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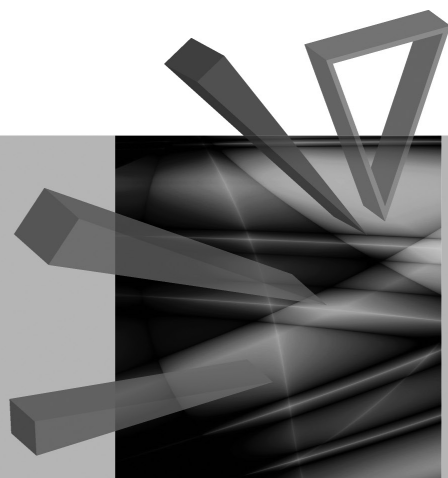
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Clusters, Networks and Markets in the Asia-Pacific Region



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Ken-ichi Ando

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**THE DYNAMICS OF THE INDUSTRIAL CLUSTER
FACING THE FOREIGN EXPANSION
OF THE HOME MULTINATIONALS, THE CHANGES
OF THE AUTOMOTIVE SECTOR IN AICHI
AND THEIR REASONS***

Abstract: The industrial cluster is an important issue in the context of globalisation. This paper intends to empirically make clear the situation and development of industrial cluster for the last decade on the example of the automotive cluster in Aichi prefecture of Japan. From the investigation, the globalisation does not force the hollowing-out of home cluster at the moment, but the internal structural change is actively led by the suppliers, rather than the assemblers.

Keywords: industrial cluster, multinational enterprises, automotive industry, assembly and components sectors.

1. Introduction

When the role of the multinational enterprises (MNEs) in the cluster is examined like in this present Conference, various perspectives can be taken. This is because the clusters themselves are different from one industry to another, while the commitments to the globalisation are variety of ways through the international trade to the foreign direct investment (FDI). However, the present works have the bias leaning to the high-tech sector. As the discussion on the industrial cluster for the last quarter of the century suggests, it is justified of some industry to agglomerate in a certain geographic area based on the external and internal economies of scale. The empirical studies and the policy orientations tend to focus on the high-tech industry, like the information technology (IT) and the biotechnology, and to advocate the open and flat relationships within and among the firms in the cluster. However, there are actually different patterns of the agglomeration, and the hierarchical relationships among firms such as

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the automotive sector is one of the typical examples in this kind. In addition, the industrial cluster came to attract the interests in the context of globalisation, but the main driver of globalisation here is the international trade. Thus, the foreign direct investment (FDI), another engine of globalisation, is not sufficiently addressed. In order to fill the gap of the present works, this paper intends to provide the comprehensive assessment of the hierarchical cluster in the context of the globalisation by the MNEs with the case study of Aichi prefecture, which is the heart of Japanese automotive industry. More specifically, we will investigate the two fundamental questions. One of them is: what kinds of change have occurred in the cluster along with the extension of the foreign production by the main MNEs in the cluster, and the second is: how these changes are explained.

2. Literature survey

In order to justify the theme setting of this work, the present literature should be summarised, and that will make clear the questions missed to be answered despite their significance.

When we consider the industrial cluster, it is quite interesting to point out that two seminar works closely relating the research on the sub-national region or the local coincidentally happen to be published in 1990.¹ M.E. Porter and his followers focus on the significance of the local in the globalisation era. Even if the work by M.E. Porter started to find out the sources of *national* competitiveness based on the famous “Porter’s Diamond,” the research comes to direct to the *sub-national* local, which is called the “industrial cluster.” The important factors influencing the competitive advantage of the locals in the “Porter’s Diamond” are the proximity to the customer, the suppliers basis, the rivalry and competition, and the resource conditions. The configuration of these factors affects the competitiveness of the industry and firms in the area concerned, and influences the performance in the global market. If it is appropriate to construct the arrangement of “Porter’s Diamond” in the local, the local in question could maintain and lead the globalisation process. Therefore, we can say that the research in Porter’s meaning is to examine the basis for the globalisation.

On the other hand, P. Krugman and his colleagues make clear the relationships among the trade cost, the scale economy, and the economic location, and their works are categorised as the New Economic Geography (NEG). If the industry can enjoy the economy of scale, it could reduce the production cost through the concentration of production in fewer numbers of places. At the same time, the concentration of production increases the trade cost from the place of production to that of consumption. If the trade costs including the customs tariffs and other institutional ones decline,

¹ P. Krugman, *Geography and Trade*, MIT Press, Cambridge, MA, 1991; M.E. Porter, *Competitive Advantage of Nations*, Free Press, New York 1990.

that would lead the industry to be more agglomerated than before. This means that while some places would enjoy the concentration of production, others would suffer the loss of the industry in question. In other words, once assumed the scale economy, the development of globalisation is likely to result in the unstable and inequitable equilibrium. Thus, the NEG analyses the impact of globalisation, especially through the international trade, on the local economy.

Indeed, the research orientations are not the same between the industrial cluster and the NEG, but the sub-national geographic area comes to be paid attention from various scholars and policy makers. The attention paid to the local area is further strengthened by the empirical studies of locals, like that of A. Saxenian.² Her analysis compares two high-tech locals in the USA, namely the Route 128 in Massachusetts, and Silicon Valley in California. The former is the typical example of the closed system, while the latter is characterised by the flat and open relationships among the firms. The Route 128 area shows the declining tendency, but the Silicon Valley becomes the most prosperous local in the IT industry. As the main conclusion, she emphasises the importance of openness for the development of rapidly growing industry.

