Evolution of Industrial System and Industrial Community

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(Vol. 30 No. 1, June 1980)

4 Locational units and structure of industrial Community

Toyota city is the second largest industrial city in terms of figures for the total value added. Nagoya, obviously, produced more than the other cities in this area. The third is Yokkaichi in the south western part of this area, on the opposite side to the inland industrial area, Toyota. And Yokkaichi is one of the world-famous coastal industrial complexes in Japan.

Within Nagoya city, the most important urban center in this area, there is no large and obvious industrial community like Toyota, however, there are several small industrial communities, developed by an agglomeration of small firms. For example, the following three districts may be quoted; the Josei district, composed of food, textile, shoes and other daily consumer goods industries, has been developed since the late Edo era on the western fringe of Nagoya, a castle town in the direction of the former castle town, Kiyosu along the Mino Highway (Kai-do). The Jonan district, composed of lumber and furniture and other wooden manufacturing industries along with the machine industry, which originally developed as wooden machine industry, is situated between Nagoya and an old port and post town, Atsuta. It developed on the reclaimed low marshlands, benefitting from the opening of Tokaido railway (1889) and of the Shinhorikawa canal (1910). The third district, the Nagoya-south machine and metal processing industrial area, has been developed between the Atsuta Arsenal (1907) on the Shinhorikawa canal and the Mitsubishi Diesel on Nagoya port (officially opened in 1907). This industrial community is composed mainly of the machine makers and metal processors and lumbering workers. These industrial communities illuminate the process of development of urban structures and of outskirts formations at each phase of urbanization.

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Compared with the above mentioned two sorts of industrial communities, Yokkaichi has a different sort of industrial community composed of several different industrial communities related indirectly with each other for their development and survival. Without considering this sort of industrial community, the development and survival of the world-famous petrochemical industry complex cannot be easily demonstrated.

The large industrial complexes, developed on the coast are built up around an old trade port, situated the two large petrochemical industry complexes. On this old trade port, there are vegetable oil refineries, a sheet glass factory (Nippon Sheet Glass), a pharmaceutical plant (Daiichi Kogyo Seiyaku) and small local firms. In this area, company houses, warehouses and other facilities related with port activities are also situated. On the southern side of this industrial area, there is a huge petrochemical industry complex, mainly composed of Mitsubishi financial group with an inland complex above the railway. In contrast to this, the Daikyo group petrochemical industrial complex has developed on the two large coastal industrial estates, Umaokoshi and Kasumi. On both sides of these three large industrial complexes, there are two industrial communities, originally developed as fishing villages; Isozu in the south and Tomita in the north. Isozu is a typical fishing village which has had a big influence on popular antipollution movements, though it is situated on the Suzuka river and in a different agricultural area developed towards the south. In contrast to Isozu, Tomita is a fishing village evolved into an industrial community, mainly composed of fishing nets plants and thread plying mills. However, the price on landing was only 15.8% of the total in Yokkaichi, far less than that in Isozu (80.0%), the third largest fishing port in Mie Prefecture by 1976. And the scale of industrial area is also not as large as the above mentioned coastal industrial complexes; the number of industrial establishments amounted 15.8% of the total (2,053) in Yokkaichi and the employees (11.7%) and the output (4.7%) could not cover 15.0% of the total (44,546 workers, and 1 billion yen), while the coastal industrial complexes accounted for 41.5% of the establishments, 64.6% of the employees and 87.2% of the output in 1976. In spite of its small scale, this industrial area is worthy of mention, because of the development of its industrial community with a fishing net industry and thread plying mills. Between this textile industrial area and the central business district of Yokkaichi, the Banko pottery production area forms one of the oldest industrial communities developed especially after the Meiji Restoration. In Yokkaichi, agricultural areas developed behind the industrial areas towards the Suzuka mountains. The southern part of this area, Suizawa is a particularly famous agricultural area which has 566 farmhouses and large tea gardens whose output is 80.0% of the total in Mie Prefecture. In the Suizawa district, 79.6% of the popula-
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Table 3-1 Distribution of population and industry in Yokkaichi

<table>
<thead>
<tr>
<th>Town</th>
<th>Population</th>
<th>Area</th>
<th>Number of industrial plants</th>
<th>Number of workers</th>
<th>Number of commercial shops' workers</th>
<th>Number of farmhouse</th>
<th>Number of farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honcho</td>
<td>28,402</td>
<td>5.56 km²</td>
<td>223</td>
<td>5,561</td>
<td>2,348</td>
<td>14,741</td>
<td>86</td>
</tr>
<tr>
<td>Shiohama</td>
<td>11,379</td>
<td>6.64</td>
<td>75</td>
<td>990</td>
<td>281</td>
<td>1,088</td>
<td>117</td>
</tr>
<tr>
<td>Hinaga</td>
<td>14,671</td>
<td>7.50</td>
<td>95</td>
<td>3,564</td>
<td>320</td>
<td>2,105</td>
<td>305</td>
</tr>
<tr>
<td>Yotsuga</td>
<td>24,621</td>
<td>8.07</td>
<td>75</td>
<td>990</td>
<td>240</td>
<td>705</td>
<td>430</td>
</tr>
<tr>
<td>Kawarada</td>
<td>3,950</td>
<td>5.22</td>
<td>38</td>
<td>2,487</td>
<td>59</td>
<td>217</td>
<td>263</td>
</tr>
<tr>
<td>Uchibe</td>
<td>11,093</td>
<td>12.06</td>
<td>56</td>
<td>1,026</td>
<td>118</td>
<td>554</td>
<td>565</td>
</tr>
<tr>
<td>Hashikita</td>
<td>10,726</td>
<td>1.71</td>
<td>216</td>
<td>2,507</td>
<td>418</td>
<td>1,859</td>
<td>31</td>
</tr>
<tr>
<td>Agura</td>
<td>10,305</td>
<td>3.66</td>
<td>279</td>
<td>2,883</td>
<td>184</td>
<td>866</td>
<td>148</td>
</tr>
<tr>
<td>Haza</td>
<td>13,014</td>
<td>8.38</td>
<td>214</td>
<td>7,163</td>
<td>168</td>
<td>1,054</td>
<td>263</td>
</tr>
<tr>
<td>Tomita</td>
<td>13,574</td>
<td>2.37</td>
<td>146</td>
<td>2,363</td>
<td>376</td>
<td>1,355</td>
<td>176</td>
</tr>
<tr>
<td>Tomishihara</td>
<td>13,214</td>
<td>2.84</td>
<td>181</td>
<td>3,452</td>
<td>342</td>
<td>1,050</td>
<td>49</td>
</tr>
<tr>
<td>Ooyachi</td>
<td>11,266</td>
<td>6.35</td>
<td>185</td>
<td>1,629</td>
<td>30</td>
<td>269</td>
<td>376</td>
</tr>
<tr>
<td>Yatsugo</td>
<td>7,562</td>
<td>9.75</td>
<td>35</td>
<td>944</td>
<td>25</td>
<td>38</td>
<td>710</td>
</tr>
<tr>
<td>Mie</td>
<td>17,560</td>
<td>12.68</td>
<td>37</td>
<td>501</td>
<td>96</td>
<td>327</td>
<td>483</td>
</tr>
<tr>
<td>Tokiwa</td>
<td>16,259</td>
<td>5.47</td>
<td>54</td>
<td>1,701</td>
<td>233</td>
<td>1,439</td>
<td>272</td>
</tr>
<tr>
<td>Kanmaca</td>
<td>6,255</td>
<td>7.34</td>
<td>18</td>
<td>70</td>
<td>79</td>
<td>187</td>
<td>441</td>
</tr>
<tr>
<td>Kawashima</td>
<td>2,955</td>
<td>8.32</td>
<td>49</td>
<td>215</td>
<td>30</td>
<td>74</td>
<td>313</td>
</tr>
<tr>
<td>Oyamada</td>
<td>5,213</td>
<td>19.43</td>
<td>87</td>
<td>348</td>
<td>63</td>
<td>147</td>
<td>772</td>
</tr>
<tr>
<td>Suizawa</td>
<td>3,633</td>
<td>19.16</td>
<td>158</td>
<td>622</td>
<td>78</td>
<td>221</td>
<td>566</td>
</tr>
<tr>
<td>Sakura</td>
<td>7,879</td>
<td>11.52</td>
<td>23</td>
<td>169</td>
<td>80</td>
<td>269</td>
<td>398</td>
</tr>
<tr>
<td>Agata</td>
<td>3,940</td>
<td>11.03</td>
<td>33</td>
<td>302</td>
<td>60</td>
<td>160</td>
<td>500</td>
</tr>
<tr>
<td>Shimonoh</td>
<td>7,024</td>
<td>7.89</td>
<td>14</td>
<td>436</td>
<td>59</td>
<td>159</td>
<td>374</td>
</tr>
<tr>
<td>Kono</td>
<td>4,351</td>
<td>10.73</td>
<td>21</td>
<td>300</td>
<td>56</td>
<td>155</td>
<td>574</td>
</tr>
<tr>
<td>Total</td>
<td>247,932</td>
<td>185.16</td>
<td>2,319</td>
<td>49,568</td>
<td>5,844</td>
<td>29,241</td>
<td>7,933</td>
</tr>
</tbody>
</table>

