

The Japanese Transplants: Production Organization and Regional Development

By Martin Kenney and Richard Florida

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During the 1980s and into the 1990s, more than one thousand Japanese transplants established plants in the U.S. (Japan Economic Institute 1991). There are now eight transplant automobile assembly complexes in the U.S. (three more are in Canada near the U.S. border); more than 250 transplant parts suppliers; sixty-six Japanese-owned or Japanese-U.S. joint venture steel producers, steel coating lines, and steel service centers; and twenty Japanese-owned rubber and tire plants for a total investment of \$25 billion. Ironically Japanese manufacturing investment is occurring in the U.S. industrial sectors that scarcely a decade ago were said to be declining, uncompetitive, and suffering from deindustrialization (Bluestone and Harrison 1982).

The transplants have given rise to a heated public policy debate. Proponents see Japanese investment as a source of jobs and economic development. States have offered incentives and opened overseas offices to lure foreign investors. Opponents contend that Japanese investment is displacing U.S. firms and jobs and that government incentives unfairly subsidize foreign competitors. They seek the elimination of state incentives as well as federal policies to limit foreign direct investment.

Our study argues that the Japanese model of production organization informs location choices and broader patterns of spatial organization and regional development, which are quite different than those that result from the production organization of traditional U.S. firms. The study asks where is Japanese manufacturing investment located? What factors motivate these location patterns? How do they compare across sectors? What does this mean for economic development policy?

The research focuses on the spatial and regional development implications of Japanese investment in automobile, steel, and rubber. These sectors represent the traditional fordist model of mass production industrial organization. Each sector has witnessed prolonged decline over the past two decades with negative consequences for employment and economic development, especially in the traditional midwestern manufacturing belt (Bluestone and

Harrison 1982; Cohen and Zysman 1987). The Japanese corporations have developed a new model of production organization in these industries based on work teams, the integration of the workers' intellectual and physical capabilities, and tightly networked just-in-time production complexes to which suppliers deliver parts to the assembly line as needed (Kenney and Florida 1988, 1992; Florida and Kenney 1990a).

Generally, the underlying changes in production organization allow Japanese firms to succeed in locations that U.S. firms have abandoned. Of crucial importance to economic development theory, policy, and planning, this finding shows that America's outmoded management and production organization--not workers, their unions, or an undesirable business climate--is responsible for the decline of heavy industry and traditional manufacturing regions. Japanese manufacturing investment has transplanted a state-of-the-art industrial infrastructure of automobile assembly, automotive parts, steel, rubber, and tire manufacturers to the lower Midwest and upper South. This new industrial complex, characterized by spatial agglomeration and functional integration, contrasts sharply with the traditional fordist model, characterized by far-flung global decentralization of production and domestic deindustrialization.

RESEARCH DESIGN

"Transplants" are defined here as firms in the automobile-assembly and automobile-related steel and rubber industries that are either wholly Japanese-owned or have significant Japanese participation in joint ventures. We derived a comprehensive database on these transplants from the Japan Economic Institute, U.S. and Japanese government sources. and an extensive bibliographic file of more than two thousand trade journal, newspaper, and magazine articles. The database includes the name, location, investment, and employment figures of various transplant facilities.

A mail survey of Japanese-owned and Japanese-U.S. joint venture automotive suppliers collected information on investment, employment, site selection, supplier relations, just-in-time delivery, production organization, and industrial incentives. This survey had a response rate of 37.2 percent, which is good considering that Japanese firms in the U.S. may have been reticent given the climate surrounding foreign investment. The research team conducted twenty-five site visits to transplant automobile assembly, automobile parts, and steel manufacturing facilities and over one hundred interviews with

Japanese executives, American managers and shop floor workers, and government officials.(1)

AUTOMOBILE ASSEMBLY

Japanese automobile assembly plants form the core of transplant investment in the U.S. There are now eight major transplant assembly complexes (and ten assembly plants) in the United States, representing a total investment of more than \$8.9 billion as shown in Table 1. (Table 1 omitted) Japanese automobile manufacturers have invested in the U.S. to gain access to the U.S. market, circumvent U.S. protectionism, and expand outside the Japanese market.

The transplant automotive assemblers are located in a corridor that drifts slightly south of the traditional U.S. automobile manufacturing belt, stretching from southwest Ontario and southeast Michigan on the north, in an almost straight line south through Ohio, Kentucky, and Tennessee, and west to Indiana and Illinois (Figure 1). (Figure 1 omitted) Interestingly, with the exception of Ohio, no state has more than one transplant assembler--a pattern that may have been designed to maximize the political benefits of Japanese investments (interviews August 1990).

Transplant automobile assemblers have employed two location strategies. Honda, Toyota, and Diamond-Star have newly constructed plants in small towns in rural or fringe metropolitan areas with populations between 5,000 and 45,000 people. SIA is in the Lafayette, Indiana MSA, with a total population of roughly 120,000. NUMMI and Mazda are in large urban areas with populations of more than one million (City and County Databook 1983). However, Mazda's site is on the rural fringe of the Detroit area, attracting workers from the city, its suburbs, and rural areas two to three hours away.

A comparison of the location pattern of the transplants to that of traditional U.S. automakers shows that generally the transplants are located slightly south of the traditional midwestern automotive assembly belt. However, the concentration of Japanese investment in the lower Midwest and adjacent southern states of Kentucky and Tennessee contrasts with the recent decentralization of the Big Three carmakers (Figure 2).(Figure 2 omitted) Faced with sagging profits and increasing foreign competition, U.S. carmakers embarked on a southern strategy in the 1970s, designed to reduce wages and avoid unions by establishing nonunionized Sunbelt plants and Mexican maquiladoras. Later, U.S. car firms dispersed parts production to

offshore subsidiaries around the world to limit further the power of labor. Carmakers closed their unionized U.S. plants as the new factories in various countries produced the needed parts (Cohen 1981; Froebel et al. 1980; Shaiken 1987, 1988). Since 1979, U.S. car manufacturers have closed sixty-six plants, eliminating between 250,000 and 300,000 jobs (New Directions 1990). However, the failures of the global strategy(2) and the success of the transplants have caused U.S. automakers to begin reconcentrating production in the U.S., adopting a location strategy that is both similar to and influenced by the transplants.

