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Changing Perceptions of the Tohoku Region as a Manufacturing District after the Great East Japan Earthquake

Masateru HINO*

Abstract After the Great East Japan Earthquake in March 2011, the Japanese mass media began to describe Tohoku as a manufacturing industry center. It is due to the fact that the shortages of car parts from the Tohoku region stopped many car assembly factories. This article examined the appropriateness of the media image of Tohoku as a center of manufacturing after the 3.11 earthquake and the current state of automobile industry in Tohoku. It can be concluded that although Tohoku has certainly overcome its backwardness in industrialization, it is not yet an outstanding region within Japan in light of the scale of its industrial agglomeration and its productivity. However, Tohoku has the competitive advantage of being near the Tokyo Metropolitan Area, which is the country's largest industrial agglomeration area and market. Tohoku is therefore expected to continue to grow as a manufacturing region.

Key words : Tohoku Region, image, manufacturing, automobile industry, the Great East Japan Earthquake, Sendai

1. Introduction

The Great East Japan Earthquake in March 2011 stopped many assembly factories operated by Japanese automobile companies for over a month. The news about the interruption in the car production process was delivered to the world as major economic news¹⁾. The cause of the interruption in production was the shortage of parts from the Tohoku Region (hereafter, called "Tohoku"; the region consists of six prefectures: Aomori, Iwate, Akita, Miyagi, Yamagata and Fukushima). Any car consists of 20,000 to 30,000 separate parts (Miyagawa, 1977; Takeuchi, 1996). The earthquake damaged both parts-production factories and infrastructure such as roads and electricity in Tohoku. The 3.11 disasters highlighted the importance of Tohoku as a base of parts-production.

After 3.11, the Japanese mass media began to describe Tohoku as a manufacturing industry center in Japan without sufficient evidence to do so²⁾. Until the 1970s, Tohoku was a rural agricultural region and was considered the most backward region in Japan regarding industrialization (Hino, 2004), and the recent evaluation of Tohoku as a center of the manufacturing

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industry was thus a surprise, especially for the people whose traditional image of Tohoku was a base of food production.

This article first examines the appropriateness of the image of Tohoku as a center of the manufacturing industry in Japan. The industrialization of Tohoku will be briefly reviewed. Second, the characteristics of the agglomeration of automobile production-related facilities in Tohoku will be examined, and the damage to facilities due to the earthquake will be discussed.

2. Current state of industrialization in Tohoku

2.1. Status of manufacturing industry of Tohoku in Japan

The spatial distribution of manufacturing in Japan is still characterized by the considerable concentration of manufacturing in the Tokai-do Megalopolis, which extends from the Tokyo Metropolitan Area to the Osaka Metropolitan Area (Figure 1). In 2005, Tohoku's share of Japan's manufacturing industry was only 8% based on the number of manufacturing employees. Tohoku's share of population in the same year was 7.5%. In light of these relatively recent data, Tohoku does not provide a very large contribution to Japan's manufacturing industry.

In the 1960s, Tohoku's share of Japan's manufacturing industry was only 4.1%, which is less than one-half of Tohoku's percentage of Japan's population at the time, 10%. Thus, compared to the 1960s, the present level of industrialization in Tohoku can be said to have increased remarkably. Since the late 1960s, many manufacturers of various sizes headquartered in the

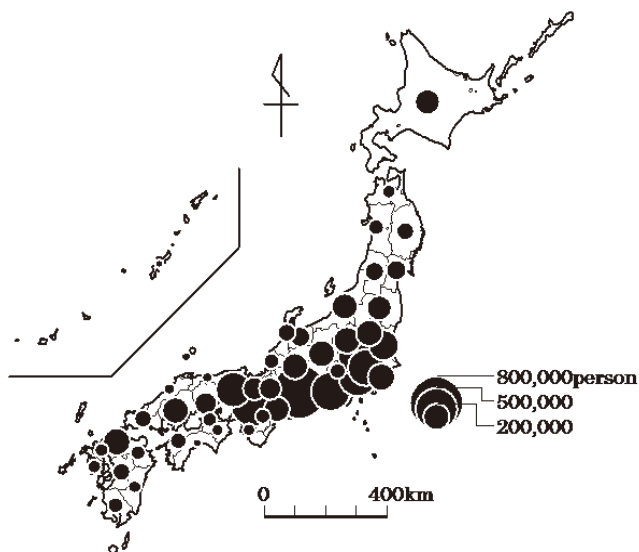


Figure 1 Distribution of employees in manufacturing in 2005
(Source : Japanese Census of Industry, 2005)