Data: Statistical Year Book of Yokkaichi 1975

Table 3-2 Industrial Structure in Yokkaichi

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of Establishments</th>
<th>Number of Workers</th>
<th>Wage &amp; Salaries (million yen)</th>
<th>Purchase of materials (million yen)</th>
<th>Gross output (million yen)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>2,184</td>
<td>45,850</td>
<td>86,461</td>
<td>678,497</td>
<td>966,423</td>
</tr>
<tr>
<td>Food</td>
<td>578</td>
<td>4,910</td>
<td>6,580</td>
<td>51,313</td>
<td>71,755</td>
</tr>
<tr>
<td>Textile</td>
<td>215</td>
<td>6,870</td>
<td>8,916</td>
<td>44,500</td>
<td>73,116</td>
</tr>
<tr>
<td>Chemical</td>
<td>49</td>
<td>14,299</td>
<td>38,738</td>
<td>486,117</td>
<td>658,289</td>
</tr>
<tr>
<td>Ceramics</td>
<td>523</td>
<td>6,093</td>
<td>5,515</td>
<td>16,154</td>
<td>33,750</td>
</tr>
<tr>
<td>Metal</td>
<td>130</td>
<td>1,447</td>
<td>2,396</td>
<td>5,990</td>
<td>11,101</td>
</tr>
<tr>
<td>Machine</td>
<td>268</td>
<td>7,594</td>
<td>14,524</td>
<td>53,814</td>
<td>82,119</td>
</tr>
<tr>
<td>Others</td>
<td>421</td>
<td>4,637</td>
<td>6,795</td>
<td>20,609</td>
<td>36,253</td>
</tr>
</tbody>
</table>

Data: Statistical Year Book of Yokkaichi 1975

tion is engaged in the agricultural industry and 91.0% of farmers cultivate tea gardens. The cultivation of this Ise tea was started in 1806 by the Buddhist priest coming back from Kyoto to Suizawa. It generated a driving force for the formation of an industrial community along with the rape oil industry (Tables 3-1, 2)
4.1. Evolution of industrial system of traditional industry and change of a local market town and port

Yokkaichi was an old seaside village, which changed into a market town when a market was opened on the northern fringe of the fortress town in 1470. The market was opened on the 4th, 14th and 24th of every month, so it was named Yokka (fourth)-Ichi (market). Largely thanks to this market function, its small port gradually held its ground with the import of fish manure and the export of cotton textiles and rape oil. The rape oil industry in particular had flourished since the 17th century, when the quasi-national and huge local market Edo (Tokyo) was formed by the Tokugawa Shogunate. And with the development of Edo as a market and political center, the rape oil, called Ise Water, gained a reputation all over the country. A new function as a post town on the Tokaido (the most important national highway, improved in 1601, which linked Edo with the traditional economic center Osaka calling at Miya-Atsuta and Kyoto) had its influence on the growth of reputation throughout the country, because many people travelled on this road not only to go to the above mentioned large cities but also to the Ise Shrine where many of them went to worship without the feudal restrictions as at Mecca. In 1801, Yokkaichi was governed directly by the Tokugawa Shogunate and became a special seat for the development of local industries closely linked with Edo; the rape oil industry developed remarkably on the local resources and a lot of wholesalers grew up in Yokkaichi. By 1833, this rape oil occupied about 27.0% of the Edo market. The shipment of rape oil exerted a great influence on the development of coastal services and the development of an old coastal industrial area around the old port.

The start of Mitsubishi’s liner services in 1872 and the establishment of its branch office in the old port in 1875 promoted the modernization of this port area. The Yokkaichi Industry (now Yokkaichi Oil), established in Hamacho is an example of the development of the coastal industrial area. In 1886, it introduced the nation’s first oil press from England. By virtue of this mechanization, the rape oil industry in Yokkaichi developed remarkably to become the third largest production area next to Osaka and Fukuoka by 1892. With regard to the development of industry on the newly reclaimed land, Inabacho, the rape oil industry also exerted an influence; Kumazawa Oil, established in 1906, is an example of this case. And the improvement of port made them possible to change their materials from domestic rape to imported sesame and soybean to cope with the shortage of rape. These conditions suggested the relocation of local rape oil mills to Yokkaichi as is seen in the case of Ando Oil in Ogaki in Gifu Prefecture, which established its new factory in Inabacho in 1906. After World War II, the vegetable oil industry
survives in cooperation with major firms such as Nissin Oil in Yokohama and maintained an oil industrial area on the old canal. The cooperation also exerted a great influence on the induction of modern industry in Yokkaichi. There is, for example, Kumazawa Oil, which cooperated with Ajinomoto. Ajinomoto established its Tokai factory in 1961 and Ajinomoto Kunor was also established at the site of former spinning and weaving mill of Kanebo in 1980. And in order to survive under the keen competition with developing countries, most of vegetable oil firms changed its products into better quality and higher value added ones and imported lower quality ones from Thailand, Philippine and China.

Thus, the vegetable oil industry has been developed with diversification of products from the rape oil to various kinds of vegetable oil largely thanks to the trade port, while the fishing net industry and its related thread plying mills was able to develop thanks to the function of the fishing ports, Tomita and Tomisuhara in the northeastern part of Yokkaichi city. This industry originally used local resources, while its materials gradually changed from local ones to hemp transported from Hiroshima on the Inland Sea and Tochigi on the fringe of the Tokyo (Edo) metropolitan area via the port of Yokkaichi, with the development of the fishing net industry. Major wholesalers managed shipping trades, such as Ito Kansuke Shoten (now Amikan Fishing Net Manufacturing) founded in 1794. And in 1868, a shipping trader, Hirata Shoten entered the fishing net industry. These wholesalers produced fishing net industry not only by themselves but also through sideworkers, most of whom were wives and daughters of fishermen, and sold to fishermen along the Ise bay.

After the Meiji Restoration, Mie Spinning introduced net manufacturing machines and thread plying machines from England and started the production of cotton fishing net with its own materials. In 1900, Nishiguchi Net Manufacturing Works, established in Hamacho on the fringe of C.B.D., developed its own machines and sold them to fishing net manufactures. Taking advantage of this, the above mentioned wholesalers changed their business from wholesaling to production and became major manufactures. An example is Amikan Fishing Net Manufacturing’s Shigefuku plant, established in 1906. With a development of a mass production system, fishing nets were exported to Asia, Northern Europe, Portugal, North America and Oceania. And Hirata Fishing Net Manufacturing (now Hirata Spinning) started a cotton spinning division in 1926, when it had fully developed its system of integrated and mass production from its materials to its product, nets. In spite of the system of mass production by female workers, there were still small manufacturers, some of whom were subcontractors of the above mentioned major manufacturers.
During World War II, this industry became depressed and some of the factories were converted for the production of aircraft parts; but after the War, it flourished more than ever, because of the government policy of developing the food industry. Under the depression after the Korean War, most fishing net manufactures changed their materials from expensive cotton to cheap synthetic fibers. By virtue of this change, not only major manufactures but also small ones were able to recover their production, while some of the small ones became subcontractors to stabilize their businesses and formed closer links between themselves, which accelerated the concentration of the fishing net industry around the three major companies, Hirata, Amikan and Oono in the Tomita and Tomisuhara district on the north eastern fringe of Yokkaichi city; namely, 25.0% of the total fishing net manufactures (177 firms) are independent, 32.3% are subcontractors of the independent ones within the district, 11.5% are subcontractors linked with fishing net manufactures and wholesalers outside of the district and the rest are very small ones with one or two netting machines, most of which are lent by subcontractors. Because of a lot of variety of fishing nets and of their small lot, a half of total independent ones use subcontractors, which can supply good and cheap nets in a short time. These independent ones buy their materials mainly from wholesalers (64.6%), however, some of them often buy materials from aforementioned big three within the district in order to deliver their ordered goods. That is, 37.2% of the total output of the independent ones are delivered to other ones, mainly to the big three. 37.4% of their outputs are sold to wholesalers and 16.4% of them are sold to fishermen. Regionally, 67.9% of the total output in this district are sold in the country and 32.1% are exported. In the country, its main market are Hokkaido, the Inland Sea district and Tohoku (17.5%, 19.9% and 7.1%) in addition to the local one (21.1%). Regarding the export, its direct export from Yokkaichi port amounted to 345 million yen in 1976, which was 26.5% of the total output. Its main export market are the North Korea (31.7%), the United States (9.7%), Cuba (9.2%), Ice Land (6.3%) and Canada (3.2%). In 1957, its export amounted to approximately 69.0% of the total output and it was a chief export good from the Yokkaichi port, however in the late phase of high economic growth it gradually has been decreasing in the keen competition with the Korean and the Formosan net especially in the United States and Canadian markets. As a result, it occupied only 0.2% of the total exports from the Yokkaichi port, whose ratio is one and tenth of that in 1937 (22.2%). In response to these changes in the world market and the national market, the leading firm, Hirata, established its local plants in Hokkaido (Muroran 1972) and in Tohoku (Hachinohe 1973 and Iwaki 1976) and also established its oversea subsidiaries in Africa (Nigeria 1971, Kenya 1972 and Tanzania 1964). Not only Hirata but also the other big firms now
have their agents all over the world. By virtue of these activities, the industrial community composed of independent makers, subcontractors and side-workers still survive in the highly urbanized and industrialized area, Yokkaichi.

In addition to fishing net plants, thread plying mills developed in this area and formed a fishing net industrial community, because except for the aforementioned three largest fishing net manufactures, Hirata, Amikan, Mie (situated in Shiohama, now Toyobo), fishing net manufactures had no processes for thread plying, and ordered plied thread from small thread plying mills. As mentioned above, thread plying in this area started in 1896, when Mie Spinning imported its machines from England, though it abolished this division in 1902, when it was succeeded by Mie Fishing Net Manufacturing Work. Therefore, fishing net manufacturers were obliged to introduce plied thread from wholesalers in the Osaka metropolitan area, a center of cotton industry in Japan. However, with the development of fishing net industry, manufacturers within the area wished to develop suitable plied thread for fishing nets and in 1916, Hirata, a leading manufacturer introduced machines from England and started its own thread plying.

