Geographical Distribution of Firm Structure and Capital Investment: Cases of Major Japanese Exporters*

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Abstract

A factor behind massive cash reserves held by companies is that they stably continue to receive cash flow over a long term while finding insufficient investment opportunities. Using information on the geographical distribution of production, sales and assets available in corporate financial statements, this study observed how Japan's three major export-oriented manufacturing industries – automobiles, general machinery (machine tools, construction machines, industrial robots, etc.) and electrical machinery (comprehensive electrical machines, electronic devices, etc.) – shifted their geographical distribution of production, sales and assets among the world's four major regions – Japan, North America, Europe and others including Asia – from FY1999 to FY2015. Observed results indicate the following four remarkable findings. First, the three industries reduced Japan's share of their sales and assets continuously and substantially while increasing the share for the others including Asia continuously and substantially from FY1999 to FY2015. Second, nevertheless, as of the mid-2010s Japan was still positioned as a production base for exports characterized by a large existing production capacity and massive sales to other regions. Third, the operating profit ratio for Japan was remarkably higher than for other regions in the observation period, excluding several years after the global financial crisis. Fourth, growth in plant and equipment investment in Japan was slower than in the other regions over a long term. Given these findings, a region-by-region breakdown of production, sales and assets at major Japanese export-oriented manufacturers indicates that a common feature of major Japanese exporters characterized by robust cash flow and fewer investment opportunities is especially true for head offices and corporate divisions located in Japan.

Key words: Production and sales structure, plant and equipment investment, cash flow, geographical distribution

JEL Classification: F23, F21, C31

* We appreciate Professor Takashi Kojima (Chuo University), Mr. Seiki Miyata (KPMG AZSA LLC.) and Mr. Takatomi Yoshida (KPMG AZSA LLC.) for their helpful comments from their professional points of view on various issues in accounting that we discuss in this paper. We also thank Ms. Yu Murakami and Ms. Nanako Wakai for their work to collect financial data. Koibuchi's work was supported by JSPS KAKENHI Grant-in-Aid for Scientific Research(C) Number 15K03553. All there will be errors of this paper is the responsibility of the authors.

I. Introduction

Since the 1980s, many Japanese manufacturing firms have developed a global production and sales network so that they can produce globally and sell products to customers all over the world by establishing foreign subsidiaries and purchasing foreign firms. Especially after the late 1990s, the stagnation of the Japanese economy accelerated such transformation for Japanese firms to further expand their businesses abroad.

Furthermore, the large Japanese firms, especially manufacturers with competitiveness in the global market, started to accumulate a large amount of cash and deposits after the 2000s. Such cash hoarding became temporarily less prominent during the global financial crisis in 2008-2010, when the business conditions of many Japanese exporters steeply deteriorated. However, many Japanese firms increased their outstanding cash and deposits again as the global economy recovered after 2010.

As Froot, *et al*. (1993) point out, a multinational company that produces and sells goods and services in different countries and regions faces a geographical gap between the cash flows from sales and from productions. If investment opportunities and procurement of equipment occur in different countries and regions, the multinational company inevitably faces a geographical gap between cash flows of investments and procurements. Therefore, it is important to recognize the geographic location of a multinational firm's activity including the sales, production, business investments and asset holdings.[1]

The first purpose of this paper is to capture the geographical distribution of production, sales, assets, and investments both at the firm-level and at the industry-level by constructing appropriate indicators. We focus on three major export sectors in Japan: the automobile industry, electrical machinery industry, and general machinery industry. These sectors are not only sectors exporting their products all over the world but are also those having significant influence in the domestic economy. Using financial data available in the annual financial statements of sample firms, including "segment information by region," "foreign sales by region," and "status of major equipment," we construct various indicators to describe the geographical distribution of sales, profit, assets, and equipment by firm and industry.