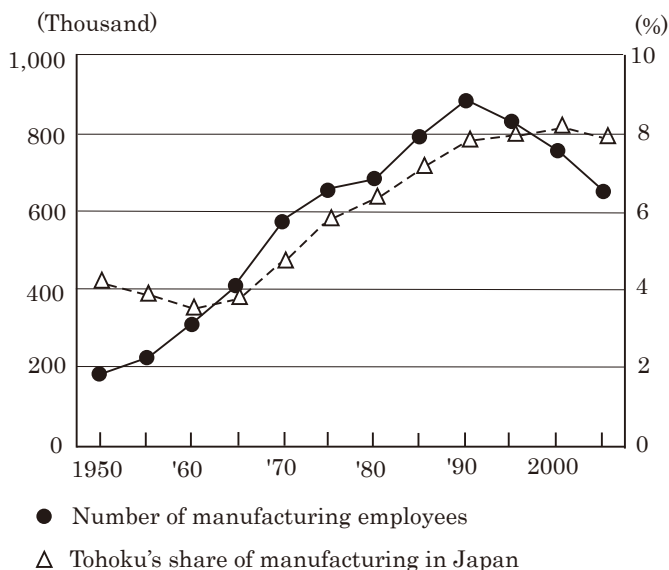


Figure 2 Industrialization in Tohoku
(Source : Japanese Census of industry)

Tokyo Metropolitan Area began to locate branch factories in Tohoku (especially southern Tohoku), looking for cheap land and labor (Hino, 2004). As a result, the number of employees in the manufacturing industry in Tohoku has increased rapidly since the late 1960s (Figure 2).

After the first oil shock in 1973 the number of employees in the manufacturing industry in Japan began to decrease and then stagnated during the 1980s. However, despite this national trend, the number of employees in manufacturing in Tohoku continued to increase, reaching 8% of the number of employees in manufacturing in Japan in 1990 (Figure 2). After Japan's 'bubble economy' burst in 1991, the number of employees in the manufacturing industry decreased even in Tohoku (as well as other regions). The long economic recession, the yen's appreciation, and the shift to parts suppliers in foreign countries (especially Asian countries) were the main reasons for the decrease in manufacturing in Japan.

2.2. Characteristics of industrialization in Tohoku

Although the industrialization of Tohoku progressed after the latter half of the 1960s and changed the agricultural nature of the region, evaluations of the industrialization of Tohoku in the 1980s were critical (Ando, 1986 ; Itakura, 1988) ; the region's industrialization was called "growth without development".

The industrialization of Tohoku was driven chiefly by the agglomeration of branch factories of manufacturers headquartered in the Tokyo Metropolitan Area. Many of these branch factories were of the mass-production type, without a development division. For that reason,

rather odd phenomenon appeared in the industrialization of Tohoku. Despite the increase in Tohoku's share of the manufacturing industry in Japan as described above, the relative level of productivity in Tohoku's manufacturing sector went down during the 1960s and the 1970s and stagnated in the 1980s (Figure 3).

Based on this phenomenon, the industrialization of Tohoku has been interpreted to be largely dependent on the agglomeration of factories of the labor-intensive type. In addition, the percentage of female employees in the manufacturing industry in Tohoku has been considerably higher than that of other regions. For example, in 1986 this percentage was 51% in Tohoku, while the average for the rest of the country was 38%. Moreover, in Japan, female employees' wages are still lower than those of males in the same jobs, and thus although Tohoku's number of manufacturing employees rapidly increased, the productivity level went down due to the increase in number of female employees working at low wages. The branch factories of the large manufacturers, especially electromechanical apparatus manufacturers, had generally established many small and medium-sized subsidiary companies around their plants in Tohoku in order to save labor costs by employing female laborers at low wages (Sueyoshi, 1989).

However, the main factories of major manufacturers are now located in Tohoku (Yamaguchi, 1982). They formed their own regional production systems by organizing subsidiaries and local suppliers. Eventually, new industrial agglomerations created two machining centers in Tohoku: Kitakami City in Iwate Prefecture and Yonezawa City in Yamagata Prefecture (Seki and Kato, 1994; Oda, 2005). By the 1990s, the Tohoku factories that had depended on the local cheap labor started shifting their operations to foreign countries to find even cheaper labor and the number of manufacturing employees largely decreased in the region. As a result, the relative productivity of manufacturing in Tohoku increased during the 1990s when the number of employees started to decrease (Figure 3).

