Industrial Systems and Industrial Agglomeration in Japan

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Akira Yamasaki

1. The Japanese Industrial System and Small Plants

David Friedman described the difference between American and Japanese manufacturing industries in the following words: "At the height of Japan's economic expansion, between 1954 and 1977, the number of manufacturing firms doubled from 429,000 to 720,000. Over the same period, the number of American manufacturing firms grew only slightly, from 288,000 to 350,000. Over time, these statistics show, Japanese manufacturing decentralized in smaller factory units, whereas the United States production was centralized in very large firms. By 1977, though its value was only 30 percent that of the United States, Japanese manufacturing took place in twice as many enterprises. The scale of Japanese production, averaged against total output, was close to one-sixth that of the United States (Author's note: the number of manufacturing firms is presumably the number of establishments with a payroll of at least one person in the industrial census, or what in this article appears as the number of plants.)[1)]

"Although mass production is efficient with respect to price, for instance, it is ineffective in coping with changing demand. But though a flexible firm might be better able to adjust to demand shifts, it may sacrifice low-cost production and scale economies by pursuing flexible manufacturing."[2)]

Behind these differences between the industrial organizations of Japan and the United States lies the existence, in Japan, of vast networks of subcontractors and parts makers which have developed to support the great number of products and specialty parts and components, complex production processes and frequent changeovers of product models which characterize Japanese manufacturing.

A number of factors including a reduction in the number of products, the use of common parts, a cut in the number of parts used in products, longer product cycles, intensive production (pursuit of economies of scale), simplified production processes, in-house production of parts and takeovers of subcontracted processes, the greater use of foreign-made parts, an overseas shift of factories, and slack do-

1) David Friedman, 1992. *The Misunderstood Miracle: Industrial Development and Political Change in Japan*, Ithaca: Cornell University press, p.10.
2) *Ibid.* p.16.

mestic demand caused by the maturation of the Japanese economy and increased imports of manufactured products are leading to the weeding-out, reorganization and integration of the small businesses in Japan that have long depended upon subcontracting jobs and parts production. The rate of reduction in the number of plants has been particularly high in the Keihin industrial area (encompassing Tokyo, Yokohama, and the surrounding areas), whose electric machinery makers are increasingly moving production plants to non-urban areas or overseas, using more foreign-made parts, or closing down due to intense competition from imported products.

Japan's industrial system has long been a system of flexible production making good use of small and tiny factories at the expense of economies of scale. In addition, many manufacturers have tended to many different products in their lines, thus putting themselves in a situation of overcompetition and having to repeat a pattern of frequent model changeovers. As many researchers have pointed out, the Keihin industrial area has followed a unique path of industrial agglomeration not seen in any other industrial nation, through the concentration of machinery industries with munitions factories and transplant factories. In this way, it has served as an industrial mother ship, supporting the above-mentioned industrial system in Japan's high-growth era.

With regard to the role of small and tiny manufacturers in the system of flexible production, Friedman does not subscribe to the dual structure theory according to which big corporations use small businesses as an adjustment valve to cope with cyclical business fluctuations. Using industrial censuses, he argues that numbers of workers at major plants have consistently declined sharply during recessions since the Great Depression era, with the exception of period between 1957 and 1959. Pointing to the high rate of decline for plants with large payrolls in the 1975-1977 period, he writes, "The figures do not indicate that small firms were sacrificed to maintain stability in large companies,"[3] and "The data indicate considerable inconsistencies within the dual structure view."[4]

Industrial censuses show that the size of plants do not necessarily correlate directly with the size of corporations. Plants with payrolls of 300 or more can be described as plants of big corporations, but plants with between 30 and 299 workers can be run by either medium sized companies or big corporations. Many medium-scale plants located in non-urban regions are in fact branch factories of middle-standing or major corporations. Friedman fails to take this factor into account.

Do his arguments really hold good for the post-bubble recession of the 1990s? The underlying trend of the 1990s has been that plants with few workers and small payrolls have demonstrated much higher rates of decline than those for plants with large numbers of workers. If we follow Friedman's argument, we are forced to conclude that in the 1990s we are witnessing the reemergence of the double structure.

We do not intend to categorically rule out the reality that small independent manufacturers with high

3) *Ibid.* pp.131-132.
3) *Ibid.* p.131.

technological credentials emerged in the 1970s. As Friedman argues, the increase in small urban plants from the 1960s to the 1970s was a phenomenon associated with the establishment of the system of flexible production, and flexible specialized companies did indeed emerge in that process. But we are not confident enough to be able to declare, as Friedman did, that "Many small-scale manufacturers were able to become flexible, high-tech specialists."[5)]

In the 1970s, medium- and large-scale electric machinery and clothing makers located relatively small-size plants in non-urban areas as a means to take advantage of cheap local labor. Friedman apparently misread this development as the burgeoning of small businesses and the floundering of major corporations. The increase in medium-scale plants and growth of workers at such plants should be interpreted as an issue of plant location and cannot be explained simply as an issue of technological prowess.

The sharp decline in the 1990s in the number of plants represents a rethinking of flexible production systems, and in this sense, it is only natural that we see an opposite phenomenon to the past developments, namely, a weeding out of small plants. Therefore, the decline in small plants can be explained by citing a review of flexible production, or a move toward the American production system, without emphasizing the dual-structural aspects which have been rejected by Friedman.