The second purpose of this paper is to analyze the indicators constructed above and then figure out the main characteristics of the geographical distribution of production, sales, assets, and business equipment aggregated at the industry level.

This paper is organized as follows. Chapter 2 clarifies the standards of selection of sample firms for the analysis and provides a list of sample firms. Chapter 3 describes the characteristics of segment information by region, foreign sales by region, and status of major

[1] As Froot *et al.* (1993) point out, one of issues arising from the multinational firms that have the geographical gap between production and sales is that of exposures against exchange rate fluctuations. For example, Ito, *et al*. (2016) estimate the firm-level exchange rate exposures by using the monthly stock returns of Japanese listed manufactures and examine how the usage of currency risk hedging tools mitigates the exchange rate risk exposures. Goto and Koibuchi (2018) find that by conducting the case study of the large scale cross-border mergers by Japanese firms after 2000s, their exchange rate exposures estimated at firm level also significantly changed after the cross-border merger.

equipment available in annual financial statements. Chapter 4 summarizes the main results of indicators of geographical distribution of production, sales, assets and equipment, aggregated at industry level in each year. Chapter 5 discusses the relationship between cash flow and business investment by region. Chapter 6 summarizes the conclusions and implications from findings in this paper.

II. Sample firms

The sample firms in this paper are major firms listed on the stock exchange in Japan that operate as automobile manufacturers (automotive makers and automobile parts), electrical machinery manufacturers (general electronics, home electronics, electronic parts, semiconductors, and liquid crystal panel), and general machinery manufacturers (construction machinery, machine tools, industrial robot, and heavy equipment).

We use the *Saishin Gyokai Chizu* (The Latest Map of Industry), which is annually issued by *Seibido Shuppan* Publisher, to identify the major firms in each industry. By using the 2014 issue, we chose all listed firms with segment sales by product of more than 200 billion yen in FY2012. If firms experienced annihilation and/or delisting from the stock exchange due to substantial corporate reorganization, such as bankruptcies or mergers with other firms, and sold their major business units to other firms during the sample period from FY1999 (the fiscal year ending in March 2000) to FY2015 (March 2016), we include such delisted firms in our sample until the year of delisting.[2]

According to these standards, we finally chose 72 sample firms, which are listed in Table A-1 (36 automobile manufacturers), Table A-2 (24 electronics manufactures), and Table A-3 (12 machinery manufacturers) in Appendix 1.[3]

Regarding the automobile manufacturers and the electrical machinery manufactures, the sample firms are divided into final goods producers and intermediate goods producers. In contrast, all general machinery manufacturers are capital goods producers.

III. Constructing Indicators of Geographical Distribution

By using the sample firms selected in the previous chapter, this chapter investigates the regions/countries in which the firms produce goods, sell goods, hold assets, and implement business investment by focusing on the geographical distribution of firm structure. For Japanese firms listed on the stock exchange, the data providing this information is available in three categories of information in the financial report annually released by the listed firms: "segment information by region," "foreign sales by region," and "status of major equip-

[2] As we explain in Section IV-1, Table A-4 in Appendix 2 also describes the corporate reorganization such as merger, purchase, spin-offs and so on as well as consolidated relationship among firms within same industry.

[3] Our sample firms extracted from the company list in the *Saishin Gyokai Chizu* by *Seibido Shuppan* cover 86 percent of total number of firms (32 out of 37 firms) and 94 percent of total industry sales in the automobile industry, 61 percent of total number of firms and 95 percent of total industry sales in the electric industry, and 27 percent (12 out of 44 firms) and 70 percent of the industry sales in the machinery industry, respectively.

ment." In this chapter, we describe the basic characteristics of this information and explain how this information provides the basis for constructing the indicators of geographical distribution of production, sales, assets and equipment.