Here, it is worth to point out that the research of the industrial cluster and the cluster policy tend to look at the high-tech industry, and to insist the flat relationships among the firms in the cluster. However, once we put the scale economy into consideration, the cluster should not be restricted to the high-tech sector like the IT and the biotechnology. Actually, other industries also enjoy both the internal and external scale economies very much, and the automotive sector provides the typical example. However, due to the technical and industrial character, the agglomeration pattern of the automotive sector is rather hierarchical, and is also different from the IT. As a result, the impact of globalisation on the cluster may well be different from the argument of A. Saxenian, and others.

Furthermore, the works mentioned above tend to focus on the international trade as the influential factor, but it is not fair to ignore the role of the multinational enterprises, which is another driving force of globalisation. From the view point of international business, for example, J.H. Dunning offers one of the principal works investigating the importance of the sub-national locals.³ Along with the development of globalisation, the significance of nation state becomes to disperse both to the supranational and the sub-national levels. At the supranational level, the international organisations from the GATT/WTO to the regional schemes like the European Union are more likely to influence the environment and conditions for the international business. At the sub-national level, some locals are more prosperous than others, because of the different attractiveness of locals within a country, which is brought about by the industrial agglomeration.

² A. Saxenian, *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*, Harvard University Press, Boston, MA, 1994.

³ J.H. Dunning, Location and the multinational enterprise: A neglected factor?, *Journal of International Business Studies* 1998, vol. 29, pp. 45–66.

Based on the recognition of the importance, the international business scholars conduct the research on the impacts of sub-national locals. For example, M. Crozet et al.⁴ analyse the inward FDI into the sub-national locals in France, while FDI location pattern within Hungary is examined by F. Boudier-Bensebaa.⁵ Both of them find out the positive significance of the industrial agglomeration on the inward-FDI. The analysis of the cases in Poland is undertaken by A. Chidlow et al.,⁶ and confirms that the significance of the industrial agglomeration is positively shown only in some central locals, but not in peripheral ones. Concerning the case in the emerging markets, M. Mukim and P. Nunnenkamp examine the determinant factors of inward-FDI into India, and obtain the positive sign of the agglomeration.⁷ Indeed, all of these works agree on the positive significance of the industrial agglomeration, but their attention is paid to the locals of host economy, not but of home of the MNEs.

On the other hand, there are fewer research studies questioning the MNEs' effects on the industrial cluster of home economy, though some discuss the impacts at the national level. Concerning the effects of MNEs on the home economies, some reports insist that the negative effects cannot be observed. For example, McKinsey Global Institute (2010) suggests the positive impacts of MNEs for the US economy, and lists up the national policy supporting the outward-FDI, as well as the inward-FDI.⁸ Copenhagen Economics conducts the research of the FDI on the EU economy, and the main findings are: 1) outward-FDI brings higher productivity gains, 2) no measurable impact on aggregate employment, and 3) real distribution impacts between skilled workers' gain and unskilled workers' loss or less gain.⁹ I. Geishecker and H. Görg reach the similar conclusion on the asymmetrical impacts of the outsourcing on the skilled and the unskilled workers, that is, the former gains, while the latter loses through the outsourcing practices by German firms.¹⁰ In France, the national impact of the outward-FDI is also confirmed as the positive one by D. Engel and V. Procher.¹¹ In sum, the aggregated impacts of the outward-FDI are likely to be positive, but the local impacts are not still fully investigated at the moment.

⁴ M. Crozet, T. Mayer, J.-L. Mucchielli, How do firms agglomerate? A study of FDI in France, *CEPR Discussion Papers, International Trade*, No. 3873, Centre for Economic Policy Research, London 2003.

⁵ F. Boudier-Bensebaa, Agglomeration economies and location choice, foreign direct investment in Hungary, *Economics of Transition* 2005, vol. 13, pp. 605–628.

⁶ A. Chidlow, L. Salciuviene, S. Young, Regional determinants of inward FDI distribution in Poland, *International Business Review* 2009, vol. 18, pp. 119–133.

⁷ M. Mukim, P. Nunnenkamp, The location choices of foreign investors: A district-level analysis in India, *The World Economy* 2012, vol. 35, pp. 886–918.

⁸ McKinsey Global Institute, *Growth and Competitiveness in the United States: The Role of its Multinational Companies*, McKinsey & Company, 2010.

⁹ Copenhagen Economics, *Impacts of EU Outward FDI. Final Report*, Copenhagen Economics, Copenhagen 2010.

¹⁰ I. Geishecker, H. Görg, Winners and losers: A micro-level analysis of international outsourcing and wages, *Canadian Journal of Economics* 2008, vol. 41, no. 1, pp. 243–270.

¹¹ D. Engel, V. Procher, Home firm performance after foreign investments and divestitures, *The World Economy* 2013, April, pp. 1–16.