Since then, several thread plying mills developed gradually with financial aid and machines lent by fishing net manufacturers. After World War II, thread plying mills spread into agricultural areas. Most of them were established by farmers around the fishing net manufacturers. And these subsidiary business with small mill gradually changed into specialized occupations, which further developed the fishing net industrial community between the pottery community on its south and the iron casting community in Kuwana on its north.

Kuwana was a fortress and post town with its port connected to Atsuta port on the fringe of Nagoya castle town. In Kuwana, a pottery wholesaler, Rozan Numanami, started pottery production in his cottage in 1736 under the protection of the Kuwana lord. At first, he introduced Kyoto’s techniques and evolved his own in Edo. Kyoto was the capital and the center of traditional industry center and Edo was the administrative center of Tokugawa Shogunate and the center of new design. By virtue of his innovation, Kuwana became a center for the evolution of pottery techniques, from which were born Izawa Banko, Matsuzaka Banko and Suzuka Banko in Mie Prefecture, Akasaka Banko in Gifu Prefecture on the fringe of Nagoya metropolitan area and Shimosa Banko in Tochigi Prefecture on the fringe of Tokyo metropolitan area, Inawashiro Banko in Fukushima Prefecture and Akita Banko in Akita Prefecture in Tohoku. In Kuwana, Mr. Yusetu Mori greatly improved the production techniques of Banko pottery in 1832. Largely thanks to these improvements and the location of Kuwana as a ferry on the Tokaido Highway, Banko pottery, especially small tea pots gained a reputation all over the country.
With this development, in Yokkaichi, Mr. Shosuke Shima, an Iga potter in Maruhashi on the western fringe of Mie Prefecture adjacent to the Shigaraki pottery production area in Shiga Prefecture, came into Yufuku temple in Higashi Kaizo in 1839 and opened his kiln in this temple with the financial aid of the resident priest. In 1853, a large landowner also opened his kiln in Suenaga near Kaizo. After the Meiji Restoration, Mr. Tomonao Hori formed an association with this area’s potters from Nagashima on the northeastern fringe of Mie Prefecture in order to export his product. He developed modern pottery and its export. Mr. M. Kawamura, a chemist in Yokkaichi, developed his business into a pottery wholesaler, and encouraged also the export of Banko pottery. In response to the development of export, new sorts of products such as ash trays and toys were developed and the Association of Banko Potters and Salers were founded in 1885. By virtue of endeavours of wholesalers, the exports volume became larger than the output of Yokkaichi by 1909, when the consulate of the United States was opened: in 1911, the Yokkaichi Railway and the Ise Railway (now Kinki Nippon Tetsudo between Osaka and Nagoya) were opened and the total exports of pottery from Yokkaichi amounted to 801,000 yen, which was far more than the output in Yokkaichi (175,000 yen). There were three major products in Yokkaichi; ornaments (50,360 yen), dinner ware (68,320 yen) and toys (17,625 yen).

Largely thanks to aforementioned development, Yokkaichi became the center of Banko production in Japan instead of Kuwana, because of the development of Yokkaichi port. In 1911, Mr. T. Mizuno introduced techniques from Awaji in the Inland Sea, Satsuma and Okinawa in the southern periphery in order to copy English pottery, and he installed first a coal kiln in Yokkaichi to reduce the cost of production. As a result of this evolution in the technology of production and of the improvement of port, potters were able to develop more than ever. In response to this evolution, raw materials were also imported from Seto, Toonoo and Sanage in the eastern part of Nagoya metropolitan area and from Ueno and Shigaraki on its western fringe, together with other materials such as Kaolin brought from Tsushima island near Nagasaki. The mechanization of production in the pottery industry developed far more than in other large production areas such as Seto, Toonoo, by virtue of so-called “western smitheries” which were able to copy modern machines easily and to improve them in order to suit Japanese potters with their techniques learned from the Mie Iron Works. The Mie Iron Works was established in 1897 to repair the textile machines of the Mie Spinning and Weaving and manufacture steam engines. The Yokkaichi Repair Shop of Kansai Railway set up in 1889 also played an important role in the development of pottery machines indirectly. As a result of this development, Yokkaichi became the fifth largest pottery production area in the country by 1925, next to Seto, Toonoo, Kyoto and Arita.
In the evolutionary atmosphere, Mr. I. Sasaoka and Mr. T. Tsukawaki invented an original product, which was quite different from Seto pottery and could develop its own market thanks to its originality. And an industrial community of potters and workers of related industries was fully developed in the area between Suenaga and Kaizo with a lot of potters who changed to that business from the agricultural industry. This evolution of regional system was promoted not only by wholesalers but also the Mie Prefectural Industrial Laboratory’s Kaizogawa Branch Office, founded in 1925. After World War II, the Yokkaichi pottery industry rose from the ashes on this industrial community and it developed again with new products such as Bone China produced by the aforementioned laboratory in 1948. The Association of Banko Pottery Manufacturers was also reorganized in 1948; it developed some cooperative mills to produce clay for its members and founded its hall in 1954.

At present, there are about 203 potters, 128 related firms and 115 wholesalers, whose total output was approximately 18,000 million yen by 1977, 5700 million yen of which was exported. Thus exports are still important for its development. Within this area, more than a half of potters are completely controlled by wholesalers and a division of labour is also completely developed. Especially in its export, wholesalers controlled the production of export-goods. 8 firms out of 12 firms each of which employs more than 50 workers are exporters. And these large exporters exerted their influences on the development of designs. Not only in exports but also in the national market, 62.3% of firms caught their informations on designs and new products through wholesalers. On the evolution of techniques and on the imports of clays from China, wholesalers exerted their influence. As mentioned above, potters and related firms formed close links with wholesalers and developed their industrial community within this area.

As mentioned above, exports of Banko pottery promoted the development of Banko pottery industrial area; namely the exports of Banko pottery increased after the development of semi-hard porcelain by Mr. T. Mizutani who wished to copy English porcelain and to develop coal kilns in order to make efficient use of Yokkaichi port. In 1915, one fifth of total output (400,000 yen) was exported, while the total export of porcelain amounted to 580,000 yen, thanks to wholesalers activities. It was 18.7% of total exports of Yokkaichi. By 1925, approximately one third of total output (2,200,000 yen) was exported and total exports of porcelain amounted to 5,319,000 yen and became the most important export good (67.2%) of Yokkaichi. Since then, the increase of its export developed remarkably, although it had decreased during World War II (1940–1947). However, after World War II, it lost its ground in total exports of Yokkaichi and it occupied only 15.3% of the total exports in 1957, when the high economic growth phase became clear.
In this year, only one and sixth of total output (2,567,890,000 yen) was sold within the country. In contrast to the development of export, during the high economic growth phase, its exports have been less than its sale within the country after the Oil Crisis in 1973. In response to the change of its market, its industrial community is also obliged to change its structure from the traditional one to the modern one led by the modern firms who wish to import Chinese clay and to develop new export goods together with larger firms in its industrial community. In other respects, artistic porcelains are developed by the Association of Banko Pottery Artists, founded in 1978 (Fig. 6).

![Fig. 6 Distribution of local industry in Yokkaichi (1978)](image)

4.2. Development of modern industries and invisible linkages among industries

When considering the development of modern industries in Yokkaichi, we
can see the port and its international trade had a great influence. The tea
gardens and tea manufacturers in the southern part of Yokkaichi, Suizawa, also
developed remarkably, benefitting from the starts of exports from Yokohama near
Tokyo in 1859. For example, Mr. K. Ito, who developed a 28 acre tea garden and
tea manufacturing with technique introduced from Uji near Kyoto, exported from
Yokohama and then from Kobe. By virtue of the development of modern
machines, its tea manufacturing of roughly processed tea developed remarkably not
only with local roughly processed tea but also with domestic ones in Yamato (Nara),
Yamashiro (Kyoto) and Shizuoka and imported ones from the United States and
Canada. In response to the development of tea manufacturing in Yokkaichi, its
export from the Yokkaichi port also gradually increased from 109,000 yen in 1904
to 1,819,000 yen in 1918, when a local firm was merged in Japan Tea, which had a
close link with an American trader. The prosperous days during World War I,
however, developed not only Yokkaichi but also local tea manufacturing areas such
as Shizuoka and the depression after the War declined an old tea manufacturing
area, which imported roughly processed tea from other new tea manufacturing
areas and delayed the improvement of techniques of processing and of sales-know-
how, largely thanks to the investment into other industries by the leading firm, Ito.

Namely, with the news of the development in the exports of silk, Mr. K. Ito
had already started silk manufacture in 1862 and mechanized its production in
1874 with technology introduced from a center of innovation, Suwa in Nagano
Prefecture between the Tokyo metropolitan area and the Nagoya metropolitan
area.

In addition to the original brewing, tea and silk manufacture, he started cotton
spinning with American spinning machines bought in Yokohama in 1875. And
then, he learned the technology of operation in the Kashima Spinning mill in Tokyo
and in the Sakai Spinning mill near Osaka and incorporated this technology in his
new modern mill equipped with imported spinning machines by the government.
Like its tea manufacturing mill and its silk mill, it was established in 1880 in an
inland area, Kawashima along the small river in order to use water wheels according
to the government’s advice, but it could not operate well because of the shortage of
water.

Therefore, Mr. K. Ito and his partner, Mr. S. Okuda who established cotton
spinning mills in the nearest metropolis, Nagoya, established a large mill with steam
engines in Hamacho near Yokkaichi port by virtue of a financial aid of the First
National Bank and advice from its president and the founder of a large spinning
mill, Osaka Spinning, Mr. E. Shibusawa. The machines imported from England
were operated by an engineer brought from the Osaka Mint Agency.
As regards the development of Mie Spinning, the designation of Yokkaichi port as a special export and import port by the government also had a great influence on its development, because Mie Spinning was able to import raw cotton and ginned cotton directly instead of from Kobe and develop a mass-production-system instead of the traditional system in Kawashima mill using local raw cotton.