III-1. Segment Information by Region and Foreign Sales by Region

According to Japanese accounting standards, in "information by region" of "accounting standards for disclosure of segment information" (Business Accounting Standard No. 17), if the amount of sales from subsidiaries located in one foreign country to outside customers exceeds 10 percent of total consolidated sales of the income statement, the firm is required to disclose it as a sale to outside customers in the independent segmented category of the country. In the annual financial statements from FY1999 (the fiscal year ending in March 2000) to FY2009 (March 2010) after the standards were introduced, the firms with more than 10 percent of sales to outside customers outside Japan disclose the segment information by region and the foreign sales by region.

Legal entities included in the segment information by region and the foreign sales by region consist of the firm submitting the annual financial report (a parent company) and its consolidated subsidiaries. Thus, while the sales of the consolidated subsidiaries are included in the segment information and foreign sales, the sales of the firms accounted for using the equity method (subsidiaries such that its parent firm's equity share is more than 20 percent and less than 50 percent) are excluded from those as non-consolidated subsidiaries.

In the segment information by region, the firm discloses two kinds of sales (sales to outside customers and internal sales between regions), operating cost, operating profit or loss, and assets (called segment assets) in the regional segments that the parent firms adopt, which are usually major regions including Japan, North America, Europe, Asia, and other regions.

The sales to outside customers in the segment sales by region are calculated based on the regional segments where the parent firm and consolidated subsidiaries are located. This means that in a case where a consolidated subsidiary in the US sold its products to an outside customer (a customer without any capital ties with the firm), the firm appropriates the sale to the US (or North America) region. On the other hand, if the head office located in Japan sold its product directly to an outside customer in the US, the firm appropriates the sale not to the US but to Japan. In this way, the segment sales by region do not depend on the location of outside customers but depend on the location of the parent firms and consolidated subsidiaries.

The internal sales between regions are the sales of intra-firm trade. For example, when a head office or plant (consolidated subsidiaries) in Japan sold their products to a consolidated subsidiary in the US, the firm appropriates the sale to the internal sales in Japan. This is not only done for sales to the US; if the head office or consolidated subsidiaries in Japan export their products to consolidated subsidiaries in Europe, Asia, or other regions, the firm also appropriates the sales to the internal sales in Japan. This means that the internal sales appro-

priated in the Japan regional segment can be interpreted as an approximate amount of total exports from the head office and subsidiaries in Japan to the subsidiaries in regional segments other than Japan. Large Japanese firms have a strong tendency to sell their products to outside customers *via* its own consolidated subsidiaries near the customers (Ito, *et al*. (2008, 2012)). On the one hand, there are also exceptional cases such that a head office of Japanese firm directly sold its products to outside customers in a foreign country and the head office exported its products *via* Japanese trading companies. If the amount of sales by these two cases is limited enough, we interpret the amount of sales appropriated as internal sales in Japan as a good approximate amount of total exports from Japan to the world for the firm. This is also true for the internal sales in regions other than Japan. If the consolidated subsidiaries located in Asian countries operate mainly as export bases to other regions, the firm reports a large amount of internal sales in Asia, which suggests that the amount is approximation of exports from the Asian region to other regions.

The operating cost appropriated in the segment information by region is calculated as the simple sum of the operating cost for head office and/or consolidated subsidiaries in the region. The operating cost in the segment information by region includes in principle depreciation for tangible assets appreciated in the fiscal year. Furthermore, the operating profit in the segment information is calculated by subtracting the operating cost from the sum of sales to outside customers and internal sales (sales to consolidated subsidiaries located in other regions).

The segment information by region also reports the outstanding of assets by region (called segment asset), which is the total assets including tangible and intangible assets held by the head office or foreign subsidiaries (consolidated subsidiaries) located in the region.