A common assertion is that the location decisions of the transplants are designed to minimize labor costs. However, the data suggest otherwise. Workers at transplant facilities earn wages (including bonuses and profitsharing) that are comparable to those of traditional Big Three workers. NUMMI workers average \$36,000 a year--just under Ford's lead of \$37,400, but ahead of GM and Chrysler at \$35,000. NUMMI's unskilled hourly rate of \$16.81 is the highest in the industry compared to \$16.74 at Ford, \$16.24 at GM, and \$16.27 at Chrysler. Honda workers average \$33,700, Mazda \$32,900, Nissan \$32,600, Toyota-Georgetown \$29,500, SIA \$28,900, and Diamond Star \$28,000 (Jackson 1990). Such high wages reflect the desire of nonunionized transplants to remain so, and a more general desire to avoid labor-management problems and motivate maximum work effort.

Others observe that the location decisions of the transplants reflect a desire to avoid unions, This view is only partly correct. While Honda, Nissan, and Toyota employ nonunionised workers and have vigorously worked to keep unions out, NUMMI, Mazda, and Diamond Star employ UAW workers (personal interviews 1990; Wall Street Journal 1989a, 1989b). The three unionized transplants each have a U.S. partner to assist in dealing with the union. In each case, management and the UAW negotiated restructuring agreements and altered work rules to facilitate the transfer of the Japanese style of production organization. The unionized transplants offer more extensive job security than the Big Three carmakers, which although potentially costly, ensures a stable work force (Florida and Kenney 1991a; Kenney and Florida 1992).

Cole and Deskins (1988) suggest that the transplants have chosen greenfield sites to avoid hiring African-Americans or members of other minority groups. Honda and SIA are located in counties with less than 3 percent minority populations. Diamond Star, Toyota-Georgetown,

and Nissan are located in counties with minority percentages of 4.8, 7.6, and 11 percent, respectively (City and County Databook 1983). Honda recently settled a 1987 EEOC suit charging discrimination on the basis of its location outside of areas with significant minority populations (Embrey 1988). Recent data, however, indicate that the transplants have significantly improved minority hiring, perhaps as a result of growing political and legal pressure. Honda increased its minority work force from 2.8 percent in 1987 to 10.6 percent by 1990 (Chappell 1990). Toyota's Georgetown, Kentucky, plant has increased its percentage of African-American workers to 15 percent, in a county that is less than 3 percent minority (personal interview Toyota officials August 1990). Although Mazda is unionized and located near Detroit, African-Americans comprise only 14 percent of the plant's work force, a full 23 percentage points below the percent share of the minority population and 15 percentage points below the percent share of African-Americans in the area work force (Cole 1989). Thus, location in a highly urbanized area does not necessarily mean that a larger percentage of jobs will go to minority group members.

How then can we explain the location preferences of transplant assemblers, most notably the selection of both greenfield and urban sites? First, the location choices of the transplants are not simply driven by factor costs of production. The transplants mainly moved to the U.S. to protect and retain long-term access to the U.S. market and to defuse growing protectionist sentiment in this country. This, as much as anything, accounts for their spread out location. Second, urban locations reflect examples of U.S. partners at U.S. plant sites NUMMI, the Toyota-GM joint venture; and Mazda, located at an old Ford engine foundry. (Mazda, with its long-term relationship with Ford, produces its new Probe at the Flat Rock plant.)

When unconstrained the automotive assembly transplants have tended to choose greenfield sites, which provide transportation and supplier infrastructures, and avoid areas of unionized labor or long histories of industrial conflict. Greenfield sites provide access to fresh recruits rural labor with little or no experience in manufacturing industry, who can be socialized to Japanese production requirements (interview June 1988). Greenfield sites also enable firms to exert significant control over their work force, in keeping with the traditional Japanese practice of erecting barriers to labor mobility. The home counties of the Honda, Nissan, Toyota, SIA, and Diamond Star plants had pretransplant manufacturing employment of 4,400, 2,700, 8,200, 10,500, and 24,700, respectively (City and County Databook 1983). Toyota's Georgetown plant currently accounts for more than two-thirds of total

manufacturing employment (3,300 of 4,900 manufacturing workers) in Scott County, Kentucky (interviews with local officials August 1990).

Our interviews indicate that the preference for greenfield sites is guided by work force characteristics, but ones that differ from that which has guided the location decisions of U.S. manufacturers--i.e., cheap labor. Japanese carmakers require low rates of absenteeism, high attendance, and low turnover among their labor force to keep costs down, ensure continuity in the labor force, and fully capture human capital investments. Some greenfield transplants looked at high school attendance data and employee attendance and turnover in selecting their sites (interviews summer and fall 1990).

The urban transplants have tried to replicate these conditions in their plants by instituting comprehensive restructuring agreements with unions and carefully screening job applicants to find workers who are dedicated, team-oriented, and will not miss work.

AUTOMOBILE PARTS SUPPLIERS

Transplant automotive parts suppliers have followed the Japanese assemblers to the U.S. to tap the growing market. As of summer 1990, there were 269 transplant automotive parts suppliers in the U.S., representing a total investment of \$5.4 billion dollars. This is still a small share of the total U.S. automotive parts industry, comprised of 15,000 companies (U.S. International Trade Commission 1987).