However, the major qualification needed by small manufacturers who supply intermediate products is still low costs, a factor closely associated with the double structure theory. According to a 1996 survey by the Small and Medium Enterprise Agency, 68% of Japanese companies who were polled said they gave priority to "cost" factors in integrating subcontractors, a proportion far larger than the 18.7 percent who cited "close affiliation," a factor deemed linked to flexible production, the 9.3% who chose "short delivery time," and the 8.0% who answered "small-volume production of a variety of products" (multiple replies).[6)] These results indicate that structural aspects of the dual structure theory cannot be jettisoned so easily.

2. Silicon Valley and Tokyo

Agglomeration means the location of companies and plants in a specific area in a time sequence, with the number of such firms and plants growing. The number of plant workers in Tokyo began to decrease in 1964, with the agglomeration there reaching a certain limit already in the 1960s. The industrial agglomeration in Tokyo must be analyzed not as a dynamic one, with ongoing concentration and agglomeration, but as a retrogressive one, which as a whole was changing and disintegrating, while some of its functions were enhanced to cope with the demerits of agglomeration.

Katsutaka Itakura took note of a 39.3% drop in the number of plant workers in Tokyo between 1963

5) *Ibid.* p.127.

6) Small and Medium Enterprise Agency, 1997. *Chusho kigyo hakusho* (White paper on small business), FY 1996, Tokyo: Printing Bureau, Ministry of Finance, p.154.

and 1980, to 520,000, trying to analyze whether this meant the collapse of an urban industrial area.

He wrote: "The decline of close to 40% of plant workers in the metropolitan Tokyo area is a major event that cannot be overlooked. A drop of 5% or 10% could be described as just a passing phenomenon or an adjustment of excessive agglomeration. Even a shrinkage of 20-30% might be explained as a result of labor-saving rationalization. But this decline of nearly 40% ought to lead us to the notion that the complex-area itself may have collapsed and that Japan's machinery assembly industry itself, which was built around Tokyo's complex-area, may well have undergone a drastic change. If so, that change may be a reflection of the process of the complex-area's collapse, and the industrial framework was likely badly shaken."[7] This strong argument is quite befitting Itakura, who became an authority in industrial geography through his empirical studies of the Keihin industrial area.

However, Itakura's conclusion is that: "The complex-area still seems to be functioning properly. In the 1950s, the regional structure had Tokyo's complex-area of small firms at its core, and was surrounded by key large plants as well as small and medium labor-intensive factories. Advances in the transportation network helped large plants to spread all over the Kanto region, small and medium plants to move onto the Nishine-Akita line, and the Joto district's tiny plants to move to the three wards along the Edogawa River. The southwestern Jonan district remained largely intact, with some peripheral expansion into the Kawasaki and Yokohama districts. If this observation holds, it would be proper to argue that the basic arrangement of the Keihin industrial area remains fundamentally unchanged, despite the big drops in large, small and medium, and tiny plants in Tokyo. What has happened simply is that its outer limit has extended."[8]

Itakura wrote this article in 1988, while hospitalized, based on an analysis of statistical data running up to the 1980s. Under such constraints, he concluded that the basic arrangement of the Keihin industrial area remained fundamentally unchanged. The only change was in the geographical framework, with tiny factories moving into the Kawasaki and Yokohama districts, medium-scale plants moving north up toward Akita Prefecture in the north, and large plants being located in inland parts of the Kanto region.

At the same time, he did hint at possible changes taking place in Tokyo and the Keihin industrial area: "Not all assembly plants for transported parts (plants which receive small parts, assemble them into mid-size parts, and then send these back to the Metropolitan area) justify the transportation of necessary parts from places several hundreds of kilometers away. It only seems natural for these plants to strive to become independent of Keihin by developing networks of subcontractors around them as quickly as possible. . . . At any rate, while the deployment of these assembly plants with transported parts has helped raise various indicators of industrialization in the Tohoku region, it would be proper to say that these plants

7) Tatsutaka Itakura, *Nihon kogyo no chiiki shisutemu* (The regional system of Japan's manufacturing industry), Tokyo: Taimeido, p.101.
8) *Ibid.* pp.115-116.

have been parasitic on agricultural areas rather than helping revitalize such areas. The situation may develop somewhat differently in the future if key plants acquire upgraded R&D departments and become more closely integrated. Some of these plants are already showing signs of moving in this direction. Many have been empowered by their head offices to conduct planning and improvements on products which are already being assembled, such as cameras and printers."[9] He also wrote that,"land price rises in big cities may shake the very root of urban complex-areas or the basic research groups located in western Tokyo that find their strength in multiplier effects. At the very least, new locations no longer seem possible."[10]

Itakura placed great importance on the industrial census of 1963. In that year, the most detailed survey ever was conducted on small plants in Tokyo, and in relative terms, the survey omitted few of such plants.

Table 1 shows changes in the number of plants and number of plant workers in Tokyo (covering all plants with at least one worker). Itakura showed keen interest in the decline in workers between 1963 and 1980, though the number of plants in fact had increased from 81,909 in 1963 to 97,093 in 1980. Along with the geographical expansion of the Keihin industrial area, this increase in the number of plants appears to be behind Itakura's conclusion that the basic arrangement of the Keihin industrial area has remained fundamentally unchanged.

The number of plants in Tokyo peaked at 99,867 in 1983 and then followed a downward trend, decreasing to 61,478 in 1997, a level lower than that of 1963. Even expanding the coverage to the entire Keihin industrial area (including Kanagawa Prefecture), there were fewer plants in 1997 than in 1963. As for the number of plant workers, as Itakura noted, by 1980 the number had fallen lower than that of 1963, and in 1990 was below the level of 1958. Between 1990 and 1997, the number of workers declined by 120,000. The 1997 level of 676,000 was even lower than the 706,000 of 1954, and was close to the 1953 level of 633,000.