The term "foreign sales" refers to the amount of sales that the listed firm reports when the total amount of foreign sales of all regions is more than 10 percent of the consolidated sales. While the sales to outside customers is appropriated based on the location of head office and subsidiaries, the foreign sales is appropriated based on the location of outside customers. The difference is, for example, if the head office directly sold the products to outside customers in the US but not through their foreign subsidiary, then the amount of sales is appropriated in Japan (location of seller) in the segment information by region while the amount of sales is appropriated in the US (location of buyer) in the foreign sales by region. From this point of view, foreign sales by region more precisely captures the geographical distribution of customers and markets for the firm than sales of the segment information by region.

As "foreign sales by region" reports the sales to outside customers located only in foreign countries/regions and not those in Japan, we need to calculate the sales to outside customers in Japan by subtracting total foreign sales from the total consolidated sales to get the amount of sales to outside customers in Japan.

III-2. Categorization into Four Major Regions

The categorization of regions in the "segment information by product" and "foreign

sales by region" is either by four regions including Japan, North America, Europe, and other regions or by five regions if Asia is separated from other regions. As firms can change the regional categorization reflecting the firm's status of foreign activities, the regional categorization attribute of a firm can also change over time. In many cases where sales in Asia and Europe are much smaller than that in North America, the total of sales in these two regions is actually reported in other regions.

To construct the database with continuity from FY1999 to FY2015, we set four regional segments including "Japan," "North America," "Europe," and "other regions" in this paper. The region including Asia was merged with "other regions," which also contains the figures of Latin America, Mid-East, Africa, and so on. This is because only few firms report the Asia regional segment separated from other regions in the early 2000s.

Furthermore, we use country name lists attached to segment information by region and foreign sales by region to categorize foreign sales, internal sales, operating profit, and total assets in the unified standard. The country name lists provide a breakdown of names of countries in order of importance such as sales amount. We categorize the region into the reginal segment that we set according to top country name in the country name list.

III-3. Revision of Accounting Standard

The accounting standard for the segment information, which includes segment information by product, segment information by region, and foreign sales by region, was revised in the annual reports released after March 2011. Consequently, there were significant changes for regional segment data consisting of segment information by region and foreign sales by region. The major changes under the new accounting standard required firms to adopt a "management approach" by allowing firms to report either segment information by product or by region considering the importance of information contributing to management decision of the firms.

It is notable to understand the following three points regarding the adoption of a management approach. First, the change of segment information under the March 2011 revision is only applied to firms adopting Japanese accounting standards at that time. There was no change for the firms adopting US accounting standards or International Financial Reporting Standards (IFRS).[4] Second, only 17 firms (about 30%) chose the segment information by region under the management approach out of the 56 firms in our sample, excluding 14 firms that adopted the US accounting standard.[5] Due to this reason, the segment information by region of many sample firms is not available after FY2010. Third, regarding the foreign sales by region, the firms that adopt the segment information by product under the management approach after FY2010 were newly required to report "information by region," which

[4] The number of listed firms that adopted the IFRS as of March 2011 are quite few, and no such firm in our sample as of March 2011 (see Table A-1, A-2, and A-3 in Appendix 1).

[5] In our sample firms, 16 firms in the automobile industry and 1 firms in the machinery industry adopted the segment information by region after the March 2011 while no firms in the electric industry.

includes sales information based on the location of customers. This figure is basically the same as foreign sales by region.

In summary, while the sales information by region based on the location of customers is basically available for most sample firms even after March 2011, the segment information by region, including sales to outside customers, internal sales, operating cost, operating profit, and total assets, which are based on the location of the firm's head office and subsidiaries, is totally disrupted for most sample firms after March 2011. Therefore, for the sample firms that did not adopt the segment information by region after March 2011, we use only data from FY1999 (the fiscal year ending in March 2000) to FY2009 (March 2010).