Figure 3 shows the location of transplant suppliers in the U.S. At the regional level, transplant suppliers are mainly concentrated in the lower Midwest and upper South in the same states that house transplant assembly facilities. The four midwestern transplant states of Ohio, Michigan, Indiana, and Illinois account for 57 percent of transplant suppliers; the two upper South transplant states--Kentucky and Tennessee--account for an additional 20 percent.(Figure 3 omitted) Together, these six transplant states house 215 of the 269 transplant parts suppliers. These transplants tend to be widely dispersed within these states because of both state policy and corporate choice.

Transplant suppliers are split between greenfield sites and large metropolitan centers. According to data from 232 transplant suppliers, 37 percent are located in rural areas (City and County Databook 1983), 28 percent are in small metropolitan communities with populations under 25,000; 11.2 percent in communities with

populations between 25,000 and 50,000; and 7.3 percent in communities with populations between 50,000 and 100,000. At the other extreme, 15.9 percent of transplant suppliers are located in large cities with populations of over 100,000.

Transplant parts suppliers are located slightly south of the historic U.S. automotive parts complex of the industrial Midwest (Glasmeier and McCluskey 1987). However, as in the case of transplant assemblers, this pattern contrasts with the recently decentralized, off-shore location pattern of U.S. suppliers. Between 1982 and 1986, U.S. parts suppliers increased direct foreign investment from \$3.1 billion to \$4.9 billion (US. International Trade Commission 1987:4-27). Since the early 1980s, between 250 and 300 domestic supplier plants have closed (New Directions 1990).

Table 2 details the relocation and site selection decisions of transplant suppliers.(Table 2 omitted) The two top-ranked relocation factors were: (1) to maintain a relationship with a Japanese customer; and (2) upon request from a Japanese customer. More than three-quarters of respondents moved to the U.S, to maintain close ties to a major Japanese customer, and more than two-thirds did so upon request from a Japanese customer. In addition, assemblers have also helped to form new supplier ventures. Assemblers hold equity in twelve of seventy-three (16.4 percent) suppliers.

Table 2 also summarizes the major site selection factors for transplant suppliers. Roughly 90 percent of respondents said that they chose their specific location to be close to their major customer. This factor is followed by proximity to transportation, local business and government attitudes, and a nonunion labor climate. Government assistance programs are ranked relatively low; they are not an important factor in site selection.

The site selection decisions of transplant suppliers reflect concern for wages and labor force characteristics. Union avoidance is an important influence on site selection (site visits and interviews 1988 to 1990). The large majority of suppliers in our survey--96 percent--are nonunionized. However, just 55 percent of suppliers indicate that labor skills are important, while 58 percent indicate that labor costs significantly influence site selection. As of 1988, hourly supplier wages were \$7.21 to start and \$8.00 after one year for low-skill workers and \$11.50 for high-skill workers (survey 1988). This is roughly two-thirds to three-quarters the pay level at transplant assemblers--a differential that is roughly similar to that in Japan (Odaka et al. 1988). These

wages are below the Big Three's internal parts operations and large unionized U.S.-owned automotive suppliers and comparable to the wages of small, nonunionized U.S. suppliers.

Transplant suppliers prefer greenfield locations where they can tap rural labor forces without manufacturing experience. According to the transplant supplier survey, less than one-third of the production workers have previous manufacturing experience, and just 19 percent have ever been union members. Most workers, 83 percent, live within a thirty-mile commuting radius of the plant. Rural site selection also appears motivated by a desire to avoid large concentrations of minority groups as they comprise just 11 percent of the supplier work force. The president of a Japanese-owned supplier in rural Michigan stated that minorities comprise 2 percent of the company's work force (the same share as the surrounding county) because this is the necessary level to "avoid trouble with American civil rights authorities" (interview August 1990).

The transplants are trying to establish just-in-time delivery practices similar to those used in Japan (Nishiguchi 1987; Sheard 1983; Sayer 1986). Table 3 indicates the delivery times, distances, and production linkages between transplant suppliers and assemblers that facilitate just-in-time procedures. (Table 3 omitted) The table also illustrates the close interactions that are characteristic of transplant assemblers and their suppliers. Engineers from a major customer came on-site to help set up production operations at 82 percent of suppliers, and continue to visit to help with quality control or production problems at 86 percent of suppliers. Supplier-assembler relationships are also characterized by collaboration in the design and development of new products. More than two-thirds of suppliers work closely with assemblers in product development. Honda engineers, for example, developed new production techniques for a small Ohio plastics firm that became a major supplier. This contrasts sharply with the traditional short-term, arm's-length relationships between Big Three carmakers and U.S. automotive parts suppliers. In short, transplant suppliers in the U.S. replicate the Japanese pattern of "obligational supplier relations"--they interact frequently, share people, and participate in joint product development efforts with the assemblers (Dore 1983).

This transplant supplier complex developed in stages. Initially, Japanese assemblers built facilities in the lower Midwest and upper South to take advantage of the indigenous infrastructure of parts suppliers (interviews Honda managers 1988). However, they quickly

discovered that U.S. suppliers could not adapt to just-in-time quality and delivery requirements. Some U.S. suppliers even chose not to supply the transplants. Transplant assemblers thus encouraged their Japanese suppliers to come to the U.S. (interviews 1988-1991). Many first-tier Japanese suppliers to the transplants have now opened U.S. branches. Nearly one-half of Honda's main suppliers operate U.S. branches (Dodwell Marketing Consultants 1986). (Of course, given the nature of Japanese production, transplant assemblers would probably have encouraged their suppliers to move to the U.S. anyway. Problems with U.S. suppliers, however, accelerated the relocation.)

