppliers to construct transplants in North America. Mazda directly requested some of the components suppliers with which it is associated in Japan to establish production facilities in North America [92], as did Honda [63]. In several cases the assembly firms have committed capital and organizational resources to construction of supplier transplants. For example, unable to find indigenous firms willing to make small stampings and assemble them into fuel tanks, wheel housings, and dashboard parts in an acceptable manner, Honda assisted four of its small Japanese suppliers which formed a joint venture to construct a factory to manufacture these components in Ohio [9; 21; 44].¹¹ Many other Japanese suppliers have independ-

¹¹Honda's managers in charge of supplier relationships nevertheless maintain that their first priority in North America was to find indigenous sources, provided these could meet price, delivery, and quality standards [62].

ently decided to invest in transplants since they feared they would eventually lose their business to indigenous suppliers who had successfully implemented JIT. All this is not to argue that the transplant assembly firms did not in many cases already favor their traditional Japanese suppliers, with whom they had often maintained close relations for decades, but rather to emphasize that there have been identifiable economic reasons behind the waves of Japanese supplier transplant investments [7].

For some of the smaller Japanese supplier firms, transferring operations to North America has proven very difficult. Very few of them had previous experience manufacturing outside Japan. It has therefore been doubly important for supplier firms to select locations for their transplants that are in proximity to the assembly plants, not only to facilitate JIT deliveries of components but also to allow for easy access to the resources of assembly plant managers and engineers in case of problems [63]. The maximum distance that will allow for accurate JIT delivery scheduling between suppliers and assembly plants is considered to be two-hours driving time, or approximately 100 miles [63]. This distance also facilitates visits by assembly and supplier firm engineers to each others' plants. Accordingly, supplier transplants have clustered around the assembly plants. Several Japanese supplier firms have even constructed separate factories close to each assembly plant they supply, instead of concentrating production at a single, large plant. The end result of these location decisions by supplier firms is the pattern of regional-scale concentration around assembly plants evident in Figure 4.

The transplants have adopted meticulous hiring practices in order to select employees with the greatest potential for successfully adopting JIT methods. Both of the pioneer assembly transplants, Honda and Nissan, were particularly concerned about the quality of North American workers [34; 69]. In order to avoid

areas with strong traditions of labor union organization they sought rural greenfield sites. Nissan considered sites in Illinois and Ohio, in the heart of the indigenous automobile supplier infrastructure. But it eventually selected Tennessee, where labor union organizing is hampered by "Right-to-Work" statutes, largely in order to minimize the likelihood of worker representation by the United Auto Workers union [34, pp. 586-587, 633]. While Honda chose to locate in Ohio, its site is in a rural area distant from any large cities.

It should be noted that factors other than unionization have also been influential in the choice of rural locations. Greenfield sites were perceived to offer resourceful employees possessing strong mechanical aptitudes but few "bad habits" who have not "lost the work ethic" [63]. Rural workers were also viewed as having low levels of occupational and geographical mobility, thus reducing the likelihood that highly trained production workers would quit [45].¹²

Within the rural regions of the Transplant Corridor a distinct and important pattern of dispersal is evident at the local scale, albeit within certain limits defined by the maximum distance allowed by JIT supplier relations. This pattern is also related to labor force requirements. Locating plants 20 to 30 miles distant from each other has allowed supplier firms to minimize overlaps in their daily labor market areas and thus reduce competition among them for employees [63]. Relatedly, Honda at Marysville will not hire individuals already employed by one of its Japanese suppliers located in Ohio, in order not to "steal" employees [61]. A pattern of dispersal is also evident at a larger scale. As Figure 4 reveals, the JIT complexes surrounding each assembly firm have themselves been largely separated from each other by the dispersal of assembly transplants into different states (the excep-

¹²We have come across no evidence for or against the argument that Japanese firms may have sought rural locations in part to avoid hiring black workers [18].

tion is Ontario, but two of the assembly transplants there are relatively small). Each complex therefore has an adequate space to locate its supplier transplants with minimal local labor market overlaps.