On the ground of the above summary, we can say that the hierarchical clusters like the automotive industry are not fully focused on compared with the flat cluster like the IT industry, while the MNEs and their impact on the cluster of MNEs' home are not explicitly studied. For the purpose to fill this gap, we will look at the automotive sector in Aichi prefecture of Japan, in which the automotive assembly, and the parts and components plants of Japanese main automotive companies are located. Before the detail examination, it is better to summarise the situation and the development of globalisation in Aichi.

3. Automotive cluster in Aichi facing globalisation

It can be easily justified to look at Aichi prefecture, for the purpose of examining the industrial cluster of MNEs' home. Aichi is the typical cluster for Japanese automotive sector with Toyota, the largest automotive manufacturer in the world, as well as some plants of other motor vehicle companies, i.e. Mitsubishi Motors and Suzuki. The geographic area size of Aichi is relatively small with 1.4% of Japan, while the population and the GDP are middle size with 5.8% and 6.6% of Japan, respectively.¹² Compared to the general picture, Aichi prefecture enjoys to concentrate the plants of both the auto vehicle assembly, and the parts and components by the main automotive producers.¹³ There are total 72 automotive plants by Japanese main automotive manufacturers including the motor cycle, and the parts and components. Among them, six plants for the assembly, and eight plants for the parts and components production are located in Aichi, whose total number is the same as in Shizuoka prefecture, and much larger than in the third, Gunma prefecture, with just six plants in total. In other words, the location of automotive plants is concentrated mostly in Aichi along with Shizuoka.

At the same time, Aichi is really the home of Japanese auto MNEs. Toyota has its origins and headquarters in Aichi, while the large automotive components companies like Denso, Aishin, and others were also established in Aichi. Toyota expanded abroad initially through the exports, but came to invest abroad for the local production from the late 1980s. As a result, the foreign production of Toyota increased, and exceeded the domestic one from 2007 (Figure 1). This globalisation trend is accelerated after the global financial and economic crisis in 2008. The latest figure in 2012 shows that the Toyota's production abroad is 5.24 million units, which is nearly three times of exports from Japan with 1.95 million units.¹⁴ Of course, this present picture is the result of the past experiences, and the process of globalisation is not always smoothly advanced. For instance, Toyota faced very serious problem

¹² The figures are calculated from the data of Statistics Bureau, Japan, <http://www.stat.go.jp/>.

¹³ Japan Automotive Manufacturers Association, *The Motor Industry of Japan, 2012*, Tokyo 2012.

¹⁴ It should be kept in mind that the production and export of Toyota are not limited within Aichi, but there are some facilities in other parts of Japan. This point will be reconsidered later.

caused by the recalls in the USA between 2009 and 2010. The troubles themselves are, of course, serious for the operation and strategy of the MNEs in question, and have the repercussion for the management at the headquarters in home country. Still, their influence is primarily concerned with the host economy.

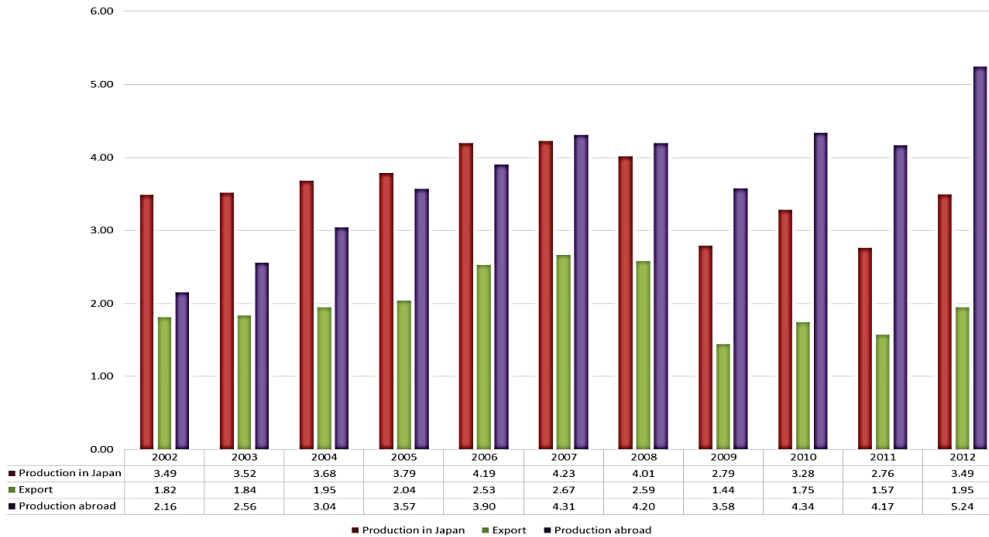


Figure 1. Globalisation of Toyota (million units)

Source: *Toyota no Gaikyo*, Toyota Corp., 2012 [in Japanese, Company Profile].

Here, it should be emphasised that the expansion of foreign production means some implications for the home cluster, which are closely related to our interest. Even if the domestic production slightly increased until 2007, it is at much lower level than the company's own potential. The relative stagnation of production means the cluster cannot fully enjoy the scale economy anymore, which is one of the main factors for the industrial agglomeration. Since Toyota is the main car assembler in Aichi, the customer basis for the component producers has been relatively losing in Aichi in the 2000s, which is one of the important factors of "Porter's Diamond." Thus, it is fair to say that the globalisation through the foreign production may well directly and indirectly affect the industrial cluster of home economy. We should keep the above summarised situation in mind as the background.