While the transplants have successfully assembled a ring of first-tier suppliers, they lack the large numbers of second-and third-tier suppliers found in Japan (Odaka et al. 1988). Just 43 percent of the first-tier suppliers in the survey receive just-in-time deliveries from their second-tier suppliers. However, a number of first-tier suppliers are forging links to U.S. producers to include local companies in the supplier complex.

STEEL

Japanese investment in the U.S. steel industry has followed and indeed been stimulated by the automotive transplants. Japan's major steelmakers--NKK, Nippon, Kawasaki, Kobe, Sumitomo Metal, and Nisshin Steel--operate joint ventures with U.S. steel firms. There are now sixty-six Japanese-owned or Japanese-U.S. joint venture steel facilities in the U.S., representing a total investment of \$7 billion. These facilities fall into three groups: large integrated steel mills, state-of-the-art galvanizing or coating lines, and smaller steel processing facilities. Table 4 lists the major Japanese investments in the U.S.(Table 4 omitted)

Figure 4 shows that the Japanese-owned and Japanese-U.S. joint venture steel plants are heavily clustered in the Midwest and upper South.(Figure 4 omitted) Two different location patterns are evident here--one for large joint ventures in integrated steel mills and galvanizing lines; the other for smaller steel processing centers.

The large integrated steel mills are all Japanese-U.S. joint ventures located at existing U.S. steel plants in urbanized Midwestern communities. Two reasons have informed this investment and location pattern: (1) to gain and protect access to the U.S. steel market by defusing the potential opposition of U.S. steelmakers; and (2) to avoid the prohibitive multibillion dollar cost of building entirely new

integrated steel production facilities (Lynn 1982, 1987; Yonekura 1988; Kenney and Florida 1992). Japanese steelmakers are working to upgrade and restructure existing U.S. integrated facilities in sharp contrast with U.S. steelmakers' moves to decentralize production, close existing facilities, and diversify into new industries. Since 1960, more than one hundred major domestic steel plants have closed (Clark 1988, 192-5).

The galvanizing facilities all represent new construction. These are also joint ventures and are mainly located at or very near existing U.S. steel mills. Galvanizing coats and prepares steel for use in automotive body parts and is the aspect of steel production most directly linked to the automotive transplants. Galvanizing facilities represent more modest investments of \$100 million to \$500 million dollars. New construction has been required to implement Japan's state-of-the-art continuous-process galvanizing technology. Managers of these facilities report that proximity to the automotive transplants is a major influence on location choice both when building on an existing U.S. plant site or constructing a new facility. Other important location factors include proximity to parts and materials, access to transportation, and the availability of high-quality skilled labor. Industrial incentives play a less important role in location decisions, though a number of firms cite tax abatement, road and rail links, industrial development bonds, loan guarantees, and recruitment and training assistance programs as the most important types of government assistance (interviews 1990, 1991).

The location decisions of Japanese investments in both integrated steel mills and galvanizing lines are apparently unrelated to union avoidance or labor cost minimization. All of the major joint venture plants are high wage employers that conform to industry pay scales and are organized by the United Steelworkers (interviews with union officials July 1990). Here again, the selection of existing urban steel sites has been coupled to restructuring agreements between the union and management to pave the way for Japanese production organization. Nearly all of the steel joint ventures have instituted restructuring agreements to reduce the number of job classifications, institute work teams, and establish other elements of Japanese production organization (site visits and interviews 1990).

The smaller steel processing centers, less constrained in their location choices, have opted for new greenfield plants in the Midwest and South. Proximity to major customer is by far the most important factor, followed by high-quality labor, low labor costs, a nonunion

environment, and transportation access. Steel service firms tend to make just-in-time deliveries to their customers and receive products from their suppliers on a just-in-time basis (survey and interviews 1988-1990). Industrial incentives have not been a major factor in the site selection decisions of steel service firms.

Transplant steel service center wages of \$7.50 to \$12.00 an hour are comparable to automotive suppliers but considerably lower than major joint venture facilities. The few dozen Japanese steel service centers are a small fraction of the more than five thousand U.S.-owned steel service centers (Patton and Markusen 1990). The concentration of transplant steel service facilities in the lower Midwest and upper South contrasts with the highly decentralized pattern of U.S. owned steel processing centers.

RUBBER AND TIRES

Japanese investment in the U.S. rubber and tire facilities surged in the mid-1980s, mainly through buyouts of U.S. companies. Today, four of Japan's five major rubber and tire companies--Bridgestone Tire, Sumitomo Rubber, Yokohama Rubber, and Toyo Tire--operate twenty U.S. factories, representing a total investment of \$5.4 billion (Table 5). (Table 5 omitted) The rubber and tire transplants exhibit a more dispersed location pattern than transplant automobile and steel facilities (Figure 5), yet many are located in states that house or are close to assembly transplants. (Figure 5 omitted)

Principally, because they are buyouts rubber and tire transplants replicate the geography of the U.S. rubber and tire makers. Since 1973, in an effort to weaken the union, American rubber companies closed more than thirty plants, mostly in the Midwest, and have expanded radial tire production in new factories in the Sunbelt and the Third World (Jeszeck 1986; Automotive Marketing 1988).

The location of the Japanese rubber and tire investments cannot be explained as an attempt to minimize wage costs. Both Bridgestone and Sumitomo are high wage employers organized by the United Rubber Workers. Bridgestone is working closely with the union to implement Japanese work and production organization. Sumitomo is also unionized. However GTY is not (interview with union officials 1991).