While most transplants selected rural locations, three Japanese assembly firms, Toyota, Mazda, and Nissan (with Ford) have located plants in metropolitan areas with strong traditions of labor union activism. Toyota selected an urban location at Fremont, near San Francisco, for its initial North American production site, the joint venture with GM at NUMMI. The assembly plant NUMMI occupies had previously been under GM management and was known for confrontational labor relations between management and the UAW local. Absenteeism averaged over 20 percent, there were problems due to abuse of alcohol and other drugs, and there was a backlog of 800 labor contract grievances. According to a GM executive, it was "one of the worst plants in the industry," and it had been closed two years previously by GM as a result [55]. When NUMMI, which is almost entirely managed by Toyota, took over the plant, an agreement was signed to allow the UAW to continue to represent the workforce. Moreover, NUMMI hired most of its employees from among the same auto workers who had been laid off when GM halted operations at the plant (the UAW contract stipulated that at least 51 percent of NUMMI employees should be ex-Fremont workers, and the eventual figure was 85 percent).¹³

Mazda also selected an urban location, at a site in metropolitan Detroit. As mentioned above, this location is centrally situated with respect to the infrastructure of indigenous automobile parts suppliers. Mazda also openly, if apprehensively, welcomed UAW organizing and representation (which was approved by 89

percent of its employees) [84]. The firm was apparently pressured to recognize the UAW by Ford, which owns 25 percent of Mazda, and like the other Big Three producers would prefer the Japanese transplants to accept unionization in order to "level the competitive playing field" [92]. Given that Mazda expected to be dealing with the UAW, it is possible that the firm decided it might as well locate in metropolitan Detroit anyway, in order to take advantage of proximity to parts suppliers. Finally, the third urban assembly transplant is Nissan-Ford, which will assemble mini-vans. The Nissan-Ford site is adjacent to a Ford van plant in suburban Cleveland, Ohio, and will also employ UAW members.

A prerequisite of the willingness to locate transplants in urban areas and to recognize the UAW was a thorough restructuring of previously "ossified" [16] labor relations frameworks. Fordist contracts, with their hundreds of job demarcations and employee classifications, would have been antithetical to the teamwork and job rotation required to operate the JIT system. For example, NUMMI has one class for all production workers and three for maintenance workers, while Mazda has one class for production workers and one for maintenance. At both plants teams of workers are deployed to each work area, and all production staff are expected to rotate among different job tasks within their teams [47; 51; 56; 57]. In return, the new union contracts oblige NUMMI and Mazda managers to reduce their own salaries before laying off employees, with layoffs only allowed under "severe economic conditions" [56; 86]. While the conditions which persuaded the UAW to accept such novel terms will not be treated in this paper, it should be noted that UAW attempts to organize the greenfield Nissan and Honda plants have met with little success.

Finally with respect to transplant geography, it is important to address the impact of the "bidding war" among state and local governments. One might have

¹³It is noteworthy that the NUMMI venture amounted to Toyota's initial experiment with North American production, and the firm's fully owned transplants are in rural areas within the Transplant Corridor.

expected the substantial inducements to have had a pronounced effect upon transplant geography. However, as we have argued, decisions on manufacturing locations were determined by the overriding strategic desire to transfer JIT methods to North America. The field of effective competition in the "bidding war" had already been reduced to the Midwest and Southern Ontario Region by these concerns over JIT, and within this region transplants are now widely diffused. Certainly, at the margin, particular states (e.g., Missouri) and particular localities might have "lost out" in the competition, and this possibility evidently fuelled the "bidding war." But the aggregate pattern of transplant geography is in fact little different from what would have occurred in the absence of government subsidies (for a review of similar findings from other cases of industrial location, see Harrison and Kantner [35]).

CONCLUDING COMMENTS

The Japanese automobile transplants are an important example of how combined economic and geographical restructuring is fostering novel patterns of regional and local economic development [73]. In analyzing this phenomenon, our first objective has been to rectify the misconception that the Japanese automobile transplants in North America are mere assembly platforms with low local content levels, manufacturing at the lower end of the product cycle, and located in North America merely to combat trade protectionism. The assembly platform argument does not take into account the JIT automobile production techniques which the Japanese firms are intent upon transferring to North America and which militate against transportation of materials and components over long distances. Moreover, the argument is denied in practice by the weight of empirical evidence adduced above, which reveals increasingly autonomous automobile production complexes centered around the assembly transplants, with

steadily increasing levels of local content.