Yokkaichi port had been improved since 1873 by a pioneer, Mr. S. Inaba, at first with his private capital and then with the financial aid of Mitsubishi financier group who opened its branch office in 1875, when it opened a regular service between Yokohama and Kobe via Yokkaichi. His improvements were completed in 1884, but the opening of the Tokaido Railway connecting Tokyo with Yokohama, Nagoya, Kyoto, Osaka and Kobe caused the depression in Yokkaichi port, which was situated so far from this main railway and the most important route of information and material flows. The depression was accelerated due to the opening of Kansai Railway connecting Nagoya with Yokkaichi and Osaka and in response to the development of Nagoya port, which was largely improved after 1896. So, Yokkaichi city council and Yokkaichi Chamber of Commerce and Industry encouraged earnestly the development of local industry and its export. As a result of this movement, Yokkaichi was designated a special export port in 1889. It was promoted by Yokkaichi Warehouse, which was established in 1895 by a director of Mie Spinning Mill with other local financiers.

This firm gradually became an important leader for introducing modern factories into Yokkaichi. It also exerted a great influence on the development of the port and the reclaimed land around it. In 1907, it promoted the formation of the Association for Port-Improvement and started research into a policy for regional development together with the committee in the city council. Largely thanks to these endeavours, Yokkaichi gradually recovered its ground and became the most important port in Ise Bay; the total tonnage calling at Yokkaichi (412, 725 ton in 1908) being ten times as much as that at Nagoya port.

In the recovery of Yokkaichi port, the development of Mie Spinning had a big influence; it merged with Ise Central Spinning in 1897, Ise Spinning in Yokkaichi in 1901, Owari Spinning and Nagoya Spinning in Nagoya in 1905, Tsushima Spinning in 1906, Kuwana Spinning and Chita Spinning in 1907. As a result of mergers of these local ones Mie Spinning became the most important and largest spinning firm in the Nagoya metropolitan area. Finally it merged with Shimotsuke Spinning in the northern part of Tokyo metropolitan area in 1911 and became the largest cotton spinning firm in the country. In 1914, it merged with the other leader in this industry, Osaka Spinning and set up its new head office at Hamacho in the center of Yokkaichi city near the port. Within Yokkaichi, it established its new plant, Tomita in 1916 behind Tomita port, which gave a
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stimulus to the modernization of the fishing net industry in this area as is seen in
the start of the division of cotton spinning in Hirata Fishing Net Manufacturing
1926.

During the depression after World War I, Toyobo (former Mie Spinning)
relocated its head office from Yokkaichi to Osaka, the most important cotton
trade and industry center in the country, in order to benefit from the cotton trade;
for in its exports, Osaka topped all the rest, followed by Kobe, and in imports,
Kobe dealt with more than half of the imported ginned cotton, Osaka being the
second important import. Not only in cotton trades but also in international
trade as a whole, the two ports developed remarkably, with Kobe surpassing
Yokohama in 1898, and Osaka also surpassing Yokohama in 1934. Consequently,
in other respects, the development of a mammoth metropolitan area made a local
port on a fringe of a large metropolitan area, Yokkaichi lost its ground in trade
and in industry.

In the Nagoya metropolitan area, Nagoya port, opened officially in 1907,
surpassed Yokkaichi in 1914 in exports and in 1923 in imports. Meeting with his
keen competition, the aforementioned Association for Port-Improvement and the
Committee in the city council asked for financial aid from the national government.
As a result, Mie prefectural government promoted the improvement of Yokkaichi
port, developing three reclaimed lands with financial aids from the national
government (3,181,000 yen), the city council (435,000 yen) and prefectural invest-
ment (3,196,000 yen). The first reclaimed land area (Suehirocho, 27 ha, completed
in 1917) and the second (Chitosecho, 39.5 ha, 1925) and the third (Ishiharacho,
13 ha, 1928) were developed not only for the growth of trade but also for the
introduction of a large firm in order to recover Yokkaichi’s ground in economic
activities.

In the first area, Okuda Oil Refinery (vegetable oil, with its head office in
Notogawa town, Shiga Prefecture) and Kamata Belt (now Tokai Rubber Industry,
rebuilt in 1937 with financial aid from Sumitomo Electric Industry) were
established in 1929, in addition to the two local firms, the Kumazawa Oil (1918)
and the Yokkaichi Bean Cake Industry (1919). These two firms were introduced
by virtue of the advice of the aforementioned Yokkaichi Warehouse. In the
second area, the Yokkaichi Chamber of Commerce and Industry’s office was
relocated from an old port area in 1930, when Nippon Yusen opened its London line,
although an industrial factory was not constructed until 1935, when Ando Oil
(vegetable oil from Ogaki, Gifu Prefecture) and Nippon Sheet Glass (sheet glass
established in 1918 in Osaka with financial aid from Sumitomo Bank and Libbey
Glass in the United States, its factory having been set up in Wakamatsu in
Kyushu island in 1920) were established. Thus, Yokkaichi was selected by Nippon Sheet Glass from among Tsurumi near Tokyo, Yokkaichi near Nagoya and Osaka, because of its location at a center in the huge market, composed of the three large metropolitan areas, and also on account of a policy designed to attract it by the mayor, city council, Chamber of Commerce and Industry and Yokkaichi Warehouse with the improved port and cheap reclaimed land. This introduction initiated the development of modern industry along the coast and the formation of new industrial community with huge factories (Fig. 7).

There was another important factory in the recovery of Yokkaichi port and the development of industry in this area; Toyo Wool Spinning Industry, introduced in 1931 by the city council and Yokkaichi Warehouse on the advice of a manager of Mitsubishi Shoji (traders). In this year, the city council, Chamber of Commerce and Industry, and Yokkaichi Warehouse promoted the reopening of the Australia-Yokkaichi line and succeeded in its reopening in the same year. As a result of imported wool and the local market in the north, the Bisai-Seino wool textile area, wool spinning factories developed on the fringe of Yokkaichi modern industrial area; in the south at Kasu, Central Wool Spinning (1933) and Toyo Wool Industry (1935) were established. There was Mie Carpet Manufacturing (1935, now Toyobo), Toyo Muslin (1935, now Kanebo) and Carpet Manufacturing Work of the Army (1940) in the southwestern part of Yokkaichi city and Kuwana.
Carpets (1936, now Toyobo) in the north.

In addition to these wool spinning mills in inland area, a lot of modern factories were established one after another in reclaimed coastal lands. In 1937, the third reclaimed area was taken over by the Ishihara Sangyo and Shipping's copper refinery and sulfuric acid works, which was converted for the production of titanic acid after World War II. Behind Ishihara, the Naval Fuel Depot (198, ha, established in 1938, operated in 1941) and Toho Heavy Industry (steel 75.9 ha established in 1939) were set up. These factories were developed during World War II thanks to imported resources from South Asian countries. The reclamation and development of industrial estates were accelerated by Yokkaichi Harbour Company established by Yokkaichi Warehouse and local financiers such as Mr. M. Kuki and Mr. S. Moroto who owned land in Shiohama. The land was under a tenancy dispute for more than ten years, though more than half of it was marsh-land of low productivity. But with the development of industry, tenant farmers lost the will to work and were easily persuaded to sell their land by the members of city council and Yokkaichi Warehouse. This illustrated the process of change in a community from agriculture to industries.

In contrast to the south, Yokkaichi Harbour also developed its coastal industrial estates on the northern side of Yokkaichi trade port 2.6 ha for Daikyo Oil and 45.9 ha for Uraga Dock. Daikyo Oil was established in 1939 by eight small oil refiners in the Niigata oil field on the Japan Sea in order to develop a refinery with imported crude oil from Sumatra, because the Act of Oil Industry in 1934 decided on the abolition of small refiners. Uraga Dock, in contrast to Daikyo Oil, a large shipbuilder at Uraga in the Tokyo metropolitan area, but it was not able to complete its factory because of the shortage of materials for the construction of shipyard. So it had not much influence on the development of industry directly in Yokkaichi. Other machine industrial firms, Fuji Electric (1944) and Kawasaki Yokkaichi Works (1943) also did not have as much influence on the development of the machine and metal processing industry as the oil refineries, because they had not been operation long by the end of World War II. As mentioned above, Yokkaichi Iron Works had been in Yokkaichi, but it was relocated from Yokkaichi to Nagoya in 1917 and so was not able to develop machine industries within Yokkaichi during World War II. Thus the basic structure of the industrial area and community was settled before World War II.

After World War II, Yokkaichi began its recovery with the textile industries and its pottery industry, then with the petrochemical industrial complexes, which took advantage of sales of government property (Naval Fuel Depot) to the Mitsubishi group. Amongst the heavy chemical industries within Yokkaichi,
Nippon Sheet Glass was first to reoperate, followed by other large factories which changed their products from munitions to the new goods demanded by consumers during the reconstruction phase; from copper to fertilizer in Ishihara, from oil refinery to medical glycerine in Daikyo and from steel to carbide in Toho Chemicals (formerly, Toho Heavy Industry) are some examples. Taking advantage of the recovery of the economy after the Korean War, Daikyo Oil started its refinery again in 1950.

In 1951, Japan Chemicals (now Mitsubishi Monsant Chemicals) built a plant in 1951 on the port, and in 1954, Toho Chemicals was purchased by Mitsubishi group to form Mitsubishi Chemicals behind Mitsubishi Monsant Chemicals in the United States. In succession, Showa Sekiyu group composed of Shell Oil, Showa Oil and Mitsubishi group, obtained the site of old Naval Fuel Depot in 1955 and Mitsubishi Petrochemicals was established as a Naphtha production center, which developed its related petrochemical industry complex to a great extent. As a result of this development, Yokkaichi recovered two cores for the development of the industrial complexes on both sides of the old trade port.