Bridgestone moved to the U.S. primarily "to find new markets." Its site selection was constrained by the purchase of Firestone's plants, but proximity to transportation, high-quality labor, a strong local work

ethic, and labor costs played a part in the decision, That Bridgestone was unionized did not influence the decision.

The location of Japanese rubber and tire producers stems from a broader entry strategy. The rubber and tire industry is distinct in that there is both a market for the original product and a large after market, Purchase of U.S. firms provides Japanese firms with the dealer networks to sell their products. Although the dispersed location of tire plants is not ideally suited to just-in-time production, plant concentrations in Illinois, Indiana, and western New York as well as the upper South provide enough proximity to the automotive transplants.

GLASS, PLASTICS, AND INDUSTRIAL MACHINERY

Japanese companies have also invested in automotive glass, plastics, and related chemicals. Japan's leading glass maker, Asahi Glass, established AP Technoglass in 1985. In March 1989, Nippon Sheet Glass, Japan's second largest producer of automobile glass, purchased a 20 percent share of Libbey-Owens-Ford for \$235 million (Japan Times 1989, 9). Okamoto Industries recently purchased Uniroyal Plastics, an Indiana-based automotive plastics supplier, for \$400 million.

Japanese companies have also opened plants to supply the transplants with assembly line equipment, production equipment, and machine tools. A major Japanese conveyor belt company and two Japanese manufacturers of automotive paint systems have opened U.S. plants (interviews 1990). Komatsu, the Japanese forklift manufacturer, has opened a U.S. plant to supply the growing base of transplant manufacturers. There are now sixteen Japanese machine tool companies in the U.S., most located near the transplants. One, the GM-Fanuc plant in Michigan, is the largest industrial robotics producer in the U.S. Yamazaki Mazak produces numerically controlled machine tools in Kentucky and is opening a major research and development center in Cincinnati, Ohio. These manufacturers are generally located near the automobile assemblers and their suppliers to facilitate close interaction in the development, installation, and maintenance of machinery.

UNDERSTANDING THE TRANSPLANT COMPLEX

Japanese investment in the automobile, steel, rubber and related industries follows two related geographic tendencies. At the regional level, the six states with major Japanese assembly facilities account

for 72.9 percent of the automobile, steel, and rubber transplants (Figure 6). (Figure 6 omitted) There are some location differences among sectors with steel primarily in the industrial Midwest, automobile assembly in the lower Midwest and upper South, and rubber and tires in the Sunbelt. At the subregional level, transplants tend to concentrate in greenfield locations, either in rural, exurban locations or in small communities at the fringes of metropolitan centers, though a significant number are in urban locations.

Basically, Japanese manufacturing investment is creating a Japanese-style steel, rubber, and automobile production complex in the U.S. This complex is integrated across the entire production chain providing the steel, automotive parts, tires, glass, and even some of the machines used to manufacture automobiles. The complex is the source of powerful production efficiencies and competitive advantage. For example, Mazda's Flat Rock plant receives automobile fenders, roofs, and doors on a just-in-time basis from a transplant automotive supplier one hour west of Detroit. These parts run through two large stamping presses made by a Michigan branch of Hitachi Zosen. The steel blanks come from ProCoil, the Marubeni-National-NKK joint venture, located just outside Detroit. ProCoil in turn gets its steel from the nearby National-NKK Great Lakes Works (site visit summer 1990).

More fundamentally, the transplants' success where U.S. corporations have failed rests upon the transplants' model of production organization. The productivity of transplant automobile assembly plants is significantly better than the Big Three assembly plants and comparable to the Japanese sister plants (Krafcik 1989). This productivity differential stems from the (1) use of teams and rotation to achieve functional integration of tasks; (2) recruitment, socialization, and remuneration policies designed to motivate work, increase work force commitment, and effectively control workers; and (3) a pattern of work organization that harnesses the intellectual as well as manual capabilities of workers (Florida and Kenney 1991a, 1991b; Kenney and Florida 1992).

Our view differs from the lean production concept of Roos, Womack, and Jones (1990), who believe that the key to the Japanese model is low inventories and efficient use of people and machines. It also contrasts with Parker and Slaughter (1988a, 1988b, 1990) and Dohse et al. (1985), who argue that the production efficiencies of the transplants are a product of a fast work pace, internal discipline provided by teams, and a general practice of management by stress. While the transplants operate a very fast paced assembly line and

effectively fill in the pores of the working day, workers indicate that they are not overly concerned about line speed or work pace. Indeed, those who have worked in both U.S. and Japanese plants generally prefer the Japanese model (interviews 1990). The real key to the transplants' success and to the Japanese model is the integration of the workers' intellectual and physical capabilities. This mode of production organization represents an advanced and sophisticated way of extracting value, by harnessing workers' full capabilities.(3)

Furthermore, the Japanese model exhibits new forms of corporate control, based upon a close identity between workers and the company (Dore 1973; Lincoln and Kalleberg 1990). Most transplants employ elaborate recruitment procedures, using intelligence and psychological tests, physical examinations, drug and alcohol tests, personal interviews, and two-or three-day visits to specialized recruitment facilities to select workers who are group oriented, identify with the firm, and generally fit the Japanese production methodology. Socialization to Japanese production methodology is a continuous process with on-going training and counseling as well as trips to Japan for team leaders, supervisors, and some shop floor employees. At some transplants video systems communicate messages to workers. Both union and nonunion transplants across sectors are strict about attendance. Honda uses monthly bonuses to reward workers who are not absent. At some transplants workers can be fired if they are absent four times in a year. Workers are placed in mandatory counseling if they are frequently absent from work or do not conform to the company norms (interview July 1990). Such control mechanisms create a corporatist identity between workers and the company, designed to motivate greater physical and intellectual effort (Kenney and Florida 1992).