III-4. Status of Major Equipment

We use data reported in the status of major equipment (buildings, machines, vehicles, and lands, etc.) held by the head office, domestic (consolidated) subsidiaries, and foreign (consolidated) subsidiaries to calculate the value of equipment and business investment by region of sample firms. Based on the country information where the head office and subsidiaries having major equipment exist, we calculate the aggregated outstanding book values of equipment located in the four major regions including Japan, North America, Europe, and other regions (including Asia). Then we interpret the increment of the aggregate book value of equipment in the region year-by-year as annual business investment in the region. Since the book value of equipment is interpreted as net value after depreciation, business investment is calculated as the net value of investment after depreciation.

In this paper, for all 72 sample manufacturing firms listed in Table A-1 to Table A-3 in Appendix 1, we construct time series data consisting of regional sales, the outstanding value of equipment of the four major regions (Japan, North America, Europe, and other regions including Asia) for the period from FY1999 to FY2015. Regarding the automobile industry, in which the majority of firms chose to provide segment information by region, we construct time series data of internal sales, operating profit, and total assets of the four major regions for the period from FY1999 to FY2015. On the other hand, regarding electric machinery industry and general machinery industry, we construct the time series data for the period from FY1999 to FY2009.

IV. Geographical Distribution of Production, Sales, and Assets

This chapter investigates the main characteristics of data constructed in the previous chapter and makes comparisons among the three major industries. For constructing the aggregated data by industry, we needed to remove the duplicated amount of sales attributed to intra-industry transactions.

IV-1. Removing Two Kinds of Duplicated Transactions within Industry

In aggregating sales among firms having a closely related mutual relationship within each industry, we consider the following two kinds of duplications. The first is duplication coming from the parent-subsidiary relationship among firms. If a sample firm is a consolidated subsidiary (the parent firm's equity share exceeds 50 percent equity share of the subsidiary) of another firm within the same industry, there is no need to aggregate sales, profit, and assets of the subsidiary because its sales, profit, and assets are already appropriated in the consolidated financial statements of the parent firm. In contrast, if a sample firm is a firm accounted for using the equity method (in general, the parent firm's equity share is more than 20 percent but less than 50 percent) of another firm within the same industry, its sales, profit, and assets are not appropriated in the consolidated financial statements of the parent firm. Thus, it is necessary to identify whether a sample firm is a consolidated subsidiary or a firm accounted for using the equity method of another firm within the same industry.

We use information reported in "status of related companies" of annual financial reports of sample firms to identify the parent-subsidiary relationship among sample firms within the same industry. Especially in the automobile and electrical machinery industries, many sample firms have a parent-subsidiary relationship within the industry, and for some firms, such relationship has changed over time (see Table A-4 (A) to (D) in Appendix 2 for details).

To avoid the duplicated appropriation of sales, profit, and assets within an industry, if the firm is the consolidated subsidiary of another firm within the same industry, we exclude the firm from calculating industry aggregation. Conversely, if the firm is accounted for using the equity method of another firm within the same industry, we include it in aggregation.

After considering the parent-subsidiary relationship, another type of duplicated appropriation can still exist. Especially in the automobile and electrical machinery industries, there is a long tradition of inter-firm business relationships among firms within the same industry. These relationships are called *Keiretsu* relationships (industrial group), in which large firms within the same industry have a close business relationship to each other. For example, there is a hierarchical structure consisting of automotive manufacturers, first-, and second-layer suppliers (parts manufacturers) in the Japanese automotive industry. In the *Kigyo Keiretsu Soran* (2000 issue) by Toyo Keizai Shimposha Publisher, major industrial groups in the automobile industry were called Toyota-*kei*, Nissan-*kei*, and Honda-*kei*, respectively. In the electrical machinery industry, industrial groups such as Hitachi-*kei*, Toshiba-*kei*, and Sony-*kei* also exist, though they have much weaker ties than those in the automobile industry. While these industrial groups started to change after the 1990s, it is still necessary to avoid duplicated appropriation in aggregating sales, profit, and assets of firms within an industry. Appendix 3 explains how we remove the duplication in industry level aggregation using information reported in the annual financial reports of sample firms.