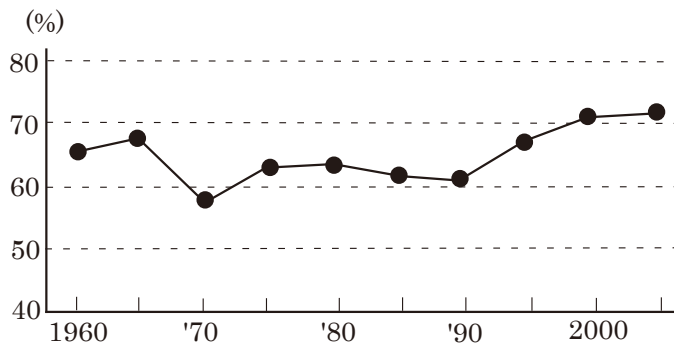


Figure 3 Relative level of productivity in Tohoku's manufacturing sector
(Source: Japanese Census of Industry)

2.3. The case of Kakuda Basin

“Kakuda Basin” here indicates the administrative areas of Kakuda City and Marumori Town in Miyagi Prefecture. It is located about 40 km south of Sendai City, the pivotal center of Tohoku Region. The population and area of the Kakuda Basin in 2005 were 49,991 persons and 421 km², respectively. Until the mid 1960s, Kakuda Basin was a rural area as well as a large part of Tohoku. The percentage of manufacturing in the composition of industry based on the number of employees in Kakuda Basin was only 5% in 1960, while the average in Japan was 20%. Because industrialization was remarkably delayed in Kakuda Basin, new junior and high school graduates from the Basin were obliged to move to industrial areas such as the Tokyo Metropolitan Area to get jobs. For that reason, the population of Kakuda Basin region decreased from 65,000 in 1955 to 53,000 in 1965.

This situation changed greatly in the late 1960's. Four large companies headquartered in Tokyo established branch factories in the Kakuda Basin region in 1967-68. Two companies, Alps Electric Co. and Keihin Corp., were main promoter of the industrialization of this region. Alps Electric is one of largest companies producing electronic parts in Japan, and at present produces various sensors and switches. Keihin is a main supplier of Honda Motor Co., producing carburetors, fuel injectors, fuel control devices and compressors. The latter has four large-scale factories in the Kakuda Basin.

Alps Electric Co. and Keihin Corp. also established subsidiaries and raised local suppliers around their branch factories in order to form their own local production systems. Figure 4 shows the distribution of factories in the Kakuda Basin in the late 1990s. Twenty-seven small and medium-sized factories producing car parts and electronic parts can be seen in this figure: many of them are a subsidiary or a local affiliated or branch factory. The placement of these factories in the Kakuda Basin resulted in many job opportunities in the manufacturing industry, changing the Kakuda Basin population trend from a decrease to an increase in the late 1960s.

The companies in the Kakuda Basin did not greatly reduce the numbers of their employees of factories in this region even in the economic recession after the first oil crisis in 1973. Rather, they strengthened the management and production functions of their Kakuda factories. For example, Alps promoted its Kakuda factory from a production plant to an operation division that included management. Keihin moved some of its headquarters functions to its Kakuda factory when the head office was relocated from Kawasaki City in Kanagawa Prefecture to Tokyo in 1985, and the Kakuda factory's production function was also strengthened. Keihin also established a center of research and development in Kakuda in 1992. Thus, manufacturing employees in the Kakuda Basin had increased from 5,200 persons in 1980 to 7,400 persons in 1990.