Traditional approaches to location theory and regional development inadequately explain the transplant complex because they neglect the connection between production organization and spatial outcomes. Traditional theory suggests that firms make location decisions to maximize profits, by minimizing labor costs, lowering transportation and materials costs, and avoiding unions (Blair and Premus 1987). Indeed, traditional theory would have predicted the dispersal of Japanese manufacturing investments in the U.S. to follow the pattern set by U.S. manufacturers (Mair et al. 1988).

The U.S. pattern reflects the spatial division of labor approach (Clark 1981; Storper and Walker 1984; Massey 1984) whereby capitalist firms locate different aspects of their production activity (simple

manufacturing, complex manufacturing, assembly, research and development, and administration) according to the availability and cost of labor. Japanese direct manufacturing investment in the U.S. contradicts this view because both simple and complex manufacturing and assembly have been colocated resulting in an integrated transplant production complex.

More recent theories call attention to the importance of agglomeration. Piore and Sabel (1984), Scott (1988), and Storper and Scott (1988) identify the rise of smallfirm industrial districts characterized by flexible production and tight interfirm linkages. The transplant production complex seems, at first glance, to resonate with this view. However, such theories are generally concerned with small firm agglomerations and have thus far been unwilling to consider the role of large firms in creating production agglomerations (Florida and Kenney 1990b). This, of course, differs from more conventional theories of agglomeration and spatial clustering, which simply view agglomeration as external scale economies.

The rise of the transplant production complex suggests that changes in the organization of production fundamentally alter spatial outcomes and geographic organization. The failure of existing models of location and regional development to predict or explain the transplant complex may not lie with the models but with the way they have been employed. In other words, the problem lies in attempts to generalize from the behavior of fordist firms under those models. According to this logic, the old models could explain the location behavior of the transplants as the profit-maximizing behavior of individual firms, which, given their distinct production organization, orient their location decisions around high quality and stable labor pools and the creation of external agglomeration economies of supply and production.

But this explanation highlights the limits of those models. Basically these models treat changes in production organization as exogenous factors that can simply be inserted into prevailing location models. Furthermore, these models emphasize individual location decisions, as opposed to the underlying structural factors that channel and orient those decisions. Third, the models assume that firms passively select locations and then adapt to the environment. This neglects the crucial fact that economic organizations may have the resources and ability to alter and change their environments in significant ways (Florida and Kenney 1991a, 1991b).

A more powerful and dynamic theory of spatial organization and regional development acknowledges that production organization is endogenous to the process of regional and spatial change, not an exogenous factor that operates outside the system. Production organization is thus seen as a dynamic force driving spatial organization and regional development and structuring and channeling the location decisions of firms. Orienting the transplants decisions is the locational logic inherent to the Japanese model of production organization, characterized by tight functional integration outside as well as inside the plant, among research and development, manufacturing, and suppliers. At Honda's Sayama Japan plant, for example, suppliers drive their trucks inside the plant to deliver parts directly to the work station on the assembly line (site visit November 1988). The glue that holds the complex together--the spatial and functional integration required for Japanese production--is more than the sum of the parts.

This approach recognizes that the transplant production complex did not just happen. It was actively constructed by large economic organizations acting on their immediate environment to bring it in line with their needs (Florida and Kenney 1991a, 1991 b).(4) In this sense, the actions of transplant firms, especially automobile assemblers, are part of an ongoing and dynamic process of industrial complex formation and region building. The underlying organization of production thus provides a set of parameters within which economic organizations act to construct or transform their spatial environment.

ECONOMIC DEVELOPMENT IMPACTS

What does this expanding transplant complex mean for regional economic development? A central issue is the employment impact of the transplants. In 1988, the U.S. Government Accounting Office estimated that the transplants would create 112,000 new jobs and displace 156,000 jobs between 1985 and 1990, resulting in a net job loss of 44,000 jobs. A UAW study (1988) estimated a net job loss of between 74,000 and 194,000 over the same period.

However, such assessments are based on problematic assumptions. They do not take into account that a number of transplants have invested in U.S. plant sites and thus reemploy workers already in the pool of U.S. production workers. In other instances, Japanese investment provides U.S. producers access to state-of-the-art production technology and organizational innovations and thus prevents job loss that would have likely occurred in the absence of

Japanese participation. Moreover, the entire issue of displacement is questionable. A balanced view considers the alternatives of domestic job loss through increased import penetration and continued U.S. manufacturing investment off-shore, and job gain and retention from domestic transplant production.

The automotive, steel, and rubber and tire transplants have together created or preserved roughly 110,000 direct jobs excluding any indirect multiplier effects (Table 6).(Table 6 omitted) While this is certainly insufficient to compensate for the hundreds of thousands of jobs lost through U.S. plant closures, it is certainly a net positive development in terms of job generation and retention. The transplants have pumped much needed investment into U.S. manufacturing and appear to be offering wages that are similar to those offered by U.S. producers.

Some critics view the automotive transplants as branch plants that assemble cars from knocked-down kits imported from Japan and thus have a minimal impact on local and regional economic development. The "screwdriver" hypothesis states that Japanese plants have only moved standard, low value-added operations to the U.S., keeping higher value-added, more sophisticated activities in Japan. The evidence contradicts the screwdriver hypothesis. Honda, Nissan, Toyota, and Mazda already produce high value-added components like engines and transmissions in the U.S. Both Diamond Star and SIA plan to do so in the future (Kertesz 1989; Chappell 1989). Moreover, the automotive transplants currently operate twenty two research and development, product engineering, and design facilities in the United States (Chappell 1990). There are two location patterns here. First, most transplants operate a research and development and product engineering facility near actual assembly plants as part of the Japanese practice of integrating suppliers into the product development process (Florida and Kenney 1990a), Second, each of the transplants has design facilities in southern California to develop new models for introduction to the U.S. Graham and Krugman conclude that the charge that "foreign firms keep their high value-added or more sophisticated activities at home is not borne out by the evidence" (1989, 5).