In order to reopen the oil refinery of Daikyo Oil, it got permission to use the facilities of the Naval Fuel Depot and to lay a pipeline between them with other materials and facilities relocated from Tokuyama and Iwakuni Naval Fuel Depot on the Inland Sea. It then developed not only its refinery (14,000 bbl/day) but also its transport and sales system. The Daikyo Maru (20,800 t) operated by the company on the Yokkaichi-Arabia line was one of these examples. As a result of this development, it produced 10% of the total output in the country by 1956.

Toho Chemicals, separated from Daido Steel in Nagoya in 1948, also enjoyed public investment for its development; designation as a specially important port in 1952, and an industrial water works installed in 1956. Tokai Ammonium Sulfate, established in 1948 by the Mitsubishi group (Asahi Glass, Mitsubishi Metal Mining and Mitsubishi Chemical Industry) was also developed thanks to the sales of facilities of Naval Fuel Depot, supported by the Fertilizer Distribution Cooperation. And as mentioned above, Mitsubishi Chemical Industry was a driving force for the introduction of Showa Yokkaichi Sekiyu (oil refinery) as was seen in the investment of Mitsubishi group (4,800 million yen) with a low interest loan (12,000 million yen) from Shell Oil. Japan Synthetic Rubber was established as related factory to Mitsubishi Petrochemicals in 1957, with some of the investment from Mitsubishi Petrochemicals and the national government (whose stocks were sold out until 1968). Later on, many chemicals and other related firms were established with a supply of materials by pipeline connected to Mitsubishi Petrochemicals; Yokkaichi Synthetic, Yuka Badish, Toho Petroleum Reisn, Nippon Butanal, and Kuraray Petroleum are examples of those developed
The above mentioned development of industry in Yokkaichi was largely thanks to the formations of the Association for the Realization of the Ise Bay Industrial Belt in 1953, benefitting from the designation as a specially important port for the development of industry and trade. This private association promoted not only the sales of government property (the site of Naval Fuel Depot) for the development of petrochemical industrial complexes but also the basic facilities for the development of industry such as an electric power station (1954), an industrial water works (1954), a telephone system connecting Yokkaichi directly with Nagoya (1956), Osaka (1958), Kobe (1958) and Tokyo (1959) and the construction of Nagoya-Yokkaichi Highway. And the amalgamation of nine neighbouring villages was also encouraged by it in 1954 for the development of an industrial area governed by an administrative authority, the Yokkaichi city council.

With regards to the fishing industry, a deep sea fishery was promoted instead of a coastal fishery in order to facilitate reclamation. As result of this movement, Yokkaichi port was designated as a deep fishery port in 1956 and the Isozu Fishing Port was improved in 1958, by virtue of a popular movement in this old fisher community. Without paying due regards to these popular movements and public investment, which was 2,700 million yen during only five years for the construction of roads, improvement of port facilities, the development of industrial water works and the development of reclaimed lands, the development of Mitsubishi Petrochemicals Industry complex (about 400 ha) with the development of Showa Yokkaichi Sekiyu (40,000 bl/day in 1958 to 310,000 bl/day in 1978) and of Mitsubishi Petrochemicals (Naphtha cracking for the production of Ethylene capacity, 12,000 t/year in 1959 to 382,000 t/year in 1978) cannot be clearly understood.

The development of the Mitsubishi's complex accelerated the change of local community into an industrial one; for an example, in the Kawajiri district, there were about 89 ha of agricultural land, most of which was paddy fields and most of the farmers of which had other jobs. In 1958, 30 ha were sold for 600,000 yen per 10 ha, which was three times the land price of the surrounding area, to Japan Synthetic Rubber on condition of employing some of the farmers and finding other agricultural land for the farmers who wished to continue agriculture. At that time, there was not very much strong opposition to selling their land to a promoter from the same community, but in 1960, when Mitsubishi Petrochemicals wanted 44 ha, most of the farmers were at first opposed to the plan; however, wooed by promoters in the same community and by the city council together with an exorbitant land price, 1,120,000 yen per 10 a, the farmers were finally persuaded to sell their land to Mitsubishi Petrochemicals, due to the worsening environment for agriculture.
Consequently, this agricultural community changed completely into an industrial community.

And the payment of compensation to the local fishermen also encouraged the change of fishing industrial community into an industrial one. The change was accelerated by water pollution in Yokkaichi harbour. The total compensation for water pollution amounted to 5 million yen in 1955 and 10 million yen in 1958. 2.3 million yen out of 5 million yen was paid by the city council as was 5.1 million out of the 10 million. This compensation was understandably, not sufficient for each fisherman to be able to continue fishing in other fishing fields and it gradually added fuel to a popular movement against the development of petrochemical industry complexes on the one hand but on the other hand, prepared them to consent to another reclamation in the Umaokoshi area in 1957 replacing the industrial area of Uraga Dock with 9.7 million yen of compensation for reclamation to fishermen by the prefectural government. The total cost of reclamation of 67.9 ha amounted to 1,650 million yen. As a matter of course, this reclamation received the increasing pressure of business competition felt by the small local oil refining firm, Daikyo Oil, since it enabled its expansion of capacity from 65,000 bl per day in 1959 to 115,000 bl per day in 1963 (now 215,000 bl/day) and made it possible to found Daikyo Petrochemicals in 1961 for advancing into the petrochemical field with Kyowa Hako Kogyo, which itself was in the process of shifting from fermentation to petrochemicals with financial aid from the same bank as that of Daikyo Oil, the Industrial Bank of Japan.

The development of Umaokoshi Petrochemical Complex encouraged a prefectural government policy to attract Yahata Steel (now Nippon Steel, as the result of large merger with Fuji Steel in 1970) into the newly reclaimed land at Kasumi in the northeastern part of Yokkaichi. Together with this idea, the prefectural government and the city council completed the payment of compensation to the local fishermen in 1960 (586.5 million yen), brought in the fill material and built the harbour at a cost of 2.3 billion yen. On this reclaimed land, they built roads and a bridge over the waterway (2 billion), brought in industrial water (4.7 billion yen) and provided for liquid waste (1.5 billion yen). The total cost of this preparatory work was over 10 billion yen, but their efforts proved to be ineffective, largely due to the multi-location policy of a huge company in the oligopolistic industrial structure.

That is, Yahata Steel had already started operation of a blast furnace at Sakai (3,110,000 t/year) in the Osaka metropolitan area in addition to Yawata (6,890,000 t/year by 1975) in the Kitakyushu area of Fukuoka. In the Tokyo metropolitan area, the Kimitsu plant (6,760,000 t/year) was also under planning.
in 1968. Yokkaichi was situated between these two huge plants in the mammoth metropolitan areas, and the scale of the local market was too small to compete with its rival, Tokai Steel, a subsidiary company of Fuji Steel, founded in 1964 in cooperation with Toyota Motor, Aichi Steel, Daido Steel and other local financiers. Tokai Steel, located on the Nagoya South Industrial Estate on the opposite side to Yokkaichi, became Nippon Steel's Nagoya Works in 1970 as a result of the large merger with Yahata Iron and Steel. Consequently, Yahata Steel cancelled its plan to establish its Yokkaichi Works in the Nagoya metropolitan area, giving the excuse that the Kasumi Industrial Estate in Yokkaichi was too weak to construct heavy works.

In the end, the Kasumi Industrial Estate became the location for the petrochemical industry complexes of enterprises closely connected with the Industrial Bank of Japan, which had been somewhat slow to move into petrochemicals. A central part was played by Shin Daikyowa Petrochemicals, and its production of ethylene jumped from 41,000 tons to 320,000 tons by 1975. Thus in one respect, this development was made possible by the cancellation of Yahata Steel, although on the other hand it may be said to be a child of a national policy to develop a native petrochemical industry, in order to break away from the major multinational oil companies in the national energy and industrial policy. With this aid, many chemical companies were concentrated around Shin Daikyowa Petrochemicals; examples being Toyosoda Manufacturing, Hitachi Chemicals, Ueno Fine Chemical, Kyowa Yuka, Nisso Petrochemical Industries and Dai Nippon Ink Acid Chemicals. With this development, an energy pipeline was built to connect all three petrochemical complexes: the Shiohama Petrochemical Industrial Complex of the Mitsubishi group with its inland Kawajiri complex, the Umaokoshi Petrochemical complex of the Daikyo Oil group, and the Kasumi Petrochemical Complex of the Industrial Bank of Japan group.

The Kasumi Petrochemical Complex is a large one developed on the Kasumi coast industrial estate (126.7 ha). It is separated from the shore like an island and is opposite to a large green park (21.2 ha) with sports grounds, swimming pools and an Australian Memorial Hall developed by the city council and the port authority. There are no large village behind the green park, as distinct from the northern side, Tomita on the other side of the trade port area, where a wool center, a meat center and large car park for Honda Motors in Suzuka have been developed. In spite of this good environment with room (132 ha) for further development in this area has been restricted as a result of the decisions headed down by the courts and of the antipollution popular movements spearheaded by the local residents at Isozu and Shiohama.
4.3. Metamorphosis of regional system and local pollution problems

Isozu is, as mentioned before, a small fishing village over the Suzuka river, situated on the opposite side to the Mitsubishi group's petrochemical complexes, and fishermen in this area, due largely to the reclamation and water pollution caused by the development of the petrochemical complexes, lost their fishing grounds and their fish. Shiohama is located between the two petrochemical complexes, Shiohama on the coast and Kawajiri in the inland area, where small old villages survive among company housing areas of the Mitsubishi group and the Ishihara Sangyo which have developed on the aforementioned complexes. These areas are situated to the leeward of prevailing winds in winter and even in summer they are not able to avoid polluting these villages. Pollution problems in this area became conspicuous when production began again at chemical plants such as Mitsubishi Monsanto Chemical in 1952 and Mitsubishi Chemical Industry in 1953, when stench fishes were recognized. In spite of this problem, the Association for the Realization of Ise Bay Industrial Belt was formed in this year in order to promote industrialization.