4. Situation and change of automotive cluster in Aichi

Facing the globalisation through the expansion of foreign production by the main MNEs in Aichi, the local economy cannot avoid the change, which must be confirmed. For this purpose, the appropriate data must be collected and assessed not at the

national, but at the local level. Mainly two statistics are used for the examination of Aichi. One of them is the “Census of Manufacturers (CoM)” by the Ministry of Economy, Trade and Industry, Japan, and another is the “Trade Statistics of Japan (TSJ)” by the Ministry of Finance, Japan.¹⁵ In order to make clear the situation and its dynamic change of the automotive sector in Aichi, the concentration level of the employment, the shipment value, and the added value will be collected from the CoM. The export data can be obtained from the TSJ, which enables us to assess the competitive position of Aichi in the context of globalisation. Here we have to keep in mind the difference between the assembling and the components producing establishments,¹⁶ since this is quite important to make us understood the internal change in the automotive cluster of Aichi.

Now, we are advancing to confirm the situation and the dynamic change of the automotive cluster in Aichi with the data from the CoM and the TSJ. The concentration level and trend of the automotive sector as a whole can be identified through three indicators, i.e. the employment, the shipment value, and the added value, whereas they are slightly different. Judged from the share of automotive employment in Japan (Table 1a), Aichi has ever enjoyed around 30% in Japan with the increasing trend at least until 2009, although the absolute number reached the peak in 2007 with 282,000

Table 1a. Automotive cluster in Aichi, number of employees

Year	Absolute number (persons)			Share of Aichi in Japan (%)		
	Motor vehicles assembly	Components total	Automotive total	Motor vehicles assembly	Components total	Automotive total
2001	45,685	163,828	209,513	28.5	28.3	28.3
2002	47,227	172,697	219,924	30.2	29.3	29.5
2003	48,719	177,520	226,239	30.3	29.4	29.6
2004	49,842	186,469	236,311	31.1	29.6	29.9
2005	51,723	200,086	251,809	30.6	30.2	30.3
2006	54,391	214,105	268,496	32.2	30.8	31.1
2007	46,583	236,004	282,587	25.5	32.1	30.8
2008	45,714	229,246	274,960	25.0	32.5	30.9
2009	43,450	217,352	260,802	26.1	33.9	32.3
2010	42,611	213,096	255,707	26.4	32.9	31.6

Source: CoM, various issues.

¹⁵ For the details of these two statistics, see the Appendix.

¹⁶ From the data of the CoM, the components sector includes the motor vehicles bodies and trailers, the motor vehicles parts and accessories, and the tires and tubes for auto motives, unless mentioned otherwise.

Table 1b. Automotive cluster in Aichi, Value of Shipments

Year	Absolute value (billion yen)			Share of Aichi in Japan (%)		
	Motor vehicles assembly	Components total	Automotive total	Motor vehicles assembly	Components total	Automotive total
2001	8,561	7,016	15,577	42.1	33.5	37.7
2002	9,099	7,663	16,762	42.2	34.0	38.0
2003	8,975	8,077	17,052	40.6	33.9	37.1
2004	9,205	8,449	17,653	41.1	34.6	37.7
2005	10,077	9,013	19,089	41.9	34.7	38.2
2006	11,728	9,990	21,718	48.8	35.6	41.7
2007	6,545	16,982	23,527	28.6	47.7	40.2
2008	6,207	16,529	22,736	26.4	48.1	39.3
2009	4,016	12,048	16,064	24.2	48.5	38.7
2010	4,543	14,270	18,814	24.5	47.7	38.8

Source: CoM, various issues.

persons. With respect to the shipment (Table 1b), the absolute value of Aichi increased to more than 23 trillion yen until 2007, and then has been showing the declining tendency. As a result, the share of Aichi keeps around 40% in Japan. The most fluctuated trend can be seen in the added value (Table 1c). The share in Japan reached in 2007 with 42.3% with nearly 7 trillion yen, but the share decreased 10 percentage points to 31.7% with 3.7 trillion yen in 2010. Thus, the concentration can be seen in the employment and the shipments, but not in the added value, mainly because of the reduction of production scale for the last few years.

The picture of the whole automotive industry, however, covers the different change between the motor vehicle assembly and the establishments producing components. All three indicators suggest that the assembly sector started to reduce both the absolute value and the share in Japan earlier than the components sector. The employment in the assembly was already at the peak in 2006 with 54,000 persons with 32.2% share in Japan. It reduced to the lowest level in the 2000s with more than 42,000 persons in 2010. Indeed, the absolute number of the components sector was the largest in 2007, but the share in Japan was still nearly 34% in 2009, which contributes to maintain the concentration of the automotive sector as a whole in Aichi.