In 1993, however, Alps Electric reduced the number of employees of its Kakuda factory. The factory's main product was changed from cassette deck cylinder heads to tact switches, and the factory was made a production plant that belonged to the operation division located in Osaki

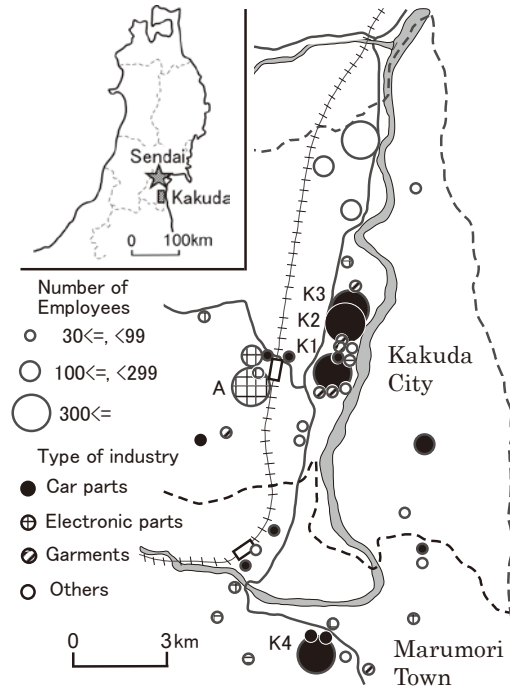


Figure 4 Locations of factories in Kakuda Basin
(Source : M. HINO (2000))

City, the northern part of Miyagi Prefecture. As a result, the number of employees of this factory decreased from 1,056 persons in 1986 to 592 persons in 1996. In addition, the local small and medium-sized suppliers of Alps Electric lost business and had to develop new customers. It was pointed out that the depression of the domestic economy following the bursting of Japan's bubble economy and China's policy of attracting foreign capital contributed to this turn of events, and the term "the hollowing of industry" was used to describe the downturn.

In contrast, Keihin Corp. made direct investments in foreign countries such as the USA and Thailand, as did Honda, its parent company. Although Keihin extended its business globally, its Kakuda division retained an important role as the 'mother factory' supporting the operation of foreign factories. In addition, the management of Keihin's overseas business was arranged in the Kakuda division. Therefore, the number of employees of Keihin's Kakuda division was maintained even in the 1990s.

Besides Alps Electric and Keihin, there is a large-scale factory of Iris Ohyama Corp in the Kakuda Basin. It is located on the bank of the Abukuma River on the north edge of Kakuda City (Figure 4). Iris was originally founded in Higashi-Osaka City, in western Japan. It produces household items such as plastic storage products, furniture, pet supplies and gardening equipment. Iris Ohyama established a branch factory in Ohgawa Town adjacent to the Kakuda

Basin in 1972. After the first oil crisis, Iris moved its headquarters to Sendai. It established its Kakuda factory in 1992. The Iris Kakuda factory is not a mere production site but bears some of the headquarters functions.

The industrialization of the Kakuda Basin noted here is not a special case in Tohoku, and it can be seen in other regions. That is, although a majority of the factories located in Tohoku are small and medium-sized subsidiaries, or branch factories, there are also main factories of large companies organizing local production systems. Two types of main factories are recognized: one is factories that were down-sized by the shift of production functions to overseas facilities after the early 1990s, and the other is factories that sustained or elevated their functions as production bases. The Kakuda Basin also has a small number of local companies that grew from secondary subcontractors of Alps Electric or Keihin to become independent suppliers.

3. Earthquake damage to Tohoku factories related to automobile production

3.1. The current situation of the auto industry in Tohoku

As of 2011 there are two car assembly factories in Tohoku. Both of them are factories of subsidiary companies of Toyota Motor Corp., the world's largest automaker. One is a factory of Kanto Auto Works, which is headquartered in Yokosuka City, Kanagawa Prefecture. It established its assembly factory in Kanegasaki Town, Iwate Prefecture in 1993 in coordination with production expansion plan of Toyota. The other is a headquarters factory of Central Motor Co. which was moved in 2010 from Sagami City, Kanagawa Prefecture to Sendai North Industrial Estate (Ohira Village in Miyagi Prefecture) to enlarge its production capacity. Toyota established a subsidiary company in the same Estate in 1998 to produce the anti-lock brake systems (Toyota Motor Tohoku Corp.)³⁾. Moreover, Toyota announced that an engine factory would be constructed adjacent to the Central Motor headquarters factory during the 2010s. Toyota has a plan to make Tohoku its third domestic production base after Tokai and northern Kyushu.

In accord with that plan, Denso Corp., the largest auto parts manufacturer, set up a subsidiary company in Tamura City, Fukushima Prefecture in 2011. Denso is a member of the Toyota group. In addition, Nissan Motor Co. set up an engine factory in Iwaki City, Fukushima Prefecture in 1994. This plant is one of two engine factories of Nissan. It suffered serious damage in the earthquake and was forced to stop production for about one month.