In response to the industrial development in Yokkaichi, water pollution not only in the Yokkaichi harbour but also up to 4 km distant from the shore, increased remarkably to the point where 100% of the fish were stench fish, and the Central Fish Market in Tokyo warned fishermen in Yokkaichi not to sell stench fish, which brought about sudden fall in the price of Yokkaichi fish. This resulted in the establishment of a committee for protecting people from pollution in the city council in 1960.

Not only water pollution but also air pollution became more serious with the development of the Shiohama Petrochemical complexes towards the inland area as was the case with the establishment of Japan Synthetic Rubber. In 1961, the Union of Association of Inhabitants of the Shiohama district started its own research into pollution problems and in the next year, the Association for Promoting Counter Movements against Air Pollution was established in Yokkaichi. As a result of these movements, the national government designated Yokkaichi as an area covered by the Smoke-Control Regulation of 1934 and the development of housing areas on the western hills, relatively far from polluted areas was encouraged by the local governments and the Japan Housing Cooperation, while Yokkaichi city council itself compensated asthmatics for their medical expenses. In addition to these policies, the city council installed a large air-cleaner in the Isozu citizens hall in 1966, but also encouraged the relocation of all the people in Heiwwacho (Peace Town in English) to new housing areas developed on the hills, a move which incurred the peoples displeasure and produced a strong movement against pollution and large petrochemical firms.
In 1967, the Yokkaichi Medical Center for those suffering from pollution was established, and 12 plaintiffs started suits against six major firms of the Mitsubishi group’s petrochemical complex, which resulted in a win in 1972, when car ferry between Yokkaichi and Kitakyushu was started and a function of Yokkaichi port changed a little. This suit had a great influence on the anti-pollution policies of the national government. And the Yokkaichi branch of the Maritime Safety Agency was able to expose the illegal discharge of sulfuric acid from Japan Aerozir and Ishihara Sangyo to the court in 1971. 7 firms established in the Kasumi Industrial Estate were bound by the agreement with the city council for pollution control and the Law Compelling Payment for Antipollution Appliances was promulgated in 1970. And when an old chemical firm in Yokkaichi, Ishihara Sangyo, was sued in 1971, the city council decided not to develop the petrochemical industry within Yokkaichi, especially in the lastest coastal industrial estate, Kasumi.

In 1972, the compensation agreement in the court verdict was concluded between one hundred local residents and the six defending companies and in accordance with this agreement, a Pollution Prevention Association financed by these six companies was established in 1973, to compensate the officially certified patients entitled to relief. And many people moved from polluted areas to new housing areas developed on the hills: according the Yokkaichi city records, the population increased by 13,000 during the five years after the court verdict (1972-76), but 5,000 people moved out from the polluted areas, especially in the Shiohama district, where 20.0% of the residents had already moved out. In contrast to this decay, new housing areas were given a boost by the people coming from polluted areas. In 1976, for example, 718 out of the total increased population in the Shigo district (1,011), where the Sasagawa Housing Estate of the Japan Housing Cooperation is situated, were people who had come from polluted areas within Yokkaichi.

The court verdict in 1972 placed heavy responsibility for pollution not only on the above mentioned six firms but also on the development policies of the local governments. Consequently, local governments were urged to change their industrial development policies and were obliged to encourage the development of trade functions in the spirit of a traditional market town. As a result, a meat center, a wool center, a major depository facilities of Honda Motors and the construction of container yards developed on the northern side of Kasumi coastal industrial estate.

By virtue of the change in industrial policy, petrochemical firms developed other branch plants outside of Yokkaichi. For an example, Mitsubishi Chemicals gradually developed its production capacity outside of Yokkaichi after it sold some
part of its site to Mitsubishi Petrochemicals in 1959 for its establishment. First it set up plants on the Inland coast, Mizushima (1964) and Sakaide (1969) on the fringe of Osaka Metropolitan area and then, after the Yokkaichi verdict, it also established its plant at Kashima in 1975, which is the latest huge coastal industrial

Fig. 8-1 Distribution of ethylene centers in Japan (1978)

Fig. 8-2 Distribution of overseas plants of the firms in Yokkaichi
During the suit, it also developed its research and development laboratory and overseas factories; Mitsubishi Chemicals Research and Development Laboratory at Machida near Tokyo in 1971 and overseas plants in Brazil (1971), Iran (1976) and Malaya (1976). (Figs. 8-2, 8-3). In response to the development of production outside of Yokkaichi, the Yokkaichi plant developed fine chemical products and became one of the two important plants, Kashima in the eastern part of Japan and Yokkaichi in the western part of Japan. Such a sort of metamorphosis of chemical industry in Yokkaichi is also seen in the case of Mitsubishi petrochemicals. Mitsubishi Petrochemicals set up its Kashima plant and its Central Research and Development Laboratory in 1971 at Kashima Industrial Estate near the Tsukuba Academic town developed on the fringe of the Tokyo metropolitan area. It developed a new biochemistry and fine chemistry in Kashima and a huge naphtha center at Singapore, its trade center in Asia like Amsterdam in Europe. In Yokkaichi, it revitalized its three Research and Development laboratories of applied chemistry and developed high value added products more than ever. In contrast to these plants of Mitsubishi group, the number of workers of Mitsubishi Monsant Chemical decreased since 1975 (1,090 in 1975) and became 865 in 1980, due to the promotion of rationalization of production. It is also because that Mitsubishi Monsant Chemical has its another plant at the center of the Nagoya metropolitan area, which produce high value added products in the same area as Yokkaichi and higher value added products plant, Tsuchiura plant near Tsukuba in the Tokyo metropolitan area. Thus, the metamorphosis of
each plant in Yokkaichi is different from each other by its own multi-plants system.

A single plant firm was obliged to react to the aforementioned change of industrial policy in Yokkaichi more keenly than a multiplants firm. By way of example, one of the oldest chemical plant in Yokkaichi, Ishihara Sangyo had to invest huge money, 8,900 million yen in order to install higher quality anti-pollution devices. Thanks to this investment, it could improve its environment and produce high value added goods such as titanium and titanous oxide, agricultural medicine and other fine chemical products together with I.C.I. and other world chemical firms. On the other hand, it set up its joint corporation with Toyo Soda Industry in the Kasumi petrochemical complex. In 1976, it set up its Tokyo head office in addition to the old head office in Osaka and started its plan of establishing its second plant in the eastern part of Japan.

Daikyo Oil is also a single plant firm, which had already established its joint corporations, Fuji Oil (at Sodegaura on the Tokyo Bay, 210,000 bl/day) in 1968 and Kashima Oil (at Kashima, 180,000 bl/day) in 1970 in the Tokyo metropolitan area and joined bands with Fuji Kosan (at Kainan, 80,000 bl/day) in 1976 in the Osaka metropolitan area. In 1980, it merged with Asia Oil, which has three plants, Sakaiide (150,000 bl/day), Yokohama (10,000 bl/day) and Hakodate (30,000 bl/day). At long last, it made clear its plant to set up its huge plant in the Tomakomai-Tobu industrial complex on the fringe of Sapporo metropolitan area in Hokkaido. Shin Daikyowa Petrochemical, set up by Daikyo Oil, Kyowa Hakko and other leading petrochemical companies in 1971, including a naphtha cracking plant with an ethylene capacity of 300,000 tons per year, also announced the establishment of its new plant in the Tomakomai-Tobu industrial complex in the future.

As mentioned above, due to the evolution of industrial system of each firm, they did not need to appeal against the court verdict in 1980 in order to survive in Yokkaichi. In fact, not only air pollution but also water pollution has greatly reduced since the court verdict in 1972, especially since the oil shock in 1973. However, there are still 1,115 officially certified patients, even though newly certified paints decreased from 191 a year in 1971 to 66 in 1976 out of its total population (247,932). And the Yokkaichi port authority dredged mud and waste matter from the bottom of harbour at a cost of 6,800 million yen and as a result of this dredging, several sorts of fish came back to Yokkaichi port. The concentration of Sulphur dioxide decreased remarkably 0.045 ppm in 1970 to 0.018 ppm in 1975. Yokkaichi ranked 24th out of 139 cities (first was Amagasaki in the Osaka metropolitan area with 0.087 ppm) in 1970 and ranked 137th out of 502 polluted cities (first was Oomuta, an old industrial area developed on the cool field in the northern part of Kyushu Island with 0.041 ppm) in 1975 (Table 4). It is largely thanks to a
### Table 4: Pollution levels in Yokkaichi

<table>
<thead>
<tr>
<th></th>
<th>1970</th>
<th>1975</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulphur dioxide</td>
<td>0.045 ppm</td>
<td>0.018 ppm</td>
</tr>
<tr>
<td>Ranked 24th out of 139 cities</td>
<td>First was Amagasaki with 0.087 ppm</td>
<td>First was Omuta with 0.041 ppm</td>
</tr>
<tr>
<td>Ichihara (near Chiba) 0.036 ppm</td>
<td>Ichihara 0.021 ppm</td>
<td>Kurashiki 0.025 ppm</td>
</tr>
<tr>
<td>Not available</td>
<td>First was Itabashi in Tokyo with 0.099 ppm</td>
<td>First was Harumi in Tokyo with 0.059 ppm</td>
</tr>
<tr>
<td>Ichihara 0.033 ppm</td>
<td>Ichihara 0.024 ppm</td>
<td>Kurashiki 0.023 ppm</td>
</tr>
<tr>
<td>Kurashiki 0.044 ppm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For all industries