The shipment value and the added value show the contrast between the assembler and the components sectors. The assembly sector had ever been larger than the components one with respect to the absolute figure until 2006 both in the shipment value and the added value. However, the components sector overtook the assembler

Table 1c. Automotive cluster in Aichi, added value in Aichi

Year	Absolute value (billion yen)			Share of Aichi in Japan (%)		
	Motor vehicles assembly	Components total	Automotive total	Motor vehicles assembly	Components total	Automotive total
2001	2,246	1,870	4,116	45.3	29.9	36.8
2002	2,713	2,108	4,821	46.3	30.0	37.4
2003	2,355	2,142	4,496	41.5	29.3	34.6
2004	2,471	2,253	4,724	45.0	30.5	36.7
2005	2,587	2,343	4,930	41.6	30.7	35.6
2006	3,271	2,452	5,722	52.6	31.0	40.5
2007	1,955	4,847	6,802	34.2	46.7	42.3
2008	1,282	3,820	5,102	26.4	43.1	37.2
2009	698	2,699	3,397	18.9	43.3	34.2
2010	485	3,263	3,748	12.4	41.4	31.7

Source: CoM, various issues.

from 2007. This is quite interesting, since the shipment value of the assembler includes the procured components, which is the shipment value of the components sector. Both sectors' shares of Aichi in Japan further confirm this trend. That of assembly sector was nearly 50% in 2006, but declined by less than quarter in 2010. On the other hand, the components sector reached nearly half of Japanese shipment in 2009. In other words, the components sector becomes less relying on the assemblers in the cluster. The added value fluctuated in the assembly more than that in the components sector. The figures of the absolute value and the share in Japan are the highest in 2006 for the assembly sector, but they declined to the lowest level of the last decade in 2010. Indeed, they are also peaked at in 2007 for the components sector, but the degree of reduction is much smaller.

Because of the concentration of the automotive sector, and the structural change of the relationship between the assembler and the components sectors, the situation of workers shows further unique development. This can be perceived by the wages of the automotive industry in Aichi (Table 2). As the automotive sector has long been the leading industry in Japan, the wage level is much higher than the average in the whole manufacturing sector. However, the cash wage per employee of motor vehicle assembly in Japan with more than 7 million yen exceeds that of Aichi with 6.9 million Yen in 2010. On the other hand, though the level of wages is lower than in the assembly sector, the average wage in the components sector is 5.8 million yen for Aichi, and higher than that of the national average of 5.1 million yen in the same year.

Table 2. Cash wages per employee of automotive sector (10,000 yen, %)

Year	Aichi			Japan			Ratio of (b) to (a)	
	Assembly (a)	Components (b)	Total	Assembly (a)	Components (b)	Total	Aichi (%)	Japan (%)
2001	835	605	655	808	534	594	72.4	66.1
2002	816	596	643	793	535	589	73.0	67.5
2003	817	600	647	773	530	581	73.5	68.6
2004	821	579	630	785	522	575	70.6	66.4
2005	783	594	632	736	523	566	75.8	71.0
2006	771	588	625	736	524	565	76.3	71.1
2007	752	607	631	732	525	566	80.7	71.7
2008	768	639	660	757	547	590	83.1	72.2
2009	669	562	580	692	494	535	84.0	71.4
2010	693	586	604	708	512	551	84.6	72.3

Source: CoM, various issues.

The interesting feature to be mentioned is the convergence trend of wages between the assemblers and the suppliers. As Japanese motor vehicle production shifts from the domestic base to the foreign facilities, the pressure for the increase of wages has been loosened from the early 2000s, when the national average exceeded 8 million yen in 2001, and the Aichi wage level reached the peak of 8.4 million yen in 2001. Since then, the declining trend can be seen for the workers in the assembly plants. Contrary to that, the average wage in components sector maintained the increasing trend until 2008, when the wage reached 6.4 million yen. From these opposite trends between the assembly and the components sectors, the ratio of the average wage in the components sector against the assembly sector increased from 70% level until 2007 to more than 80% for the last 3 years to 2010. This ratio of national average in Japan is much lower, and the difference with Aichi is widening from 6% points in 2001 to 12% points in 2010.

The globalisation of the automotive sector is the cause and the result of the above mentioned situation and change, and we can confirm this by the performance of Aichi's exports.¹⁷ Aichi is the main and leading exporter of Japanese automotive industry, more than its role of production in Japan (Table 3). The automotive exports of Aichi was 6.0 trillion yen in 2012, and amounted to 46.8% of total Japanese

¹⁷ Here, the export of motor vehicle is the passenger cars. The components include the parts of cars, the engines, the electric and electronics equipment for the automotive, and the tires and tubes. Due to the different classification, it is impossible to directly compare the exports data with the data from the CoM, which are summarised above. Still, they are sufficient to follow the situation and the change of Aichi from the perspective of international trade.