The paper's second objective was to investigate the geography of automobile manufacturing being created within North America by the transplant complexes. The international diffusion of JIT production methods was expected to be very difficult to orchestrate, and transplant location decisions were carefully designed to facilitate the process. The Japanese assembly firms weighed the respective advantages of geographical dispersal to greenfield sites for labor market reasons versus concentration to ensure proximity between supplier and assembly firms. The trade-off between these requirements suggested by Schoenberger [72] is plainly seen by comparing Nissan's Tennessee location with Mazda's Detroit location. Nissan, which viewed North American labor as the biggest potential obstacle to implementation of JIT, opted for a strategy of regional-scale dispersal which took it right to the outskirts of the indigenous supplier network. Mazda, by contrast, obliged to accept union organization, chose an urban location in the heart of North America's historic automobile manufacturing region in order to benefit from proximity to the indigenous supplier network.

It must be pointed out, however, that neither Nissan nor Mazda represents the *predominant* pattern of assembly transplant locations, the paradigm instance of which is Honda's Marysville plant. Honda sought a *resolution* to the contradictory tendencies between dispersal to a greenfield site and concentration for assembler-supplier proximity by breaking its site selection process into two parts at two different scales. At the regional scale, Honda selected an Ohio site in the center of North America's automobile supplier infrastructure, i.e., geographical concentration. Simultaneously, at the local scale, the firm selected a rural greenfield location, i.e., geographical dispersal. In all, seven of the twelve assembly transplants (not counting the borderline case of Toyota in Kentucky) have adopted this locational strategy.

Interestingly, as the urban locations of NUMMI, Mazda, and Nissan-Ford attest, greenfield locations have not been viewed as *necessary* for successful transfer of JIT techniques. But the selection of urban locations was predicated upon in situ restructurings of Fordist local labor relations frameworks. These restructured contracts appear to have functioned relatively smoothly so far. In the near future, however, more intense automobile industry competition seems destined to result from the increased capacity due to the new transplant investments. As factory managers respond to increased pressures, the very stable labor relations needed to operate the JIT system may well be threatened at the urban transplants.

The predominant geographical pattern of supplier transplants is similar to that of the assembly transplants: regional-scale concentration in the Midwest and southern Ontario, and dispersal to rural localities within the region. Also evident among supplier transplants are: (i) a further level of regional concentration—around the particular assembly plants supplied—to facilitate JIT deliveries; and (ii) a further level of rural dispersal, to separate the firms' daily labor markets from each other. However, there are also several notable secondary patterns of supplier locations. First, in urban locations, especially Detroit and Chicago, there have been several cases in which sales and service centers constructed to support relationships with Big Three firms have been expanded into manufacturing plants. Second, some supplier transplants are located near the ports where Japanese cars are imported. And third, there is a group of over a dozen suppliers located in southeastern Indiana. Many of these decided to establish North American manufacturing facilities without first knowing who their customers would be, and they therefore selected a central location for deliveries to the transplant assembly plants.

Finally, it is important to address contemporary debates over the geography of

automobile manufacturing and industrial production in general. Unravelling the full geographical implications of the transplant phenomenon requires separating out spatial scales to clarify the different processes occurring at each scale [77, pp. 135-147]. Starting at the international scale then, rather than the continued deindustrialization of the core Fordist countries and establishment of a new international division of labor [59], which in the automobile sector implies production of components or even a whole "world car" at third world sites, the Japanese transplants represent a reverse trend wherein the globally most advanced manufacturing techniques are to be incorporated within new production capacity in North America. The causal factors responsible for these substantial investments in North America include the superiority of JIT over Fordist methods in constituting a production system suited to the contemporary world economy, the expansionary corporate strategies of Japanese automobile producers, the need to organize geographically integrated production complexes in North America if JIT were to be implemented there, and the avoidance of potential protectionist trade legislation.

Moving to the regional scale, in contrast to the late-Fordist accelerated shift of manufacturing industry out of the North American manufacturing belt into the "sunbelt" states [12; 70], the predominant trend in transplant locations has been concentration of automobile production in the heart of the manufacturing belt, the Midwest and Southern Ontario Region. This trend towards regional reconcentration is due on the one hand to the pre-existing location [49] of automobile suppliers in this region, and, on the other hand, to the requirements of geographical proximity between suppliers and assembly firms which is necessary for JIT to be implemented. The combination of these factors led most of the Japanese assembly firms to choose locations close to the heart of the indigenous automobile industry. Once the assembly transplants

had selected their locations, a further phase of regional-scale concentration ensued when 80 percent of the 250 transplant suppliers were then located in the same region.