<table>
<thead>
<tr>
<th>Number of firms</th>
<th>1991</th>
<th>2184</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of employees</td>
<td>50,940</td>
<td>48,850</td>
</tr>
<tr>
<td>Value of output</td>
<td>434 billion yen</td>
<td>966 billion yen</td>
</tr>
</tbody>
</table>

In the petrochemical industry

<table>
<thead>
<tr>
<th>Number of firms</th>
<th>41 (2.1%)</th>
<th>51 (2.3%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of employees</td>
<td>12,323 (16.2%)</td>
<td>13,299 (15.3%)</td>
</tr>
<tr>
<td>Value of output</td>
<td>298 billion yen (61.6%)</td>
<td>659 billion yen (68.1%)</td>
</tr>
</tbody>
</table>

| Total population | 229,234 | 247,001 |

Source: Provided by the Municipal Office of Yokkaichi

huge investment in anti-air pollution appliance and the depression after the oil shock in 1973. According to the opinionaire to the citizen about the policy of industrialization in 1980, 25.2% out of 2,351 people supported this policy thanks to affording more opportunity of working and to the improvement of urban facilities, although 32.8% answered that the industrialization policy influenced badly on populations life environment. Especially, the people in Shiohama (46.4%), Tomita (44.7%) and Tomisuhara (43.7%) situated behind petrochemical complexes has this opinion. However, still 34.2% of the total wish to keep industry and expect industry to develop Yokkaichi. Even in Shiohama (27.4%), Tomita (30.1%) and Tomisuhara (30.1%), this opinion tops all the rest. And it is more interest that 46.8% of the total want to introduce new industries into Yokkaichi (47.6% in Shiohama, 40.8% in Tomita and 42.7% in Tomisuhara).

Taking account of this fact, the Yokkaichi Chamber of Commerce and Industry petitioned the city council to cancel the resolution on the restriction imposed on the further development of petrochemical complexes, because of the need to find resources for survival. As a result of this petition, the city council decided to cancel the restriction in 1980 in order to increase taxation, and so, a local oil refining company, Daikyo Oil found a way to develop its trade, despite keen competition from the growth of refinery capacity in oil producing
countries. From another perspective, the traditional spirit of a market town enabled local oil company to absorb shocks caused by the rise of oil prices and to survive in a local city by means of an increase in storage capacity not only of oil but also of L.T.G.

This sort of spirit, which infused the whole industrial community, also had an influence on the survival of the oldest industry, the vegetable oil industry; with the development of oil refinery in the resource production countries, vegetable oil refineries import crude oil from developing countries in order to refine and promote the development of derivatives. There is, for example, Ito Oil Refinery, which had imported crude oil from Thailand to refine since 1980, when a oil refiner was established in Thailand with financial assistance from West Germany. And it still refines two thirds of the total product from materials, while it endeavours to invent higher value added derivative, not only from crude oil coming from Thailand but also directly from materials imported from Philippine, China and Pakistan. This endeavour illustrated a traditional pioneer spirit to come up with new ideas and then to put them into practice, as was seen in the development of Banko pottery industry and other local industries at the early phase of their development.

As mentioned above, within Yokkaichi, a traditional industrial community with a market and a port had always generated a traditional ethos as a trade center and an industrial center and has encouraged a traditional pioneer spirit in an area inferior to other large market centers and large resource production areas. And it has had a large influence on the formation of each local unit, on its evolution and on its survival.

THE FORMATION OF LOCATIONAL UNIT AND STRUCTURE OF INDUSTRIAL COMMUNITY

**A MARKET TOWN**

(1470)

developed on the fringe of fortress with a small trade port and pioneer spirit which incubated new ideas

**RAPE OIL INDUSTRY**

TOKAIDO (1601) ⇒ developed by virtue of local resource and shipments to Edo (Tokyo) market (17th century)

**FISHING NET INDUSTRY**

developed on local market resource and labours within fishing village (Amikan 1794)

**BANKO POTTERY INDUSTRY**

relocated from neighbouring port town, Kuwana and developed on local resource wholesaler and export port (1839)
Evolution of Industrial System and Industrial Community

OPENING OF THE COUNTRY (1857)

TEA MANUFACTURE
 developed by Mr. K. Ito (1860), by virtue of latest information in Yokohama and benefit in Yokkaichi Port

MEIJI RESTORATION (1868)

SILK INDUSTRY (1874)
 by Mr. K. Ito

COTTON SPINNING INDUSTRY
 developed by Mr. K. Ito (1875) originally local resource and local power (MIE SPINNING 1880)

IMPROVEMENT OF PORT (1884)

TOKAIDO RAILWAY (1884) DESIGNATE EXPORT PORT (1889)

REPAIR SHOP of KASAI RAILWAY (1890, 1924, relocated to Nagoya) (a incubator of modern machine technology)

SPECIAL DESIGANTED IMPORT PORT 91897

Coal, steam engine and mechanization of oil press (1889) and import of resource from other area within the country and overseas

MIE SPINNING HAMACHO
 factory with steam engine near the port (1886)

YOKKAICHI WAREHOUSE (1895)
 (the most important pioneer for the development of port, trade and Industry)

deployment of import

MIE IRON WORK
 repair of textile machine (1897)

development of mechanization of production of pottery with kiln (coal landing on the port)

(start of fishing net manufacturing with pleyd cotton thread and imported machine by MIE SPINNING 1896)
OFFICIAL OPENING of NAGOYA PORT (1907)

formation of the ASSOCIATION of PORT IMPROVEMENT by local financiers and YOKKAICHI WARE HOUSE (1907)

large mergers of other firms with MIE SPINNING (1897-1919) and foundation of TOYOBÔ (1914) with its head office in YOKKAICHI.

NAGOYA surpassed YOKKAICHI in export in 1914 and in import in 1923.

decoration of reclamion on the old trade port the number 1 (Suehiro-1917 vegetable oil on the import port, KUMAZAWA Oil-1918)

relocation of head office of TOYOBÔ to Osaka (1920)

a port of call of YOKKAICHI AUSTRALIA line with wool (1924)

TOYO WOOL SPINNING (1931, now TOYOBÔ) and development of wool spinning plants

YOKKAICHI HARBOUR COMPANY (1938) promoted the improvement of port with NAVAL FUEL DEPOT (1938)

the number II reclaimed land, Chitose (1925) and introduction of NIPPO SHEET GLASS (1935)

the number III reclaimed land, Ishihara (1928) and introduction of [ISHIYAMA SANGYO] (1937)

TOHO HEAVY INDUSTRY (1938)

SHOWA SEKIYU (SHELL, 1933)

MITSUBISHI CHEMICAL INDUSTRY (1951)

DAIKYO OIL (reoperation 1950)

DAIKYO OIL & KYOWA 1963 & 1966

CARPET MANUFACTURING WORK OF ARMY (1940)

FUJI ELECTRIC (1942)

DAIKYO OIL (1940)

URAGA DOCK (1943)

(1916) stimulated the development of fishing net industry and cotton thread plying mills

opening of cotton spinning division of HIRATA FISHING NET MANUFACTURE (1926)
Evolution of Industrial System and Industrial Community

- Reoperation of Daikyo Oil Refinery (1950)
- Designation of Special Import-ANT PORT (1952)
- MITSUBISHI group's Shiohama Petrochemical Complex (1952–)
- Mitsubshi Monsant (1952)
- MITSUBISHI CHEMICAL INDUSTRY (1953)
- Reclamation of UMAOKOSHI (1957)
- Development of MITSUBISHI PETROCHEMICAL INDUSTRIAL COMPLEX in KAWAJIRI
- Development of MITSUBISHI PETROCHEMICAL INDUSTRIAL COMPLEX in SHIOHAMA & IN KAWAJIRI (1960)
- The policies of local government to induce YAWATA STEEL into KASUMI coastal industrial estate and start of reclamation (1960)
- Start of the UMAOKOSHI PETROCHEMICAL INDUSTRIAL COMPLEX (DAIKYO, KYOWA, and CHUBU ELECTRIC POWER (1960)
- Development of UMAOKOSHI COMPLEX
- Association for Promoting a Counter Movement to Air Pollution (1961)
- AJINOMOTO (1961)
- The Association for Promoting a Counter Movement to Air Pollution (1991)
- Development of Housing Estates on the Western Hills (1962–)
- Bank Potters' Hall (1954)
- Reoperation of Daikyo Oil Refinery (1950)
- Policies of local government to induce YAWATA STEEL into KASUMI coastal industrial estate and start of reclamation (1960)
- Start of the UMAOKOSHI PETROCHEMICAL INDUSTRIAL COMPLEX (DAIKYO, KYOWA, and CHUBU ELECTRIC POWER (1960)
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- The Association for Promoting a Counter Movement to Air Pollution (1991)
- Development of Housing Estates on the Western Hills (1962–)
Y. MIYAKAWA

5 Conclusion

An industrial community, in which inhabitants and local industry have a close relationship between them, often exerts much influence on the formation of an industrial system, especially on the location of an industry and its development. Sometimes, an industrial community plays an important role in the decision-taking process of an industrial system, an indispensable partner in effect, of the decision-taker. And the ethos generated in the community exerts itself on the decision-making process of industry, too.

Oxford in England contains not only one of the world-famous universities but
also world-famous motor vehicle company with a mass production system, developed in a former Roman pottery production area; just as Toyota Motors on the former Sanage pottery production area neighbours the Aichi Kyoiku University. The University of Oxford, developed since 13th century, has kept an indescribable atmosphere of tradition and history, and captivates all who came to the city and all who live there. A traditional pioneer in all kinds of activities, especially in academic and political fields, it also exerted much influence on the development of modern industries within Oxford.