Table 3. Export from Aichi

Year	Passenger cars		Components total		Automotive total		Number of passenger cars		Average unit value (million yen)	Components ratio against cars (%)
	Value (billion yen)	Share in Japan (%)	Value (billion yen)	Share in Japan (%)	Value (billion yen)	Share in Japan (%)	Value (,000 units)	Share in Japan (%)		
2000	3,139	51.3	1,104	33.5	4,242	45.0	2,018	45.1	1.56	35.2
2001	3,474	54.1	1,150	34.8	4,624	47.6	1,936	45.4	1.79	33.1
2002	4,048	51.7	1,365	37.2	5,413	47.1	2,086	42.3	1.94	33.7
2003	4,009	50.8	1,428	36.5	5,437	46.1	2,052	40.7	1.95	35.6
2004	4,095	50.7	1,555	36.4	5,650	45.7	2,163	40.9	1.89	38.0
2005	4,555	51.9	1,789	38.0	6,343	47.0	2,303	41.4	1.98	39.3
2006	5,864	53.5	1,986	39.5	4,630	29.0	2,814	42.9	2.03	33.9
2007	6,680	52.7	2,239	40.2	8,919	48.9	3,108	43.3	2.15	33.5
2008	5,856	49.0	2,059	39.9	7,915	46.3	2,915	40.2	2.01	35.2
2009	2,797	48.3	1,573	41.6	4,370	45.6	1,568	41.4	1.78	56.2
2010	3,690	46.7	2,024	40.7	5,714	44.4	2,019	40.3	1.83	54.8
2011	3,042	43.8	1,969	40.6	5,012	42.5	1,797	38.6	1.69	64.7
2012	3,881	50.0	2,120	41.8	6,001	46.8	2,134	42.3	1.82	54.6

Source: TSJ.

automotive exports. The export value is divided into 3.9 trillion yen for the passenger cars and 2.1 trillion yen for the components. The former takes 50.0% of Japanese exports, while the latter 41.8%. However, they are not the highest values of Aichi's export, whose peak was in 2007 in terms of export values and units of passenger cars. Still, compared with the fact that the share of the total export by Aichi is less than 20% of total Japanese exports, as well as the concentration level already shown by other indicators, the high concentration of auto export in Aichi is noteworthy.

Finally, but not least important, the components export from Aichi has been significant more and more without disruption. Aichi exported components worth 1.1 trillion yen in 2000, which was 33.5% share of Japan exports, and 35.2% of the passenger cars' export value. The components sector continuously increased the exports with some fluctuations, and increased its the share in Japan export to 41.8% in 2012. Reflecting this growing trend of Aichi's components export, the ratio of the components export to the passenger cars went up to the highest level with 64.7% in 2011. In other words, the components sector comes to be the equal contributor for the Aichi's export with the assemblers.

Though the importance of Aichi as the automotive cluster in Japan has slightly decreased for the last few years, it still plays the role of the leading local of Japanese automotive production and exports. At the same time, the automotive sector in Aichi experiences the fundamental change of the relationships between the motor vehicle assembly and the components sector.

5. Reasons of the dynamic changes in Aichi

From the facts found in the last section, we should consider two issues in detail. One of them is the relatively high concentration of export from Aichi in Japan, compared to the other indicators of concentration. Another is to ask the reason why the components sector in Aichi can enjoy better performance than the motor vehicle assembly, despite the fact that the latter is the customer basis of "Porter's Diamond." These two issues should not be underestimated, since the automotive cluster in Aichi has been affected by the expansion of foreign production by Toyota locating at the top of the hierarchy in the cluster.

The first question of the relatively high level of the automotive exports from Aichi despite the expansion of foreign production by the leading MNEs can be answered by three factors, that is, the employment practice, the upgrading of export, and the improvement of the components sector. Facing the globalisation through the foreign production, the MNEs in the local of home have to restrict the production costs, so that they can maintain the exports. In Japan, the wage cost is adjusted in two ways. One of them is through the change of over-time work along with the demand. Another is the increased usage of the contract workers, whose wage level is lower than that of the full-time workers. In addition, we should remind that the value added by the assembly sector shows the most fluctuation, and this suggests keeping

the price competitiveness under control at the expense of the wages and the profit. Furthermore, the domestic relocation enables putting the wage costs in Aichi downward. Toyota started the production in Kyushu plants in 1992, which are not directly controlled by Toyota itself, but by Toyota Kyushu, the subsidiary of Toyota. This makes possible the introduction of the wage system different from that in the plants in Aichi, where wage level had ever been the highest in Japan.¹⁸ Thus, the domestic relocation recently turned around the cash wage in Aichi against the national average. These practices enable the assemblers to maintain the competitive edge of exports.

The relatively high share of export from Aichi in Japan is also explained by the qualitative change. The upgrading of exports should be underlined for the case of passenger cars. Indeed, the number of exported passenger cars increased until 2007, to 43.3% in Japanese total, but the share is lower than that of the export value. Calculated from the export value and number of passenger cars, the average unit price increased, at least, from 1.56 million yen in 2000 to 2.15 million yen in 2007. Since 2008, it shows the declining trend to 1.82 million yen in 2012. As Japanese economy has suffered from the deflationary pressure since 1998, the increase of the average price of cars exported from Aichi means the upgrade of models and qualities more than the price-term suggests. For example, Toyota produces and exports the hybrid engine cars like Prius. In other words, the assemblers maintain the sales through the high value exports against the relatively low level of export volume.¹⁹

The third explanation is the improvement of the components sector. As has already been confirmed, the components sector starts not only to concentrate, but also to improve the operation indicators like the added value and the cash wage. The fundamental reasons for this improvement are closely related with the next question, and will be seen in detail further. However, it is still worth to point out that the components sector is one of the factors consisting the “Porter’s Diamond,” and it enables the assemblers to maintain the competitiveness and the exports share from Aichi in Japan through the procurement of the improved inputs.