A related economic development issue is the domestic content of the transplants. It is commonly asserted that more than one-half of the transplants' parts originate in Japan. However, the 1990 data indicate that domestic content has risen to between 65 and 75 percent for most of the transplant assembly plants (Chappell 1991), The rise is

attributable to (1) the movement of engine and transmission facilities to the U.S.; (2) the influx of Japanese automotive component suppliers, steel firms, and rubber plants; and (3) recent efforts by transplant assemblers to upgrade and integrate U.S. suppliers. The supplier survey indicates that as of 1988 domestic content for transplant suppliers was 64 percent. That figure has probably risen since then.

The UAW estimates lower domestic content using the alternative measure of foreign merchandise imports, which in 1988 comprised 61 percent of total merchandise at Mazda and 39 percent at Honda (UAW Research Bulletin November 1989). Foreign merchandise imports and domestic content, however, are not the same. Domestic content refers to the direct material inputs (steel, rubber, automotive parts, engines, and transmissions) used in the manufacture and assembly of automobiles. Foreign merchandise imports include expensive capital equipment in the form of heavy machinery, machine tools, conveyor belts, and the assembly line. While the transplants obtain a large share of capital equipment from Japan, they acquire the bulk of in-process materials in the U.S. Foreign merchandise imports should begin to decline as transplant producers complete initial start-up and capital equipment makers open more U.S. factories.

Finally, the rise of the transplant complex appears to have stimulated Japanese investment and employment in unrelated sectors. Sony, for example, is centralizing all of its North American color television manufacturing near Pittsburgh, on the site of a defunct Volkswagen automotive assembly plant (interviews 1988-1991; Wray 1989; Deane 1991).

Over the long run, the transplants pose a serious challenge for U.S. producers. In 1989, automotive transplants produced one-quarter of all U.S. cars (Wall Street Journal 1990). Japanese firms control a large segment of U.S. tire production capability; in 1989, U.S. tire producers accounted for less than 20 percent of total domestic production. Growing Japanese ownership of U.S. steel firms is resulting in a creeping takeover of that industry. A number of transplant producers expect to grow beyond the U.S. market and to compete in global markets as well.

POLICY IMPLICATIONS

The direct cash costs of industrial incentives have climbed from \$2,500 per job at Honda in 1982 to nearly \$100,000 at SIA in 1989 (Table

7).(Table 7 omitted) Proponents suggest that such incentives attract investment and jobs, while opponents argue that such programs are giveaways to foreign competitors who are taking profits and jobs away from U.S.-owned firms. The above figures do not include interest paid on bonds or foregone tax revenues (Davies and Lowell 1990; Miyauchi 1987). Some estimate that the real value of Kentucky's incentive package to Toyota exceeds \$350 million including interest costs (interviews with local officials August 1990).

The location of the transplants is probably not notably influenced by industrial incentives. First, a significant number of decisions have been constrained by the location of existing U.S. plants and by other extra economic factors. Second, proximity to automotive assemblers and to the complex itself is a major siting criteria. Third, transplant producers report that incentives play a minor role in their location calculus. Fourth, some transplants, sensitive to the political controversy surrounding incentives to foreign firms, are actively seeking smaller incentive packages (interview August 1990). Basically, transplant location is informed by the plant's production organization and by other factors that industrial incentives, designed in light of the location choices of fordist firms, were never meant to affect.

The planner's dilemma is how to generate economic development and jobs yet avoid the zero-sum consequences of a climate in which states and localities continue to compete fiercely for new plants and jobs; firms expect subsidies; and politicians are likely to use incentives to ensure that their jurisdiction comes out the winner. Given these factors planners should press for strict limits or completely eliminate industrial incentives to Japanese transplants.

Transplant facilities can be a source of local fiscal stress. They can require a large commitment of local expenditures for ongoing services, beyond the large initial cost of incentives. As recipients of long-term, tax-exempt industrial revenue bond financing, many of the larger transplants have been able to temporarily avoid property taxation. In one extreme case, Georgetown, Kentucky, was left to support Toyota's burgeoning service requirements, while the company provided only a relatively small amount of revenue. After months of negotiations, Toyota agreed to have its site annexed by Georgetown and make an in lieu of tax payment of \$10 million to the city and county (interviews August 1990). State and local planners must work together to develop realistic forecasts of local financial impacts and appropriate mechanisms for ensuring the financial health and solvency of communities.

One strategy that planners can use to enhance the benefits of transplant investment is to encourage more U.S. owned firms to tap into the transplant market. U.S.-owned firms can supply the transplants, but only if they are willing to radically improve their quality standards and delivery practices and bring their production methods into line with the Japanese model. Johnson Controls, Inc., has plants in five states, which supply the transplants. Its Georgetown, Kentucky, plant has worked closely with Toyota to implement a complete version of the Toyota production system.

Government programs can help local producers gain access to the transplant market. Ohio, for example, used \$2.5 million in funds from its Steel Futures Fund and Thomas Edison program to help ARMCO upgrade its steel production and add new electrogalvanizing lines to supply the transplants (interviews with Ohio and ARMCO officials 1988, 1990). Some states have launched industrial assistance or manufacturing modernization programs, which to be effective, must go beyond the identification of new markets and technology, and address organizational restructuring, state-of-the-art manufacturing practices, and the traditional labor-management divide.