Using above methodology, we construct time-series data including sales to outside customers, internal sales, total assets, equipment, and operating profit in each year aggregated

in the three major industries, and we discuss the transitions of geographical distribution of production, sales, assets and other variables using graphs.

IV-2. The Geographical Distribution of Production, Sales, and Assets

The scatters graphs in Figure 1-1(a), Figure 1-2(a), and Figure 1-3(a) plot the share of sales by region (industry-aggregated sales by region based on the location of customers / total industry-aggregated sales of all region) on the horizontal axis and the share of equipment by region (industry-aggregated outstanding of equipment by region / total industry-aggregated outstanding of equipment of all regions) on the vertical axis of the automobile industry, electrical machinery industry, and general machinery industry, respectively. These graphs show the transition of shares over 16 years from FY1999 (March 2000) to FY2015 (March 2016).

The first feature of the graphs that the three major industries commonly share is a declining trend of the share of Japan both in sales and equipment. In particular, the share of sales in Japan experienced a significant decline by around 20 percent from more than 40 percent in March 2000 to 20 percent in March 2016 in the automobile industry, from 60 percent to 45 percent in the electrical machinery industry, and from more than 60 percent to less than 40 percent in the general machinery industry. The outstanding of equipment in Japan also experienced a significant decline by about 20 percent from 80 percent in March 2000 to less than 60 percent in March 2016 in the automobile industry and by around 10 to 15 percent in the electrical machinery and general machinery industries, respectively.

The second feature is that in contrast to the declining share for Japan, the share of other regions including Asia steadily increased over time from FY1999 (March 2000) to FY2015 (March 2016). In particular, the share of sales in other regions increased by about 20 percent in all three major industries. Similarly, the share of equipment in other regions increased from almost zero percent in FY1999 to around 20 percent in FY2015 in the automobile and electrical machinery industries. In the general machinery industry, the share of equipment in other regions increased only after FY2010, remaining at a share less than 10 percent.

The third feature is that we observe relatively stable shares over time in two advanced economies, North America and Europe, during a long period of 17 years. This is in contrast to the significant fluctuations of shares in Japan and other regions in all three major industries. Even though these economies experienced significant economic fluctuations by the global financial crisis and the Eurozone crisis, these events only had a small impact on the shares of both regions.

Figure 1-1(b), Figure 1-2(b), and Figure 1-3(b) show the share of sales by region (industry-aggregated sales by region based on the location of customers / total industry-aggregated sales of all region) on the horizontal axis (same as the horizontal axis in Figure 1-1(a) to Figure 1-3(a)) and the share of total assets by region (industry-aggregated total assets by region / industry-aggregated total assets of all regions) on the vertical axis for the automobile, electrical machinery, and general machinery industries, respectively. As we explained in Chapter 3, the data of total assets by region are only available until FY2009 (March 2010).

Figure 1-1(a) Regional Shares of Sales and Equipment in Automobile Industry from Fiscal Year ending in March 2000 to Fiscal Year ending in March 2016