The auto sector in Tohoku is expected to expand further in the future. The six prefectures of the Tohoku region have developed an auto-sector cluster as an important strategy for industrial promotion in the region, and an industry-government-academics council has been set up in each prefecture to promote the region's auto sector. A conference coordinating the six councils was also established with the participation of industrial groups, prefecture governments, economic organizations, universities, and supporting groups in Tohoku. The purpose

of the conference is to promote the agglomeration of industry related to auto production by expanding and increasing the network of auto components suppliers through improvements in the technology capacities of local enterprises and by attracting of enterprises from other regions (Tohoku Bureau of Economics Trade and Industry 2007).

3.2. Features of factories related to automobile production in Tohoku

In 2010, the Tohoku Bureau of Economics, Trade and Industry (TBETI) introduced a directory of factories related to automobile production in Tohoku on its homepage (TBETI, 2010). Based on this directory, Figure 5 shows the distribution of the above-mentioned factories, which number over 1,000. Overall, many of factories are located along the Tohoku Expressway from Shirakawa City at the southern end of Fukushima Prefecture to Kitakami City in the central area of Iwate Prefecture. A relatively large agglomeration of factories is seen around Kohriyama City in Fukushima Prefecture, Sendai City in Miyagi Prefecture, and Kitakami City. Another agglomeration of factories is seen along national highway No. 13 from Yonezawa City in the southern part of Yamagata Prefecture to Yamagata Basin in the central area of Yamagata Prefecture. An isolated agglomeration of factories is observed in Iwaki City, Fukushima Prefecture, in which the previously mentioned Nissan large-scale engine-producing factory is located.

A large number of factories related to automobile production in the Tohoku region are small or medium-sized. According to the responses to a 2003 questionnaire survey distributed by a car agglomeration formation committee⁴, factories with fewer than 50 employees accounted for 50% of all responding factories ; factories with 300 people or more comprised only 6%. This size composition is due to the hierarchical organizations of automobile production, which includes many small subcontractors. For example, the Keihin's factory in Kakuda Basin mentioned earlier is a first-order supplier (subsidiary) that produces engine parts for Honda. The factory has several subsidiaries and subordinate factories around Kakuda Basin ; these are second-order suppliers. Many second-order suppliers also have subcontractors and some of these subcontractors have also their own subcontractors. In general, the further down the hierarchy a factory is the smaller the factory size. Thus, a large percentage of the factories in Tohoku are second- and third-order suppliers with small numbers of employees.

The same questionnaire study surveyed the modes of production among the Tohoku car-related factories, revealing that 73% of the respondent factories produced parts based on blueprints from an enterprise at the delivery destination, and 17% designed their products based on specifications from the delivery enterprise. The percentage of factories producing parts based on their own original designs was only 3%.

The survey showed that 49% of the factories were headquarters factories, and 44% were branch factories. However, subsidiaries of parent companies headquartered in another region were included in the "headquarters factory" category, and therefore, the ratio of headquarters factories in the local capitals is actually smaller than that indicated by the above ratio (49%). It

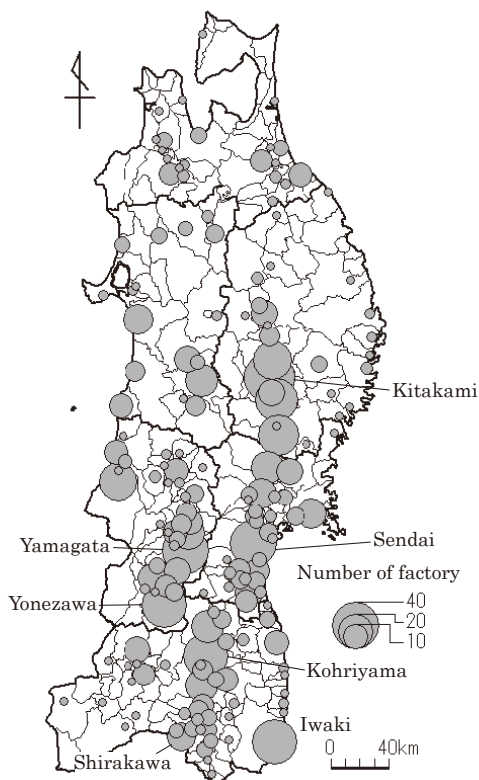


Figure 5 Distribution of factories related to car production in Tohoku (2010)

(Source : The directory of factories related to automobile production introduced by Tohoku Bureau of Economic, Trade and Industry)

can be said that the factories in the local capitals are almost all second and third-order subcontractors. Their shipment destinations tend to be limited to the parent companies and headquarters factories located in the same prefecture or in the Kanto region. According to the survey result, the shipment ratio to the same prefecture and the Kanto region exceeded 70%, except in Akita Prefecture. The shipment ratio to the Tokai region with Toyota and Honda assembly factories was relatively low.