Even if the improvement of the components sector in Aichi is surely confirmed, and this is one of the reasons to maintain the concentration of car exports from Aichi, this very fact is the important question to be solved. Since the globalisation through the foreign production seems to erode the customer basis in the cluster, we cannot avoid this puzzle. The positive change seen in the components sector can be explained

¹⁸ Nissan followed the same strategy as Toyota in Kyushu through the spin-off of its own plants to the subsidiary in the process of the domestic restructuring in 2011. Nissan itself expects that this would make the Kyushu plants more competitive, see: Nissan decides to establish new company based on its Kyushu plant. New company to be named Nissan Motor Kyushu Co., Ltd., *News Release* 2011, April 22.

¹⁹ The export upgrading strategy is not free from the risk, as is shown by the decline of Aichi after the global crisis in 2008, which heavily affected the higher price models due to the downturn of demand and the increase of the market interest rates.

by the improvement of the competitive edge, the expansion of non-local domestic sales and exports, which enable the suppliers less dependent on the assemblers within the local. However, it is more difficult to follow the business and operation of the components producer within Aichi, except for the CoM data, we have to rely on the general information of the components producers like the various reports by the Japan Automotive Parts Industries Association (JAPIA) in the following discussion.²⁰

First, the suppliers have been advancing the consolidation, so that they can improve their efficiency. As the assemblers demand the high quality components more and more to the suppliers for the lower emission and higher fuel efficiency cars, the components producers have to not only invest more in the R&D, but also to call for the scale economy. The JAPIA reports the business situation annually, and finds out that the number of main suppliers decreased from 443 to 344 between 1999 and 2011. At the same time, the interesting finding is that the number of the biggest companies with more than 200 billion yen sales increased from 8 to 21 in the same period, while those with less than 10 billion yen sales decreased from 223 to 141. According to the CoM, the similar trend of consolidation in the motor vehicle parts and accessories sector in Aichi can be recognised. The number of establishments was reduced from more than 2,000 in 2000 to 1750 in 2010, even if the share in Japan relatively increased from 19.6% to 22.4%. During the same period, the number of employees, and the shipments value per establishment grew very much. The number of employees per establishment increased from 53 to 119 in the same period, while the shipments value per establishment increased from 2.1 billion yen to 8.0 billion yen. Thus, the components sector has promoted the scale economy for the last decade, improved the efficiency, and strengthened the bargaining power against the assembler.

Second, the components companies have expanded their customer bases wider for the last decade. Since the late 1990s, Japanese motor vehicle assemblers have come to face more severe competition, especially from European MNEs based on the “module production,” which requests the suppliers to provide the semi-constructed main components rather than separate parts. This new production system is also introduced in Japan. Actually, H. Ohno, the former president both of Calsonic Kansei, the car components producer, and of the JAPIA, suggests the possibility of new relationships between the assembler and the suppliers (Ohno, 2004).²¹ The conventional relationship between the assembler and the suppliers in Japan was the one-top pyramid with one assembler at the top supported by the tire-one suppliers which were also supported by more tire-two suppliers, and so on. However, along with the introduction of the “module-production system,” H. Ohno insists, the suppliers could and should expand the sales of their products to more customers than

²⁰ The following discussion is based on the data obtained from the various issues of the reports published every year by JAPIA.

²¹ H. Ohno, The shift to the “supra-keiretsu” relationships and the development of “modulation”, *Japanese Automotive Parts Industry* 2003, April (Japanese), pp. 15–28 [in Japanese].

before. He calls this new configuration the Alpine type relationship with some tops, rather than with only one top. As his assessment is proved, the reports by the JAPIA show that the average number of the assemblers to be supplied by one supplier has increased from 5.64 in 1999 to 7.06 in 2011. In addition, the larger a components company is, the more assemblers it supplies. For example, among 21 companies with more than 200 billion yen sales, 20 companies supply more than five assemblers, while only 37 of 141 companies with less than 10 billion yen sales can supply more than five assemblers. It is very impressive that this tendency became clearer in the 2000s. The share of the firms with more than five customers of assembler increased from 87.5 in 1999 to 95.2% in 2011 in the top sales category. Even those in the smallest sales group increased the share from 18.4 to 26.4% in the same period. It is fair to expect that this trend suggests less dependency of the components firms on the assembler in the same cluster.

Third, the foreign production of assemblers is dependent on the main components like the engines and the transmissions from the parent. Indeed, Toyota established the components plants abroad as well as the assembly plants, but all of them did not bring the necessary components facilities simultaneously. The same can be said of the tier-one suppliers, which tend to follow the assembler. Thus, some components still have to be exported from Japan. Here, the following components suppliers may well cultivate new customers abroad, who are supplied from the foreign plants, as well as from Japanese plants. According to the survey reports by the JAPIA on the foreign subsidiaries of Japanese components producer, less than 60% of the foreign subsidiaries' sales go to Japanese assemblers. In other words, the globalisation through the foreign production by Japanese automotive sector may well very much expand the export from Japan, and this enables the components sector in Aichi to maintain and expand their operation in the home cluster.