Table. Manufacturing in Tokyo (Plants with at least one worker)

		1958	1963	1980	1990	1997
Number of plants	Tokyo	51, 861	81, 909	97, 093	80, 009	62, 511
	Japan	455, 372	563, 327	734, 623	728, 853	612, 830
Number of workers	Tokyo	1, 026, 845	1, 509, 083	1, 030, 981	865, 386	677, 197
	Japan	6, 664, 355	9, 727, 874	10, 932, 041	11, 788, 019	10, 473, 141

Source: Calculated on the basis of the Industrial Census, Ministry of International Trade and Industry.

9) *Ibid.* p.200.
10) *Ibid.* p.248.

Urban industrial agglomeration, which until the 1980s was understood as an evolutionary process, in the form of the expansion and functional change of the Keihin industrial area, and discussed as the core issue of Japan's industrial agglomeration, is now in the process of a transformation that cannot be seen as a process of "evolution."[11] It may not even be a"transformation," and perhaps we should use the term "dismantling."

It was Kenichi Imai who described the transformation (expansion of the geographical coverage and upgraded functions) of the industrial agglomeration in the 1980s as an"evolution" of industrial agglomeration.

He argued:"Silicon Valley and the agglomeration along Route 128 in the Boston area were formed spontaneously."[12] "[In Japan,] what is comparable to Silicon Valley is 'The Tokyo Technopolis.'"[13] Aside from the question of whether it is appropriate to call the concentration and agglomeration of machinery industries in Japan's capital "spontaneous," as it is the result of the unique development modality of Japan's capitalism, the agglomeration of small plants in the metropolitan area has been seen as a model of information networking society that has parallels with Silicon Valley.

Imai further argued as follows:

"This agglomeration took shape spontaneously, but there were specific reasons why plants came to be clustered together in certain traditional commercial 'Shitamachi' (downtown) neighborhoods in Tokyo and Kawasaki. Specifically, companies needed to be located close to each of a divergent group of customers to whose orders they were able to respond. These locations allowed frequent and less time-consuming business meetings and transportation of materials and products. The companies also had be surrounded by a variety of specialist business partners which could to respond to different kinds of orders. Moreover, businesses in different fields had to be located within a certain geographical area so that they could give or take orders and have a local network of division of labor for the subdivision of orders taken by any particular company. To ensure a smooth division of labor, it was necessary to maintain a close proximity between residences and plants to allow free and easy sessions for business arrangements even late at night. There also had to be a variety of small buildings for such sessions."[14]

"The valuable inefficiency" of the city is what kept this agglomeration going. In other words, the agglomeration took advantage of the minus factor of overcrowding in Tokyo, relying rather on the use of this invisible resource."[15]

"The flexibility and speed with which Japanese companies developed products emerged from the basis of the aforementioned network industrial organization,"[16] and "that organization has been formed

11) Small and Medium Enterprise Agency, *Chusho kigyo hakusho* (White paper on small business), FY 1998, Tokyo: Printing Bureau, Ministry of Finance. This paper has an independent section entitled "Transformation of industrial agglomeration," p.195.
12) Keiichi Imai, 1984. *Joho nettowaku shakai* (The information networking society), Tokyo: Iwanami Shoten, Publishers, p.17.
13) *Ibid.* p.17.
14) *Ibid.* p.20.
15) *Ibid.* p.21.

evolutionarily as a creative network."[17]

Imai was aware of the following: "A portion of the parts production that was once standardized into the network, as well as a certain degree of mass production, is being shifted to regions 100 to 200 kilometers from Tokyo, and severed from the super-crowded Shitamachi network. In order to achieve a certain scale of mass production, one requires a plant site and relatively cheap land for that site. Women in outlying areas, who find it too difficult to commute to Tokyo, and thus could not find suitable jobs, are now being utilized as part-time labor."[18] But he interpreted this dispersal of plants to outlying areas as an "evolutionary process toward a next stage."

The intent of this article is not to criticize Imai's 1984 views. His view of the information networking society was an original one, that was well ahead of his time. We did not ourselves anticipate, at the time, the changes that have taken place between then and 1997.

Still, calm analysis from the standpoint of plant location leads to the conclusion that the successive relocation of mass-production plants to outlying areas was not an"evolution toward a next stage" but rather the beginning of a dismantling of the urban industrial agglomeration. The shift of mass-production plants to local areas provides the momentum for building regional industrial agglomerations, albeit on a limited scale. When output reaches a certain level, the need to save on transportation costs and to be close to markets works as incentives to the regional location of related parts plants, resulting in a gradually rising level of agglomeration. Through this process, production costs at existing plants decline (through the benefits of agglomeration). Agglomeration provides an incentive to have plants fixed at the location over the long term.

As Paul Krugman said (and as is also evident from Alfred Weber's theory on plant location), "the circular relationship in which the location of demand determines the location of production, and vice versa, can be a deeply conservative force, tending to lock into place any established center-periphery pattern."[19] For producers of parts and components, the southern part of the Tohoku region is a new area of industrial agglomeration where demand is being generated.