3.3. Earthquake damage

The Japan Industrial Location Center (JILC) surveyed approx. 6,000 enterprise companies across Japan with 150 employees or more in May 2011 to determine the effects of 3.11 earthquake on the companies (JILC, 2011). Survey responses were obtained from 943 companies, of which 287 had factories in the Tohoku region or North Kanto region. Of those 287 companies, 232 were damaged by the earthquake, and 271 companies were influenced by the earth-

quake's damage to customers and/or suppliers.

Forty-one percent of the 943 respondent companies completely stopped production after the earthquake. If the focus is only to companies with factories in Tohoku or North Kanto, the percentage could be expected to be higher, but only 36% of those respondents stopped production at least in part. The percentage of companies that were scheduled to restart production accounts for 92% of the whole. Therefore, it can be said that the number of companies that relocated because of earthquake is small. Actually, 72% of the companies that responded to the survey had restarted all production as of May 20.

Companies that reported being hampered by the electricity shortage after the earthquake accounted for 44% of the entire group of respondents. Moreover, 73% of the 410 companies that reported being influenced by the electricity shortage named the influence of the rolling blackout as a problem. The percentage of respondent company that reported dealing with one or more power failures due to the earthquake was 42%. Sixty-seven percent suffered difficulties in the procurement of materials and parts. The percentage of companies that affected by a gap in logistics was 51%. Because the outsourcing and subcontracting system in the automobile production sector is remarkably developed, the latter two difficulties (difficulties with procurement and logistics) are thought to have been more serious problems than in other sectors. If major automobile manufactures begin to procure their materials and parts from foreign countries rather than Tohoku suppliers, the region may suffer from de-industrialization. This possibility is of great concern in Tohoku.

4. Conclusion

This article examined the appropriateness of the media image of Tohoku as a center of manufacturing after the 3.11 earthquake and the current state of automobile industry in Tohoku. It can be concluded that although Tohoku has certainly overcome its backwardness in industrialization, it is not yet an outstanding region within Japan in light of the scale of its industrial agglomeration and its productivity. However, Tohoku has the competitive advantage of being near the Tokyo Metropolitan Area, which is the country's largest industrial agglomeration area and market. Tohoku is therefore expected to continue to grow as a manufacturing region.

As for the current state of the automobile industry in Tohoku, over 1,000 factories related to car production located in this region including two assembly factories and an engine factory. After the 3.11 earthquake, some Tohoku car parts factories stopped the car production process, and in that sense, it can be said that the auto sector is considerably advanced in Tohoku. The present situation was not imaginable even 20 years ago.

Thinking of the auto sector in Tohoku having entered a real expansion period seems appropriate. The further development of the auto sector in Tohoku greatly depends on how Toyota positions Tohoku in its own production system. The 3.11 earthquake damages pointed out the weakness in the region's system for the procurement and transportation of parts and materials.

The necessity of ensuring a viable infrastructure (e.g. transportation networks) from the viewpoint of not only efficiency but also crisis-management is the next challenge for the auto industry, Tohoku prefectural and local governments, and all interested stakeholders.

Acknowledgements

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Note

- 1) <http://www.bloomberg.com/news/2011-03-11/>
- 2) Japan Broadcasting Corporation broadcasted a special TV program called “*Seizougyou ohkoku tohoku ha tachinaoeruka* [Can the Northeast Japan manufacturing industry kingdom recover?]” on June 1, 2011.
- 3) Three subsidiary companies amalgamated and became Toyota Motor East Japan, Inc. in 2012, whose headquarters was located in the place of Central Motor Co..
- 4) In this investigation, a questionnaire was mailed to 815 factories located in Tohoku's six prefectures, and 236 factories responded.
<http://www.tohoku.meti.go.jp/2008/kikaku/report/jidosyakanren/sanko.pdf>

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