Only at the local scale do the locational patterns of the Japanese transplants generally confirm an extant geographical tendency, towards rural industrialization [37]. The selection of rural greenfield locations by most of the firms reflects a concern to avoid labor union organization and to find production employees with a strong work ethic and little experience in Fordist industries. Local-scale dispersal of supplier transplants within rural regions is due to a desire to segregate their daily labor markets. This local-scale trend towards dispersal could well mean that deindustrialization continues to plague many of the traditional automobile communities, while at the same time, and within the same Midwest and Southern Ontario Region, new automobile communities spring up. Dispersal also means, however, that places of concentrated automobile manufacturing along the lines of Toyota City are unlikely to emerge in North America.

In the case of the Japanese transplants in North America, then, geographical reconcentration of automobile manufacturing globally and regionally has been combined with local-scale dispersal. The result is a new type of industrial region in North America, the "JIT complexes" now strung across the Midwest and southern Ontario landscape. While it is still unclear how the likely diffusion of JIT into the Big Three firms will affect the geography of the indigenous automobile industry, the JIT complexes have already created a new geography of automobile production in their very backyard.

LITERATURE CITED

1. Abernathy, W. J. *The Productivity Dilemma: Roadblock to Innovation in the Automobile Industry*. Baltimore: Johns Hopkins University Press, 1978.
2. Abernathy, W. J., K. Clark, and A. Kantraw. *Industrial Renaissance: Producing a Competitive Future for America*. New York: Basic Books, 1983.
3. Aglietta, M. *A Theory of Capitalist Regulation: The U.S. Experience*. London: Verso, 1979.
4. Altshuler, A., M. Anderson, D. Jones, D. Roos, and J. Womack. *The Future of the Automobile: The Report of MIT's International Automobile Program*. Cambridge: MIT Press, 1984.
5. Arnesen, P. J., R. E. Cole, and A. R. Krishna. *Japanese Auto Parts Companies in the U.S. and Japan: Implications for U.S. Competitors*. Ann Arbor: University of Michigan, East Asia Program, 1987.
6. Aronowitz, S. *False Promises: The Shaping of American Working Class Consciousness*. New York: McGraw Hill, 1973.
7. Asanuma, B. "Manufacturer-Supplier Relationships and the Japanese OEMs," *The Japanese Competition: Phase 2*. Edited by P. J. Arnesen. Ann Arbor: University of Michigan, Center for Japanese Studies, 1987.
8. Ballance, R. H. and S. W. Sinclair. *Collapse and Survival: Industry Strategies in a Changing World*. London: George Allen and Unwin, 1983.
9. Berry, B. M. "Honda Goes American," *Chilton's Iron Age*, May 16, 1987.
10. Bloomfield, M. *The World Automotive Industry*. Newton Abbot: David and Charles, 1978.
11. Bloomfield, M. "The Changing Spatial Organization of Multinational Corporations in the World Automotive Industry," *Spatial Analysis, Industry and the Industrial Environment, Vol. II: International Industrial Systems*. Edited by F.E.I. Hamilton and G.H.R. Linge, Chichester: John Wiley, 1981.
12. Bluestone, B. and B. Harrison. *The Deindustrialization of America*. New York: Basic Books, 1982.
13. *Business Japan*. "Daihatsu Plans to Begin Joint Venture Production in Canada," March, 1987, p. 37.
14. *Business Week*. "Detroit is Bracing For a One-Two Punch," November 16, 1987, pp. 136-44.
15. Chang, C. S. *The Japanese Auto Industry and the U.S. Market*. New York: Praeger, 1981.
16. Clark, G. L. "The Crisis of the Midwest Auto Industry," *Production, Work, Territory: The Geographical Anatomy of Industrial Capitalism*. Edited by A. J. Scott and M. Storper, Boston: Allen and Unwin, 1986.