Mr. W. Morris started his shop for the repair and assembly of bicycles at his parent’s house situated between the center of Oxford and Cowely, outside of the city wall, in 1882; and soon after its establishment, he caught the demand of students in the University for more luxurious transport equipment, motor bicycles and motor cars. In 1903, he started a repair shop, distributor and assembly plants in the Longwall street behind New College within the city wall, with the financial aid of rich students. With the development of production, he relocated his plant to an empty army school on the outskirts of the urbanized area, Cowley in order to set up a large factory with a mass production system, introduced from Ford in the United States, just as Toyota Motors did 25 years after Morris’s Cowley.

In 1926, Mr. W. Morris had fully developed his system of mass production with the introduction of Pressed Steel from the United States to the adjacent site and his system of mass sales with his own Nuffield Press established in Cowley, while on the other hand, a negative industrial system for the development of motor vehicle industry had been gradually formed within the ethos of University Town, by virtue of its national industrial system; So, he endowed the major part of his benefaction to the University of Oxford to promote the development of his business. However, as a result of his benefaction, the landscape of university town developed fully in the western side of town where Nuffield College was established, and the expansion of the university’s facilities into the northern part of Oxford city was accelerated when the Nuffield Institute of Medical Research was founded, which exerted a large influence on the development of hospitals in the eastern part of Oxford city, where the Wingfield Morris Orthopaedic Hospital was set up. The development of academic areas and the academic community, which regenerated the atmosphere of the academic town, encouraged Lord Nuffield’s public spirited policies more and constrained the development of the motor vehicle industry in order to avoid the collapse of an academic environment. Indeed, Austin-Morris entered into an agreement with the city council for the restriction imposed on the development of the Cowley assembly factory and other related factories in 1953. The above mentioned negative industrial system for the development of Morris Cowley has become crucial since the three big mergers with Austin in Birmingham in 1952,
Pressed Steel and Jaguar in 1966, and Leyland in 1968, which formed B.L. Cars with its head office in London.

Toyota Motors has a similar locus to Morris’s Cowley plant in Oxford in England. In the early days of Morris Motors in Cowley, it was able to develop its production, largely thanks to a concentration of motor vehicle industries in the Birmingham-Coventry metropolitan area, situated between London, the Capital and Manchester, one of the most important commercial centers in the United Kingdom. Toyota Motors was also able to develop thanks to the motor vehicle industries and machine-metal processing industries in the Nagoya metropolitan area, situated between Tokyo, the Capital and Osaka, one of the most important commercial centers in Japan.

In filling an information gap between the core and periphery and overcoming the problem of isolation, the inter-connection of decisive factors, i.e. an organization of decision-takers and the formation of a network of information has exerted a great influence; at the foundation phase of Toyota Motors, a private information network of the founder, Mr. K. Toyoda could not be overlooked. That is to say, without having formed a unique route of information flow and keeping up with the latest information and know-how which was available in the two cities, Tokyo and Osaka, Toyota Motors could not have been founded. By virtue of their tight information network in Tokyo, the Capital, Toyota Motors could get the latest information from the government about policy for developing the nation’s motor vehicle industry in order to check the development of the two major multinational enterprises, Ford Motor in Yokohama and General Motors in Osaka and it also could be aware of the behavior of its rivals. In respect of technological development, the Research and Development Institute of Toyota Motors in Tokyo was able to fill the large gap between Tokyo, a birth place of Japan’s motor vehicle industry, and Koromo, a remote place where there was no motor vehicle industry, together with introducing engineers and professors into Toyota Motors. In other words, lacking this network of information of technology, Toyota Motors could not have developed the system of mass production of Ford Motors and to evolve it so well.

Without a close link between Mr. K. Toyoda and Mr. S. Kamiya, a former director of Japan General Motors, Toyota Motors also could not evolved the system of mass sales already developed and improved by Mr. S. Kamiya in the most important and traditional economic center in Japan, Osaka; Mr. S. Kamiya (the former president of Toyota Motor Sales) was one of the most distinguished decision-takers concerning the foundation of Toyota Motors. Thus, by virtue of the above mentioned network of information which filled the gap of information between the cores and the periphery, Toyota Motors was able to start its business on the fringe
of the third largest metropolitan area between the two mammoth cores, which already had an infant motor industry.

With regard to the building of motor vehicle industries within Toyota city, it is worth mentioning of one of the most important decision-takers, the Association of Wage Earners (Kumyoša Rengokai), which is a sort of popular movement group in Toyota city. It was founded just after the largest strike at Toyota Motors in 1950 and revolved primarily around the employees at Toyota Motors. Its original purpose was an agitation for the reduction of taxes, while it aimed to change the old characteristic of the local agricultural community which had become an obstacle against the development of Toyota Motors; in this community, even the workers of Toyota Motors had no vote against the decision of a village meeting composed only of farmers.

The Association of Wage Earners first pressed on local councils for a policy to attract an industry and its workers into the area in order to change the old conservative characteristics and ideas of the local communities. And then, it persuaded local people to accelerate the amalgamation of all surrounding towns into the one municipality to create one large administrative unit, in which both production and other daily activities would be fully integrated into forming one rather enclosed life supported system, a single company community. In the movements of local people to change the city's name from Koromo to Toyota, it played an important role against the other people's movement to keep the traditional city's name and to check the development of Toyota Motors. As a result of this peoples movement, Toyota Motors was able to form its ideal industrial system within Toyota city with the concentration of motor vehicle industries.

At present, Toyota Motors promotes its new network of international information flows with three focal points on the cross roads of international information flows; Tokyo, Brussels and New York. On the other hand, Toyota Motors endows a lot of money to the city council in order to develop local culture and to improve the environment for local people. At last, it established Toyota University of Engineering at the fringe of Nagoya city near Toyota city in 1980, just as Lord Nuffield did in Oxford. This link is a key to understand the evolution of a regional system in Toyota for the purpose of keeping the vision of an ideal industrial community.

In contrast to Toyota, Yokkaichi, a world-famous petrochemical city, has no core of industrial community, which could exert much influence on the decision-making in the formation of the industrial system. However, an ethos of a traditional industrial community developed in a market town with a port, has gradually penetrated most of all the locational units; a traditional vegetable oil industrial area with some modern factories, which relocated from an inland area where rape
seeds was cultivated to a port area, in response to the change of materials and the development of market. It was first able to develop due to a close link with Edo (now Tokyo) and could survive by means of cooperation with large ones in the mammoth metropolitan areas and with high value added products made from imported crude oil. In the northeastern part of Yokkaichi, a traditional fishing net manufacturing area developed with thread plying mills. It was also developed originally due to local materials and local market and then imported raw materials from outside of Yokkaichi and exported fishing nets to foreign countries, especially the United States and Asian countries. In addition to Yokkaichi port, local machine industries developed by Mie Spinning and Kansai Railway and local spinning industries exerted a great influence on the modernization of fishing net industries in one respect and on the other hand developed small thread plying mills owned by farmers and fishermen in inland areas as a result of rationalization of system of production. Between these two traditional industrial communities, a pottery production area with wholesalers has been developed. Due to the shortage of local resource and of local market, it has been endeavouring the improvement of its technologies and of its system of production in the traditional spirit of pioneer in the market town in order to keep foreign and domestic market. With regards to the mechanization, local machine industries also exerted influences on it.

Compared with the these industrial communities developed in the northern part of Yokkaichi, a tea manufacturing industrial area is, at present, not so much flourished, although it is still one of the most important tea cultivation area in the country. One of the pioneers in this industry, Mr. K. Ito also became the pioneer of modern industry. He set up Mie Spinning in 1880 with financial and technological assistances from pioneers and financiers in the Nagoya metropolitan area and in the Osaka metropolitan area. It became gradually the promoter of the development of modern port and modern industry. As a result of merger of Mie Spinning with Osaka Spinning, its head office relocated from Yokkaichi to Osaka in 1920 and Nagoya port, officially opened in 1907, surpassed Yokkaichi in 1914 in exports and in 1923 in imports. Meeting with this keen competition, the Association for Port Improvement, set up by the aforementioned firm group, developed industrial estate on the port with financial aids from the national and local governments and attracted industries such as wool spinning and chemical industries. Forerunners of petrochemical industries complexes, Daikyo Oil group and Mitsubishi group were attracted at that time. After World War II, especially during the high growth economic phase, these petrochemical complexes developed remarkably and developed their industrial communities into inland areas.

In response to the development of petrochemical complexes, pollution problems became keen and in 1967, 12 plaintiffs started suits against six major firms of the
Mitsubishi group's petrochemical complex, which resulted in a win in 1972. This suit had a great influence on the anti-pollution policies of the national and local governments. Due to these policies, petrochemical firms developed their branch factories and overseas factories outside of Yokkaichi in one respect and on the other hand, they endeavoured the development of high value added products. Thanks to a large investment in the anti-pollution devices, the life environment in Yokkaichi has been greatly improved since the court verdict. Taking account of this, the Yokkaichi Chamber of Commerce and Industry petitioned the city council to cancel the resolution on the restriction imposed on the future development of petrochemical complexes. As a result of this petition and of opinions of citizens, the city council decided to cancel the restriction in order to revitalize traditional industrial community and to keep the development of Yokkaichi. Thus, the traditional industrial community and the spirit of pioneers always had absorbed shocks coming from the inside and the outside of this community and stabilized the industrial community.

As mentioned above, an industrial community exerts much influence not only on the evolution of an industrial system but also on the evolution of regional system by virtue of its function, as a decision-taker, an incubator of new ideas, and a shock absorber, in the region.

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