In addition, the development of high-speed transport systems helped to rapidly expand the scope of potential industrial agglomeration areas. An expressway makes it possible to reach a destination 100 kilometers away in one hour. This one-hour access sphere covers 80% of the plants of client companies of small and medium enterprises located in metropolitan Tokyo.[20]

Hironobu Oda looked at the agglomeration of machinery makers in the Kitakami area of Iwate Prefecture as an example of a local area following a pattern of development comparable to that of Ota Ward

16) *Ibid.* p.21.
17) *Ibid.* p.21.
18) *Ibid.* p.22.
19) Paul Krugman, 1994. *Geography and Trade*, Cambridge, Mass.: MIT Press, p.26.
20) Metropolitan Areas Development Bureau, National Land Agency, 1995. *Ikinokori no michi o saguru toshin no chusho kojo* (Small manufacturing plants in central Tokyo grope for path to survival), Printing Bureau, Ministry of Finance, p.14.

in Tokyo. He saw the Kitakami area's receipts of orders for basic processing as a case of long-distance linkages, of over 100 kilometers.[21)]

Looking at the elasticity of social transfer of labor, a determinant of the scale of agglomeration under Weber's theory of industrial agglomeration, the decline in workers employed in manufacturing industries in metropolitan areas and the difficulty of securing workers for plants in such areas both pointed to the inevitability of the future disintegration of agglomeration.

"The minus factor of Tokyo's overcrowding" is precisely the demerit of agglomeration under agglomeration theory. Some metropolitan plants have attempted to cope with this demerit by raising the productivity of land in order to maintain their metropolitan location. However, an increasing number of companies have failed in such endeavors and have opted to abandon their metropolitan location of plants in favor of non-urban locations.

The situation has changed significantly since 1984, and it is now well known that industrial agglomeration is in flux. Nevertheless, partly because of the vitality of industrial production in metropolitan areas during the economic bubble years, the framework advocated by Imai of comparing Tokyo's industrial agglomeration to that of Silicon Valley remained intact as the framework for research in later years. Silicon Valley represented a new type of industrial agglomeration, and the traditional industrial agglomeration of the northeast United States was on a gradual decline. However, Imai himself made little reference to the industrial agglomeration of small businesses in metropolitan areas in his later books and other writing on information networks.[22)]

Kiyoji Murata and others, in a 1988 analysis, wrote,"The key feature of Tokyo's manufacturing does not lie in the size of output of individual products, but rather in the fact that is serves the function of leading Japan's overall industrial development. Tokyo has an 'industrial mother function' in Japan and performs the role of leading Japan's technological innovation."[23)] They characterized the agglomeration of urban plants, a model of the Imai-advocated information networking society, as the"industrial mother function." In the face of the quantitative decline of plants, however, they admitted:"While the importance of Tokyo's industrial mother function, with its role of leading Japan's technological innovation, is apparent, it cannot be denied that Tokyo faces a problem of excess agglomeration. In pursuit of a better balance and greater efficiency in the utilization of national land, it is desirable for innovation cores to be fostered in other ar-

21) Hironobu Oda, 1998. Iwate-ken kitakami chiiki ni okeru kikaikeikogyo no shuseki renkan kozo (Agglomeration and linkage structure of machinery industries in the Kitakami area, Iwate Prefecture), *Keizai chirigaku nenpo* (Annual of the Japan Association of Economic Geographers), Vol.44 No.1, p.54. For further reference on the location of machinery manufacturing plants in the Kitakami area: Mitsuhiro Seki, 1995. *Chiiki keizai to chusho kigyo* (Regional economies and small business), Chikuma Shinsho, Tokyo: Chikuma Shobo, pp.69-72.

22) Kenichi Imai and Ikuyo Kaneko, 1998. *Nettowaku soshiki ron* (Network organization theory), Tokyo: Iwanami Shoten, Publishers; Kenichi Imai, 1990. *Joho nettowaku shakai no tenkai* (Development of the information networking society), Tokyo: Iwanami Shoten, Publishers; Kenichi Imai, 1992. *Shihonshugi sisutemu-kan kyoso* (Competition between capitalistic systems), Tokyo: Chikuma Shobo.

23) Compiled by Kiyoji Murata, 1988. *Sangyo botoshi – Tokyo* (Tokyo – industrial mother city), Tokyo: Toyo Keizai Inc., p.5.

eas."[24] Other areas they cited included not the Tohoku region but rather Osaka, a place where, like Tokyo, few new plants were being located, and they did not provide any convincing reason for this choice. The"industrial mother function of Tokyo," a theory advocated by Murata and others, brought Tokyo's Jonan district, and particularly Ota Ward, into the spotlight as the core of the industrial agglomeration that has supported Japan's manufacturing. The theory also led to the spread of the view that the international competitiveness of Japan's manufacturing would decline unless this industrial agglomeration was maintained.

Industrial agglomeration attracted renewed attention, after the publication of *Regional Advantage* by Anna Lee Saxsenian[25] in 1995. In Japan, some books on agglomeration were the published, including *Nihongata sangyo shuseki no miraizo* (The Future of Japanese industrial agglomeration) by Tadao Kiyonari and Toshiro Hashimoto, and *Sangyo shuseki no honshitsu* (The essence of industrial agglomeration), compiled by Noriyuki Itami, Shigeru Matsushima and Takeo Kitsukawa.

The future of Japanese industrial agglomeration also used a comparison of Silicon Valley and Tokyo. Toshiro Hashimoto, who wrote a chapter on Japanese industrial agglomeration, showed a keen interest in the issue, saying that "even at present, Tokyo can boast of one of the highest standards in the world in the technological levels and varieties of materials and parts, though it also faces serious problems as a result of the changes in the external environment."[26] In particular, he noted and discussed the absence of agents well versed in international transactions.