17. Cohen, R. B. "The New Spatial Organization of the European and American Automotive Industries," *Regional Analysis and the New International Division of Labor: Applications of a Political Economy Approach*. Edited by F. Moulaert and P. W. Salinas, Boston: Kluwer Nijhoff, 1983.
18. Cole, R. E. and D. R. Deskins, Jr. "Racial Factors in Site Location and Employment Patterns of Japanese Auto Firms in North America," *California Management Review*, 31.1 (1988), pp. 9-22.
19. *Columbus Dispatch*. "New Nissan Pulsar Tops Japanese Imports for '87," November 22, 1986, p. D1.
20. *Columbus Dispatch*. "Study Says Transplants' Chief Threat to Big Three," August 8, 1987, p. C1.
21. *Columbus Dispatch*. "To Work With Honda You Must Adjust," February 7, 1988, p. 2B.
22. *Columbus Dispatch*. "Honda, State Deny Rumors," May 25, 1988, p. D1.
23. Cool, K. O. and C. A. Legnick-Hall. "Second Thoughts On the Transferability of the Japanese Management Style," *Organization Studies*, 6.1 (1985), pp. 1-22.
24. Cusumano, M. A. *The Japanese Automobile Industry: Technology and Management at Nissan and Toyota*. Cambridge: Council on East Asian Studies, Harvard University, 1985.
25. Dodwell Marketing Consultants. *The Structure of the Japanese Auto Parts Industry*. Tokyo: Dodwell, 1986.
26. Dohse, K., U. Jurgens, and T. Malsch. "From Fordism to Toyotism? The Social Organization of the Labor Process in the Japanese Automobile Industry," *Politics and Society*, 14.2 (1985), pp. 115-46.
27. Dunn, A. J., Jr. "Automobiles in International Trade: Regime Change, or Persistence?" *International Organization*, 41.2 (1987), pp. 225-52.
28. Elder, A. H. and N. S. Lind. "The Implications of Uncertainty in Economic Development: The Case of Diamond Star Motors," *Economic Development Quarterly*, 1.1 (1987), pp. 30-40.
29. Estall, R. C. "Stock Control in Manufacturing: The Just-in-Time System and its Locational Implications," *Area*, 17.2 (1985), pp. 129-33.
30. Flint, J. "Nobody Likes Us Except the Customer," *Forbes*, October 19, 1987, pp. 56-60.
31. Friedman, D. "Beyond the Age of Ford: The Strategic Basis of the Japanese Success in Automobiles," *American Industry in International Competition*. Edited by J. Zysman and L. Tyson. Ithaca: Cornell University Press, 1983.
32. Garrahan, P. "Nissan in the North East of England," *Capital and Class*, 27 (1986), pp. 5-13.
33. Glasmeier, A. K. and R. E. McCluskey. "U.S. Auto Parts Production: An Analysis of the Organization and Location of a Changing Industry," *Economic Geography*, 63.2 (1987), pp. 142-59.
34. Halberstam, D. *The Reckoning*. New York: Avon, 1986.
35. Harrison, B. and S. Kantner. "The Political Economy of States' Job-Creation Business Incentives," *Journal of the American Institute of Planners*, 44 (1978), pp. 424-35.
36. Hayashi, K. "Crosscultural Interface Management: The Case of Japanese Firms Abroad," *Japanese Economic Studies*, 13.4 (1986), pp. 3-41.
37. Hayes, K. E. and Z. B. Machunda. "Spatial Restructuring of Manufacturing and Employment Growth in the Rural Midwest: An Analysis of Indiana," *Economic Geography*. 63.4 (1987), pp. 319-33.
38. Hill, R. C. "The Transnationalization of Japanese Auto Production: Implications For Japan and North America." Paper presented at East Lakes Geographers Conference, Windsor, Ontario, 16-17 October, 1987.
39. Hill, R. C. "Comparing Transnational Production Systems: The Automobile Industry in the United States and Japan," *International Journal of Urban and Regional Research*, forthcoming.
40. Holden, C. "New Toyota-GM Plant Is U.S. Model for Japanese Management," *Science*, 18 July, 1986, pp. 273-77.
41. Holmes, J. "Technical Change and the Restructuring of the North American Automobile Industry," *Technical Change and Industrial Policy*. Edited by K. Chapman and G. Humphrys. Oxford: Basil Blackwell, 1987.
42. Holmes, J. "The Impact of New Production Technologies on the Organization of Labor in the North American Automobile Industry," *Labour, Environment, and Industrial Change*. Edited by G. Linge and G. A. van der Kamp, London: Croon Helm, 1989.
43. Honda of America Mfg., Inc. *The Honda Way: An Innovative Approach to Management and Production*. n. d.
44. Ishiro, K. "Internationalization in Japan's Auto Parts Industry," *Digest of Japanese Industry and Technology*, 221 (1986), pp. 24-32.