Planners could develop with Japanese manufacturers lists of potential suppliers and then work with the suppliers to accomplish needed organizational changes. Japanese manufacturers would probably welcome such efforts especially given the increased political pressure to integrate U.S.-owned suppliers. Transplant assemblers have formed teams of engineers, manufacturing experts, and purchasing representatives to consult with potential suppliers. Toyota has gone further and established the Bluegrass Automotive Manufacturers Association (BAMA) to improve supplier efficiency and delivery and accelerate the diffusion of Japanese production methodology to potential Toyota suppliers (interviews August 1990). This integrative approach might also help to temper the deal-mania that afflicts many state governments. Instead of traditional industrial incentives, states might establish funds to develop local supplier capabilities.

A highly charged debate rages over whether to limit or eliminate foreign direct investment in the U.S. Those in favor of limits see direct investment as a threat to U.S. owned firms, while those opposed to limits see foreign investment as creating productive activity and employment. The real issue, however, is the distinct form of production organization that is the source of the Japanese firms' competitive advantage over U.S. firms. Eliminating foreign direct

investment will not change that advantage, it will simply shift the geographic locus of competition off-shore, exchanging jobs in transplant firms for jobs abroad.

A growing number of commentators contend that the U.S. government should develop an industrial policy to rebuild traditional manufacturing industries. But simply pumping public capital into U.S. manufacturing firms will do little either to improve their performance or to generate broader social and economic benefits. The U.S. government's industrial policy of trade protection and assistance to the steel industry dates from the 1960s. The response has been continued disinvestment, chronic neglect of technological and organizational upgrading, and the use of steel as a cash cow for corporate diversification and financial speculation, Chrysler has received government bailouts, but it is still not competitive. The rubber and machine tools sectors have been subject to a management strategy of disinvestment, asset stripping, and sell-offs. It is little wonder that planners have been so frequently stymied in their efforts to promote economic development among fordist firms concerned primarily with short-term profits and goals.

A new economic development policy is required to achieve an organizational transformation of the U.S. manufacturing industry. Such an approach must recognize the new model of production organization, especially the need to harness the intellectual capabilities of factory workers. Planners and public policymakers should develop programs that emphasize organizational restructuring over industrial incentives or even direct capital investment. However, planners and policymakers must resist the temptation to simply imitate other models, especially the negative aspects of the Japanese model--selfless devotion to the firm and extreme levels of corporate control over workers--and create more humane, democratic, and effective forms of production organization and economic development. This will require interaction and cooperation among labor, management, and government. Industrial policy, for example, could be an agent of organizational restructuring, by making government financing dependent upon a combination of work place reforms and greater job security for workers. Regional economic development policy could help to fashion interactive relations between end users and suppliers in the design, development, and production of new products (Florida and Kenney 1990a).

At the core of such a strategy must be a combination of reinvestment and organizational restructuring. Managers and workers in former U.S. plants that are now wholly or partly under Japanese management

report that the key to success has been learning how to organizationally restructure and having the capital to upgrade and modernize. This has not required massive infusions of capital. Many of these plants had been operated as cash cows with earnings siphoned off to finance corporate diversification and speculative endeavors. Both management and union representatives indicate that they are now able to reinvest their earnings in upgrading and modernizing their facilities.

Where plant ownership or management is reluctant to undertake needed organizational restructuring, economic development planners could work with labor unions and workers' groups to get these issues on the table. Government funds could be used to enable workers to buy out failing plants, reinvest their own earnings, and implement comprehensive organizational restructuring.

REINDUSTRIALIZING AMERICA

The success of the Japanese transplants punctures the myth that high wages, unions, and a poor business climate are responsible for the decline of U.S. manufacturing. Instead, the causes are short-term, myopic investments; casino-like financial speculation; little reinvestment in manufacturing plants, equipment, and technology; and most significantly an outmoded fordist production organization that considers workers a necessary nuisance (Florida and Kenney 1990a). The transplants, however, by establishing a viable new model of production organization in the U.S., are contributing to the reindustrialization of American manufacturing.

The transplants offer a new model of production organization that harnesses the intellectual as well as physical capabilities of workers and integrates end users with their suppliers. U.S. steel-makers and automobile companies are forming joint ventures with Japanese firms to learn more about this new model. The Big Three carmakers are now trying to establish their own modified versions of this model with initiatives like GM's Saturn (interviews 1990).

Japanese-led reindustrialization is not an economic development panacea. While Japanese investment in manufacturing provides capital and jobs, it is not the answer for the severe economic and social problems facing American communities. Of utmost urgency is a new approach to economic development that emphasizes organizational restructuring. Such an approach requires a sharp break with the outmoded organizational practices of U.S. industry. It must offer

better jobs, better pay, and more humane and democratic working environments, placing worker and community interests ahead of corporate profits.

After the massive industrial decline and destruction of the late 1970s and early 1980s, who would have predicted a major reinvestment in the automotive, steel, and rubber industries indeed, reindustrialization in the late 1980s and the 1990s? And, who would have predicted that the main actors in this process would be the Japanese?

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NOTES

1. These were conducted by a team of Japanese, European, and American researchers during summer 1990.
2. The global car strategy ultimately weakened the U.S. automobile industry as a whole, as transportation costs rose, new administrative layers were added, and the entire production process fell victim to serious international bottlenecks. The industrial relations climate also worsened, as workers grew increasingly anxious about their jobs, and so-called docile Third World labor grew increasingly more concerned with improvements in their wages and working conditions,
3. For a full exposition of our position see Kenney and Florida (1988) and the international debate over that article, including our response, published in the Japanese journal, *Mado*, Nos. 1-5(1989-1990).

4. This conceptualization builds upon Storper and Walker's (1989) concept of "geographic industrialization," whereby capitalist firms create the conditions required for their existence.

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