The analysis by Itami and others, from the viewpoint of business administration, attempted to discover the"essence of agglomeration" in the business relationships among corporations, and thus has little to offer from the standpoint of plant location theory. Their fundamental stance, like that of Murata and others, is that industrial agglomeration in metropolitan areas was important for Japan's manufacturing as a whole. Kiyohiko Shibayama offered a clear background of the changed environment within which Tokyo's tiny and small and medium manufacturers found themselves.

Shibayama correctly grasped the real essence of the changes taking place: "The industrial agglomeration in this district, which managed to adapt to the new environment of large clients' mass-production plants being located over a wide region, is now being confronted by a fresh environmental change, in which development bases which were once concentrated in the metropolitan area are being dispersed over a wide region."[27] Consequently, he argued,"changes are beginning to take place in the direction of

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24) *Ibid.* p.7.

25) Anna Lee Saxsenian, 1995. *Regional Advantage, Cambridge*, Mass.: Harvard University Press.

26) Toshiro Hashimoto, 1997. Nihon-gata sangyo shuseki saisei no hokosei (Direction for the revival of Japanese industrial agglomeration), Tadao Kiyonari and Toshiro Hashimoto, writers and compilers, *Nihon-gata sangyo shuseki no miraizo* (Future image of Japanese industrial agglomeration), Tokyo: Nihon Keizai Shimbun, Inc., p.177.

27) Kiyohiko Shibayama, 1998. Daitoshi sangyo shuseki no yukue (The future of metropolitan industrial agglomeration), Noriyuki Itami, Shigeru Matsushima, and Takeo Kitsukawa, compilers, *Sangyo shuseki no honshitsu* (Essence of industrial agglomeration), Tokyo: Yuhikaku, p.202.

transferring the functions of parts making for trial products and production of small-lot parts to local plants as well."[28]

In addition to the responses necessitated by changes in geographical location, the demand for the products of small plants in the Tokyo metropolitan area was further undermined by"product policy reviews by 'big corporations,' including moves toward cutting the number of product varieties and model changeovers, and making greater use of common parts in different products."[29] The decline in demand, he wrote, "reflects more than simply transient environmental changes such as recession and other cyclical factors, or a review of erroneous product policies."[30] This author, who announced a similar opinion in 1994, basically shares his view.

Moreover, technological changes are forcing changes on the agglomeration. Shibayama points out that the technological gap between metropolitan plants and local plants has narrowed, stating that "local subcontractors are in a sense evolving into Jonan-type subcontractors, and providing support for product development by big companies; the development of production technologies is no longer a patented function reserved exclusively for small firms in the Jonan district (or in metropolitan areas)."[31] The technological changes, moreover, have not been limited to this point. "The spread of three-dimensional CAD systems and advanced telecommunications technology has expanded the leeway for the location of design and development bases."[32]

Essentially, changes in the environmental conditions of transportation and telecommunications are working in the direction of enhancing leeway in plant location. In addition, Murakami pointed out that "The development of ME equipment has narrowed the room for personal skills, or craftsmanship."[33]

In short, the development of new technologies has increased the leeway for plant location, reduced dependence on craftsmanship and narrowed the technological gaps between regions.

Hideo Kato of the Tokyo Metropolitan Government's Management Consultant Office offered, sooner than anyone else, a systematic argument involving the points presented by Shibayama and Murakami. He analyzed the transformation process of Tokyo's industrial agglomeration and the factors behind that transformation in 1994-1995, based on a survey, in which he himself participated, for the Tokyo Metropolitan Government's white paper on small businesses (*White Paper on Small Businesses in Tokyo*). According to Kato, "In discussing small businesses in Tokyo, we can no longer use the traditional, fixed regional idea of Tokyo."[34]

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28) *Ibid.* p.204.
29) *Ibid.* p.207.
30) *Ibid.* p.207.
31) *Ibid.* p.209.
32) *Ibid.* p.209.
33) *Ibid.*, Yoshiaki Murakami, Sogyo to sogyo shien (Founding a business and support for foundation), p.261.
34) Hideo Kato, 1995. Daitoshi chusho kigyo no seisan no chihoka to kaigai tenkai (Urban small business' shift of production to non-urban areas and overseas), *Sangyo ritchi* (Industrial location), August, p.17.

According to the White Paper, among small and medium manufacturers with head offices in Tokyo, 58 firms, or 29.4%, had no production operations in Tokyo.[35]

As reasons for locating their production outside Tokyo, 44.3% cited the need to secure space for operational expansion, 39.7% wanted to secure sufficient labor, and 26.9% listed the worsening of the environment for operating production plants in Tokyo.[36]

While no information is available on the precise locations of branch plants outside Tokyo, which would shed greater light on access problems, it is instructive that only 4.6% replied that the distance from Tokyo was hampering business.[37]

Small manufacturers in Tokyo appear confident of the benefits of local branch plants, with 37.3 % placing high expectations on their future role as production bases and 32.3% saying they are pleased with their branch plants having achieved the intended results.[38]

When asked what function these local branch plants played, the largest number of respondents, 66.4%, cited "mass-production plants." But the survey results also indicated manufacturers have transferred some high-grade production functions to local branch plants, with 3 7.4% citing "small-lot, special-order production," 11.9% "product development," and 10.9% "trial product processing."[39]

Kato further wrote: "The upgrading of local branch plants can be traced to the objective development of standardized production facilities, as well as to the quality of local labor. Many production facilities are computer-controlled and it is important that companies can employ many workers capable of handling these facilities locally rather than in Tokyo with its aging labor force. The fact that next-generation manufacturing production systems have been developed with regional location as their guiding idea is the biggest reason behind the enhancement of the roles of local branch plants."[40]

The information-society aspect of computer-controlled production facilities is what prompted the dispersion of plants from Tokyo to outlying areas. Together with "the spread of three-dimensional CAD systems and advanced telecommunications technology," as Shibata pointed out, responses to the information society have been directly related to the dispersion of plants to local areas, the upgrading of local plants' functions, and the relative decline in the role of metropolitan plants. In his theory of the information networking society, Imai did not address these aspects of information networks.