45. Ito, K. *Organizational Adaption of Japanese Companies in the United States*. Ph. D. Dissertation, The Ohio State University, 1987.
46. Japan Economic Institute. "The U.S. Automotive Parts Market and Japanese Competition," Report 11A, March 20, 1987.
47. Krafcik, J. "Learning from NUMMI." Cambridge: International Motor Vehicle Program, Massachusetts Institute of Technology, 1986.
48. Mair, A., R. Florida, and M. Kenney. "Honda's North American Just-in-time Complex," unpublished manuscript, available from A. Mair.
49. Massey, D. *Spatial Divisions of Labor: Social Structures and the Geography of Production*. New York: Methuen, 1984.
50. Maxcy, G. *The Multinational Motor Industry*. London: Croon Helm, 1981.
51. Merchant, David. Presentation on Mazda Labor and Community Relations. Eighth International Automotive Industry Conference, University of Michigan, March 23, 1988.
52. Miyakawa, Y. "The Location of Modern Industry in Japan," *The Geography of Japan*. Edited by Association of Japanese Geographers, Tokyo: Teikoku-Shoin, 1980.
53. Miyuchi, T. "The Man Who Lured Toyota to Kentucky," *Economic Eye*, March 1987, pp. 23-26.
54. Monden, Y. *Toyota Production System: Practical Approach to Production Management*. Norcross, Georgia: Industrial Engineering and Management Press, 1983.
55. *Newsweek*. "Building Cars Japan's Way: Harmony at GM-Toyota," March 31, 1986, p. 43.
56. New United Motor Manufacturing, Inc., United Automobile Workers, and U.S. Department of Labor. "New United Motor Manufacturing, Inc. and The United Automobile Workers: Partners in Training," Case Study for the International Labor Organization/Turin Center, May 21, 1986.
57. Nobuto, O. "Breaking Ground in the U.S.: Mazda's Plans for the American Market," *Japan Automobile Manufacturers Association Forum*, 6.1 (1987), pp. 10-14.
58. Nobuto, O. "Remarks," Eighth International Automotive Industry Conference, University of Michigan, March 22, 1988.
59. Peet, R. (editor) *International Capitalism and Industrial Restructuring: A Critical Analysis*. Boston: Allen and Unwin, 1987.
60. Peet, R. "Introduction" *International Capitalism and Industrial Restructuring: A Critical Analysis*. Edited by R. Peet, Boston: Allen and Unwin, 1987.
61. Personal Interviews, Executives, Managers and Engineers at Honda (Marysville and Anna, Ohio), 1988.
62. Personal Interview by M. Kenney, Honda Executive in Japan, 1988.
63. Personal Interviews, Managers and Engineers at Six Supplier Transplants in Ohio, 1987 and 1988.
64. Personal Interviews, State and Local Government Officials in Ohio, Michigan, and Indiana, 1988.
65. Reich, R. B. and Mankin, E. D. "Joint Ventures with Japan Give Away our Future," *Harvard Business Review*, 86.2 (1986), pp.78-86.
66. Rubenstein, J. "Changing Distribution of the American Automobile Industry," *Geographical Review*, 76.3 (1986), pp. 288-300.
67. Rubenstein, J. "Further Changes in the American Automobile Industry," *Geographical Review*, 77.3 (1987), pp. 359-62.
68. Rubenstein, J. "Changing Distribution of American Motor-Vehicle-Parts Suppliers," *Geographical Review*, 78.3 (1988), pp. 288-98.
69. Sakiya, T. *Honda Motors: The Men, The Management, The Machines*. Tokyo: Kodansha International, 1987, second edition.
70. Sawers, L. and W. K. Tabb (editors). *Sunbelt Snowbelt: Urban Development and Regional Restructuring*. New York: Oxford University Press, 1983.
71. Sayer, A. "New Developments in Manufacturing: The Just-In-Time System," *Capital and Class*, 30 (1986), pp. 43-72.
72. Schoenberger, E. "Technological and Organizational Change in Automobile Production: Spatial Implications," *Regional Studies*, 21.3 (1987), pp. 199-214.
73. Scott, A. J. and M. Storper (editors). *Production, Work, Territory: The Geographical Anatomy of Industrial Capitalism*. Boston: Allen and Unwin, 1986.
74. Shaiken, M. *Work Transformed: Automation and Labor in the Computer Age*. New York: Holt, Rinehart and Winston, 1984.
75. Sheard, P. "Auto Production Systems in Japan: Organizational and Locational Features," *Australian Geographical Studies*, 21 (1983), pp. 49-68.
76. Sinclair, S. *The World Car: The Future of the Automobile Industry*. London: Euromonitor, 1983.