Final but not least important, the domestic relocation of production can be pointed out. Japanese MNEs do not only shift the production to abroad, but also move it domestically. As the wages level of automotive sector in Aichi had ever been much higher than the national average, it is reasonable to change the location to relatively cheap area. Toyota has 17 plants in total in Japan, but five of them, including assembly ones, are located outside Aichi. For example, the main assembly plant in Fukuoka prefecture by Toyota Kyushu possesses more than 400,000-units production capacity. Although there are some Toyota Kyushu's own components plants in Fukuoka, they are also supplied with the components by others, including the suppliers in Aichi. They can be the customers for the components sector in Aichi. Since there are other assembly and components plants in Fukuoka and Oita prefecture,²² the suppliers in Aichi may well be able to expand the customers outside Aichi through the business experience in Kyushu.

²² Nissan has another plant with more than 400,000-units capacity, while Daihatsu, one of Toyota's group company, has another assembly plant with more than 200,000-units capacity in Oita, next prefecture of Fukuoka.

6. Conclusion

We have just analysed the changes occurred in the hierarchical cluster of the automotive industry in Aichi with the data at the prefectural level rather than at the national level, and the reasons of the found changes for the last decade. The globalisation of the leading MNEs through the expanding production abroad seems to erode the basis of the cluster, but Aichi enjoys higher level of the export concentration than the concentration of the production and the employment. At the same time, the suppliers expand and improve their business, especially compared with the assemblers. Since these findings are not compatible with the expectations from the argument of the industrial cluster or the NEG, the reasons are further considered in more detail. The working and employment practices, the upgrading of cars exported, and the improvement of the suppliers are to contribute for higher concentration of the export value by the automotive sector. The consolidation enables the components sector to enjoy the scale economy, while the extension of customer base to outside Aichi prefecture makes the suppliers in Aichi less dependent on the customer factor in the cluster. The change is not necessarily negative for the firms in the lower tier of the hierarchy in the Aichi automotive cluster, as the wage per employee in the components sector converges to the assembly sector. Summing up, while the globalisation through the leading MNEs in the cluster has the asymmetrical impacts between the assembly and the components sectors, the structural change enables the suppliers to acquire more favourable position through the expansion and improvement of their trade and business within and outside the cluster.

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Appendix. The explanation of the statistic data sources

Census of Manufacturers, CoM:

The CoM reports the situation and operation of the manufacturing industry in very detail every year from 1991. The data at the 4-digit industrial sub classification are available at the prefecture level, which is the most disaggregated in the CoM. The Census reports various data at various levels of aggregation not only in the geographic area, but also in the industrial sectors. The prefecture level data at the 4-digit industrial sub classification include from the number of establishments and employee to the value of inputs, production, shipments, and so on. For our research purpose, we have chosen four sub-classifications, that is, tires and tubes for automotive (Industrial Code, ID 1911 from 2008, ID 2011 until 2007), motor vehicle (ID, 3111), motor vehicle bodies and trailers (ID 3112), and motor vehicle parts and components (ID 3113). The homepage address for the CoM is the following: <http://www.meti.go.jp/english/statistics/tyo/kougyo/index.html>.

Trade Statistics of Japan, TSJ:

The homepage of the TSJ enables us to collect the data at each sea- and airport interactively each year from 1988, and the disaggregated data is available. For the purpose of this research, we collect four industrial sectors of exports, that is, motor vehicles (principal commodity code, 70503), tires and tubes for motor vehicles (principal commodity code, 6030301), vehicle engines (principal commodity code, 70101031), electrical equipment for motor vehicles (principal commodity code, 70325), and parts of motor vehicles (principal commodity code, 70505) at four sea

ports (Nagoya, Gamagori, Mikawa, Kinuura) and one airport (Chubu). Although the sub-classification of trade is slightly different from the CoM code, we carefully check the compatibility between the data of production and trade. The homepage address for the TSJ is the following: http://www.customs.go.jp/toukei/info/index_e.htm.

Japan Auto Parts Industries Association (JAPIA)

As the association of the automotive parts and components companies, the JAPIA conducts the questionnaire survey of the parts industry in various aspects from the general situation of the business to the operation in abroad. The results are published, and can be obtained from the following homepage, although all of them are in Japanese. The author consulted all the issues obtained from the homepage, as well as the publications by JAPIA. The main surveys used in this paper are in the bibliography. JAPIA: <http://www.japia.or.jp/>.

KLASTRY PRZEMYSŁOWE W KRAJU MACIERZYSTYM KORPORACJI TRANSNARODOWYCH NA PRZYKŁADZIE JAPOŃSKIEGO SEKTORA MOTORYZACYJNEGO

Streszczenie: Klastry przemysłowe to niezwykle istotne zagadnienie, szczególnie w kontekście globalizacji. Celem artykułu jest przedstawienie sytuacji oraz rozwoju klastrów przemysłowych funkcjonujących w ostatniej dekadzie w Japonii na przykładzie klastra motoryzacyjnego w regionie Aichi w Japonii. Jest to region macierzysty dla samochodów firmy Toyota, która jest jedną z największych korporacji transnarodowych branży motoryzacyjnej na świecie.

Słowa kluczowe: klastry przemysłowe, korporacje transnarodowe, branża motoryzacyjna, sektor elementów montażowych i komponentów.