Kato linked the introduction of ME equipment to a decline in new manufacturing startups. ME equipment requires spacious plant sites and large initial investment, thus raising the barriers to entry for small

35) Research Department, Management Consultant Office, Tokyo Metropolitan Government, 1995. *Heisei 7 nen ban Tokyo-to chusho kigyo keiei hakusho – seizogyo hen* (1995 White paper on the management of small businesses in Tokyo – manufacturing, Tokyo: Tokyo Metropolitan Government Office of Information, p.123.
36) *Ibid.* p.124.
37) *Ibid.* p.126.
38) *Ibid.* p.126.
39) *Ibid.* p.127.
40) Kato, *op. cit.*, p.23.

businesses.[41] Moreover, ME equipment, by using enhanced software, made small-lot production easier, leading to the rapid narrowing in the production technology gaps between urban sites and regional locations.[42]

While not terming it the disintegration of agglomeration, Kato described the acceleration of the transformation of agglomeration as follows: "I have been pointing to the rapid narrowing in recent years of the various gaps between big cities and local areas. Notable areas include the standardization of technologies through ME equipment, easier access due to the development of railroad and expressway networks, the development of computer-age information networks, and, more than anything, changes in corporate behavior that have made manufacturers significantly more responsive to users' demands for upgraded production. These shrinking gaps between Tokyo and local areas have transformed the discussion of the local division of labor from the tripolar structure of Tokyo, local areas and overseas to the a bipolar one, between Japan and overseas. ."[43]

There have been changes in technological locational units and in the social transfer of labor, demerits of agglomeration arising from spiraling land prices and traffic congestion in Tokyo, and changes in environmental conditions for plant locations, such as transportation and telecommunications. An accurate analysis of the transformation in industrial agglomeration that became evident beginning in the 1980s could have been possible if the analytical framework of plant location theory had been adopted.

According to the White Paper on Small Businesses in Tokyo, "Development-related work, which in the past never contracted even during recessionary periods, is showing an even greater decline than mass production activities."[44] The division of roles where high valued-added, small-lot production was done in Tokyo, mass production was carried out in local areas, and mass production of products for matured markets was done in overseas plants, is becoming less and less fixed. In terms of production technology, too, interregional gaps are steadily shrinking, against the backdrop of standardized production facilities, through the advancement of computer control.

Local plants are being assigned roles in production development and trial product processing. Among Tokyo-based manufacturers that had set up local branch plants, 66.6% said the technological levels of locally based companies were nearly equivalent to their Tokyo counterparts, while 9.6% said they were superior. Only 5.2% said they lagged far behind Tokyo's technological levels.[45] "Technological levels may differ, very subtly in most cases, among manufacturers across Japan, but it would not be far off the mark to say that differences, if any, are no longer as wide as was once thought,"[46] the White Paper concluded.

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41) Hideo Kato, 1995. Daitoshi kogyo no shinkyokumen (New phase in metropolitan manufacturing industry), Mitsuhiro Seki and Masaki Nishizawa, compilers, *Chiiki sangyo jidai no seisaku* (Policy in an era of regional industries), Tokyo: Shin Hyoron, p.36.
42) *Ibid.* p.50.
43) Kato, *op. cit.*, p.28.
44) Research Department, Management Consultant Office, Tokyo Metropolitan Government, White Paper, *op. cit.*, p.54.
45) *Ibid.* p.129.

In April 1999, Toshiba Corp. closed a trial product factory at its Tamagawa plant in Kawasaki, Kanagawa Prefecture, and moved the production to four mass-production plants across the nation. Some 600 workers at the trial product factory were transferred to Oita, Yokkaichi, Kitakyushu and other places of work. The closed facility will be used for R&D activities. Toshiba expects to shorten the period between development/design and mass production by around six months by integrating the functions of trial products and mass production.

In a survey of the views of Tokyo-based production establishments of major companies about the future of manufacturing in Tokyo, 40.1% said it would be increasingly difficult for Tokyo's manufacturing to continue its operations, and 54.2% said they expected to see a gradual retreat from its central role in Japanese manufacturing, while 5.2% predicted Tokyo would push ahead as the center of Japan's manufacturing.[47]

Krugman stated:"if for some reasons businesses and workers become pessimistic about a region's prospects, this pessimism can become self-justifying."[48]

The modalities of transactions are moving toward a tighter selection of subcontractors and strengthened in-house production by big manufacturers. "Moves toward in-house production may go beyond a mere cyclical phenomenon,"[49] and"the role of subcontractors in supplementing production capacity shortages of parent firms is declining in importance as the parent companies come to have surplus capacity, as evidenced in the area of increasing in-house procuction."[50]

As many as 40% of parent companies regard cuts in labor costs as the benefit of conducting transactions with subcontractors.[51] The aspect which is highlighted by the dual structure theory still refuses to go away.