77. Smith, N. *Uneven Development: Nature, Capital, and The Production of Space*. Oxford: Basil Blackwell, 1984.
78. Takeuchi, A. "Motor Vehicles," *An Industrial Geography of Japan*. Edited by K. Murata and I. Ota. New York: St. Martin's Press, 1980.
79. United States General Accounting Office. *Foreign Investment: Growing Japanese Presence in the U.S. Auto Industry*. Washington, D.C., NSIAD-88-11, 1988.
80. United States International Trade Commission. *U.S. Global Competitiveness: The U.S. Automotive Parts Industry*. Washington, D.C.; USITC Publication 2037, 1987.
81. *USA Today*. "Honda Wins USA's Heartland," December 2, 1987, pp. B1-2.
82. *Wall Street Journal*. "Bombardier Cancels Plans for Venture to Build Cars with Daihatsu in Canada," June 24, 1987, p. 29.
83. *Wall Street Journal*. "Japanese Car Firms in U.S. Plan to Buy More Parts Locally," June 24, 1987, p. 31.
84. *Wall Street Journal*. "UAW, Mazda Reach Agreement for Plant at Flat Rock, Mich.," March 15, 1988, p.5.
85. *Wall Street Journal*. "Low Wages No Longer Give Competitive Edge," March 16, 1988, p. 30.
86. *Wall Street Journal*. "Mazda Motor Corp.: Initial UAW Contract Wins Ratification by 90% Margin," March 22, 1988, p. 47.
87. *Wall Street Journal*. "Japan's Largest Truck Maker Considers Assembling Medium-Size Units in U.S.," May 12, 1988, p. 18.
88. *Wall Street Journal*. "Honda's U.S. Unit To Export Cars to South Korea," June 15, 1988, p. 20.
89. *Wall Street Journal*. "Koreans Press Ahead with Canadian Plant," July 29, 1988, p. 12.
90. *Wall Street Journal*. "GM and Toyota Near Agreement on Light Trucks," January 6, 1989, p. 3.
91. *Wall Street Journal*. "Toyota May Announce in April Plans for an Assembly Plant in Britain," March 24, 1989, p. 4.
92. *Ward's Auto World*. "Almost Ready to Roll: Mazda Gears Up For Flat Rock Production," July 1987, p. 115.
93. *Ward's Auto World*. "'Self-reliant' U.S. Honda will Produce 500,000 Vehicles, Export 70,000," October 1987, p. 81.
94. *Ward's Auto World*. "Honda: Japan's First Transplant Automaker Refuses to Slow Down," January 1988, pp. 24-8.
95. *Ward's Auto World*. "Nissan: A Change at the Top Won't Mean Changes in Smyrna," January 1988, pp. 29-30. 96. *Ward's Auto World*.
96. "Mazda: Carving Out A Slightly Different Pattern at Flat Rock," January, 1988, pp. 34-9.
97. *Ward's Auto World*. "Diamond-Star: Chrysler, MMC to Jointly Build Inexpensive 'Ferrari'," January 1988, pp. 39-40.
98. *Ward's Auto World*. "Toyota: Japan's No. 1 Puts Plants on Both Sides of the Border," January 1988, pp. 40-1.
99. *Ward's Auto World*. "Subaru/Isuzu: Smaller Automakers Team Up for U.S. Automaking Foray," January 1988, p. 44.
100. *Ward's Auto World*. "Big Three's Big Threat Will be from Transplants," January 1988, p. 45.
101. *Ward's Auto World*. "With Ford Tie-up, Nissan Expands U.S. Technical Product Capabilities," February 1988, p. 23.
102. *Ward's Auto World*. "Mazda Gears Up to Give America what it Wants," July 1988, p. 108.