3. New Industrial Systems and Changes in Industrial Agglomeration

The shift of production abroad is continuing in the electrical machinery and equipment sector. Sanyo Electric Co. has increased its production of videotape recorders in Indonesia, reducing output at domestic plants by nearly 40%. The ratio of overseas production at Aiwa Co., which has been pushing ahead with an overseas shift of production activities since the yen's sharp rise in 1985, topped 70%, with the bulk of overseas production operations located in Asian countries.

The decline in the number of small and medium firms in Japan has been the result not only of the output shift overseas by major machinery makers, but has also been accelerated by the reorganization

46) *Ibid.* p.129.
47) *Ibid.* p.164.
48) Krugman, *op. cit.*, p.33.
49) Small and Medium Enterprise Agency, White Paper, *op. cit.*, p.156.
50) *Ibid.* p.159.
51) *Ibid.* p.160.

of production systems.

Even when domestic plants are left intact, drastic reviews of the production systems are being seen, including a reduction in numbers of parts used, increases in purchases of foreign-made parts, the adoption of module parts, reductions in product lines, and the simplification of production processes. Unless the Japanese economy rebounds sharply, therefore, parts and subcontracting plants in Japan will inevitably face a further process of weeding out.

NEC Corp. is planning to integrate its design and manufacturing operations, aiming for easier links between product development and production. For the procurement of materials and parts, it will build a database of new materials and parts available at home and abroad, and select those most suitable in terms of both cost and quality. It plans to divert the surplus labor emerging from this rationalization to the in-house production of parts which have so far been procured from outside suppliers.

Work previously assigned to subcontractors and affiliated firms is in for substantial cutbacks due to three factors: purchases of foreign-made parts, cutbacks in the number of parts required (stemming from a review of production systems), and in-house production of needed parts. A survey of metal mold manufacturers in Tokyo found that the demand for their products had declined due to the procurement of foreign products by the electric machinery industry, and to increased in-house production at automakers.[52)]

As discussed in my previous paper, the reorganization of automobile-related plants will soon go into full gear, including plants affiliated with Toyota Motor Corp., Nissan Motor Co., Honda Motor Co. and Mitsubishi Motors Corp.[53)] On top of the closedown of domestic assembly plants and increased production at overseas plants, the weeding out and reorganization of subcontractors and affiliates caused by the reorganization of production systems is coming closer to fruition. Motoshige Ito predicted that the automotive industry, which is representative of Japan's production systems, will sever ties with subcontractors if auto demand remains sluggish much longer.[54)]

Three minivehicle manufacturers are now planning to cut costs by promoting the use of common parts and components. The increase in parts plants in Japan was not only a response to the quantitative aspect of increased vehicle production, but also reflected the need for numerous plants producing parts, metal molds and other related products, in order to respond to the large number of products turned out and frequent model changeovers. The use of common parts would allow for the mass production of such parts and thus bring down the costs of production. However, realizing these things would require an absolute en-

52) Federation of Small and Medium Business Associations of Tokyo City, 1994. *Kobetsu kigyo no genkai o koeru keiei kankyo – Tokyo-to ni okeru shokibo kanagata seizogyo no jittai chosa hokokusho* (Survey report on small-scale metal mold manufacturers in Tokyo – a business climate that defies independent efforts of individual companies), p.30.

53) Akira Yamasaki, 1999. Kojo heisa no chiikiteki tokusei (Regional features of plant closures), *Keizaigaku kenkyu* (Journal of Political Economy), Kyushu University, Vol.66, No.2.

54) Motoshige Ito, 1993. Nihonteki torihiki kanko (Japanese business practices), Yoshiyuki Itami, Tadao Kagono and Motoshige Ito, compilers, *Kigyo to shijo* (Companies and markets), *Nihon no kigyo shisutemu – dai yonkan* (The Japanese corporate system – Vol.4), Tokyo: Yuhikaku, p.88.

largement of parts plants, the consolidation and reorganization of parts makers, and the integration of manufacturing plants. This reorganization of production systems would help accelerate closures and bankruptcies among tiny parts makers in the third and lower tiers of the industrial pyramid.

In the future, an economic recovery may lead to the expansion of production at Japanese machinery makers, and mitigate the pain stemming from the drastic change in the industrial structure resulting from the above-mentioned reorganization of production systems. However, the ongoing industrial reorganization, as I pointed out at the outset, is not simply a cyclical fluctuations like those that have taken place repeatedly since the 1970s.

This time around, Japanese companies are being confronted with a new phase in their choosing of plant locations as they pursue the establishment of optimal global production. This is taking place in conjunction with the reorganization of the Japanese production system, encompassing Japanese methods of product development, manufacturing and marketing. Unless these movements come to a stop, the total number of manufacturing plants in Japan, regardless of economic cycles, will have to continue to decline for a considerable length of time. If the series of business restructuring measures from the use of common parts, in-house production of parts, and procurement of foreign-made parts, to the simplification of production processes, reduction of parts used, and lengthening of product cycles have not yet reached their final stage, closures and consolidations of domestic plants, and cutbacks on production lines, will have to continue for some time to come. Furthermore, when large plants operated by big corporations are shut down, the effects spread downward to the small parts and subcontractor plants that have long supported the lower end of the Japanese industrial system. While industrial materials industries do not operate as many manufacturing plants as do machinery makers, the decline in the supply of materials to machinery, construction and civil engineering industries will place cement, petroleum, petrochemical, steel and nonferrous metal industries under pressure to reorganize their plants. Because industrial materials plants are large-scale and thus have large impacts on their local economies, closures in this sector have to be closely monitored. Among cement makers and oil refiners, such shutdowns are already a reality. Corporate mergers are also leading to the shutdown of overlapping plants in big cities. Thus, the concentration of production activities in urban areas may decline for industrial materials makers as well.[55)]

Nevertheless, the reorganization of the Japanese industrial system does not have to be viewed with pessimism alone. The use of common parts and lengthening of product cycles indicates a change to a system that has placed a major load on the environment through mass-production, mass-consumption and mass-disposal. The use of common parts makes purchases of foreign-made parts easy but also makes possible the recycling of parts and the rationalization of services sectors such as repair, maintenance and inspection.

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55) Akira Yamasaki, 1999. Nihon no sangyo haichi no rekishiteki hensen (Historical changes in industrial location in Japan), *Keizaigaku kenkyu* (Journal of Political Economy), Kyushu University, Vol.66, No.2.

In the short run, subcontractors will face intense pressure. But it is also true that the increased use of common parts will pave the way for a conversion from pyramidal industrial organizations consisting of affiliates and subcontractors, to network industrial organizations that allow participation beyond "keiretsu" affiliations.

It must be noted that the networks of the anticipated new industrial organizations will be open to the entire world, rather than regional ones limited to the Tokyo metropolitan area, as envisioned by Kiyoji Murata in his Tokyo industrial mother city theory or Kenichi Imai's network industrial society. Otherwise, companies will lose the foundation of their existence.

In the field of auto parts, it can be anticipated that automakers will want to escape from the situation where they are forced, involuntarily, to purchase foreign-made parts under U.S. pressure, moving instead to a situation in which they can purchase foreign-made parts on a commercial basis, based on business decisions dictated by economic reasons. It may also be anticipated that international criticism of Japan's trade surpluses and nontariff trade barriers will be eliminated in the not-so-distant future.

As Japanese companies move toward the global procurement of the most suitable parts, they are coming under pressure to review the "kanban" (just-in-time) inventory reduction system, which is based on the geographical proximity of parts suppliers to parent manufacturing plants.

Small businesses with high productivity, technological prowess and product development capabilities should be able to break out of their keiretsu networks, go beyond the framework of domestic transactions, and begin dealings with a variety of companies and marketing in the worldwide market. New options include the expansion of the operational scale of small businesses and increased overseas production.

The continuing decline in the number of manufacturing plants in Japan can be interpreted as a transitional process of drastic change in the Japanese industrial system from one that was effective in achieving high economic growth to a global one as those found in Europe and the United States.

The reorganization of the Japanese industrial system ought to have been initiated with the yen's sharp appreciation in the 1980s. But the enormous rises in land and stock prices in the latter half of the 1980s (the emergence of the so-called bubble economy) led to a reinforcement, rather than a reorganization, of the Japanese industrial system. It left behind huge excess capacity, meaning that the consequent reorganization would have to be a harsher one. It is indeed regrettable that the bubble economy invited a delay in the launch of the industrial system's reorganization, and that the collapse of the bubble economy added to the pain of the reorganization. However, given that the adjustment cannot be avoided, a positive assessment of the process may be called for. The present industrial reorganization is not something that can be explained away simply as the hollowing of industry. Rather, the decline in the number of plants, while fundamentally influenced by past changes in industrial structure and cyclical factors, must be considered a result of dramatic changes brought about by the reorganization of the Japanese industrial system, as discussed in this paper.

There are signs that the existing of two conflicting research approaches – one which has a sense of crisis over the transformation of urban agglomeration and the other over dissatisfaction with the growth without development engendered by local branch plants – is being resolved. The aforementioned research by Oda has established that the wide-area agglomeration of machinery industries outside Tokyo is possible, and that there are already in fact some regions that are moving in that direction. Masato Yanai pointed out that high value-added production processes have moved out to local areas in a piling up fashion, and that the way in which such advances were made has led to differences in regional industrial agglomeration.[56] The thesis of Yukio Watanabe, which has come to enjoy wide support, is that in order to survive, a site of manufacturing agglomeration requires the kind of agglomeration of production processes seen in Ota ward and underscores the importance of promoting such agglomeration.[57]

Plant closedowns aimed at scrapping excess capacity are likely to continue into 2002-2003. The industrial agglomeration in central Tokyo is expected to undergo further transformation and decline. Its important production function in urban industry should be expanded in scale by making use of the sites of closed plants. For this purpose, new legal measures are called for, including an easing of legislation which restricts plant locations.

However, due to the standardization of transportation and telecommunications conditions, as well as technologies, many of the production processes concentrated in central Tokyo can now be located outside. In fact, plant locations outside metropolitan areas are beginning to have the upper hand in terms of cost. It would be risky to overestimate the benefits of agglomeration in a narrow district. The merits of geographical proximity and agglomeration, meaning the merits of close contact, are the aggregate benefits of savings in transportation and telecommunications costs, and if such costs decline, so do the merits of agglomeration. At the same time, the decline in transportation and telecommunications costs is helping expand the geographical scope of agglomeration.

There is less and less need to regard the urban agglomeration of manufacturing plants and the dispersion of plants to non-urban areas as conflicting or hierarchical.

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56) Masato Yanai, 1996. Kogyo no Asia tenkai to chiiki keizai (Japanese manufacturing's advance into Asia and its impact on regional economies), *Keizai chirigaku nenpo* (Annual of the Japan Association of Economic Geographers), Vol.42, No.4.

57) Yukio Watanabe, 1994. Kikai kogyo no kaigai seisan to kokunai kogyo shuseki no saihensei (Overseas production by machinery manufacturers and the reorganization of domestic industrial agglomeration), *Shoko kinyu* (Commerce and finance), Vol. 44, No.7.