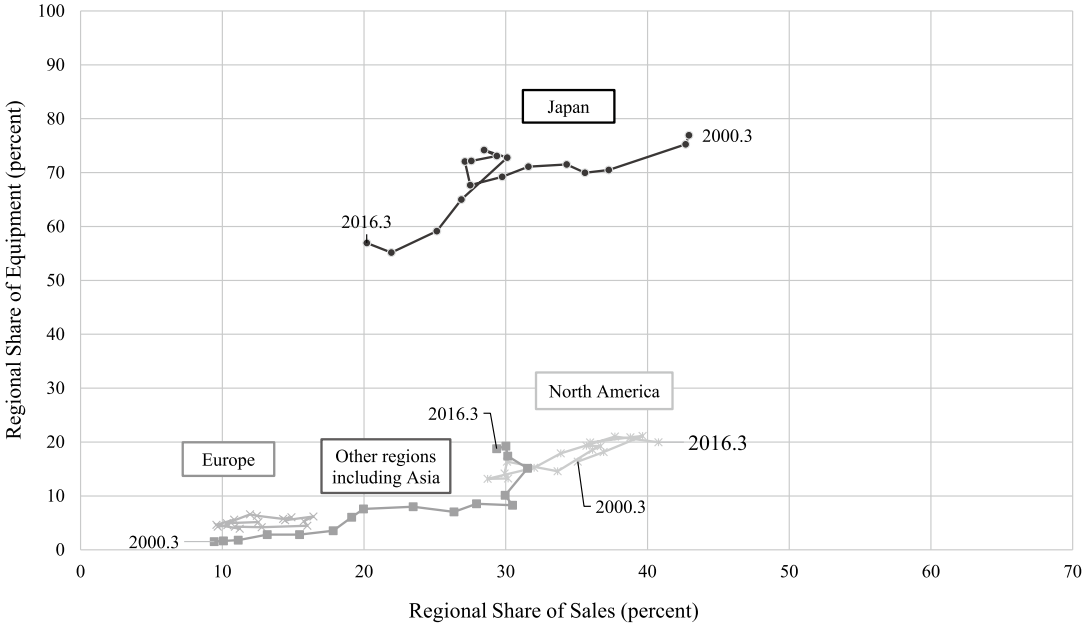


Figure 1-1(b) Regional Shares of Sales and Total Assets in Automobile Industry from Fiscal Year ending in March 2000 to Fiscal Year ending in March 2010

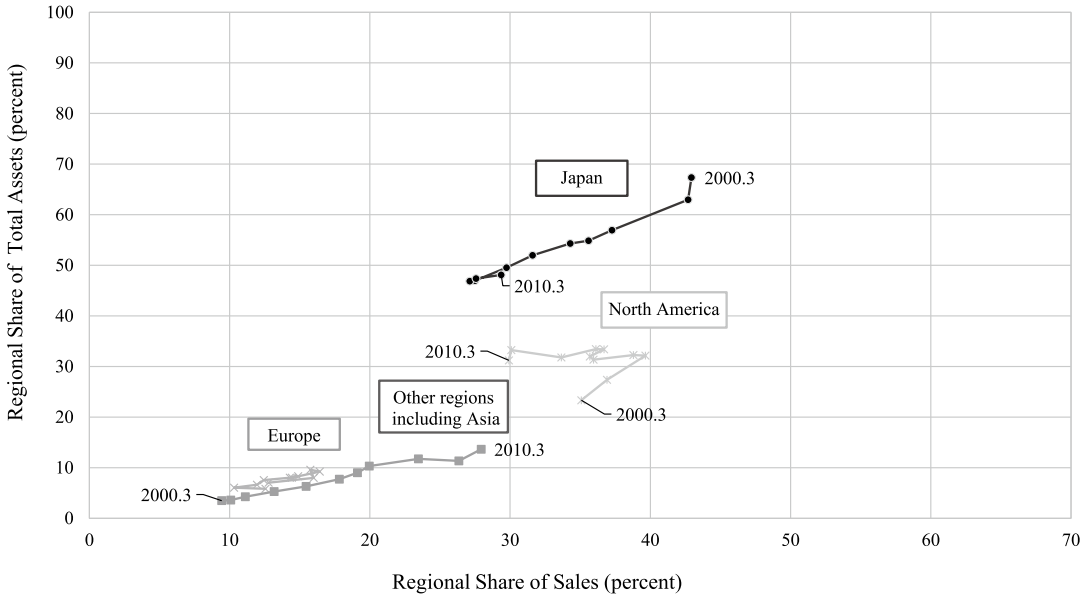


Figure 1-2(a) Regional Shares of Sales and Equipment in Electrical Machinery Industry from Fiscal Year ending in March 2000 to Fiscal Year ending in March 2016

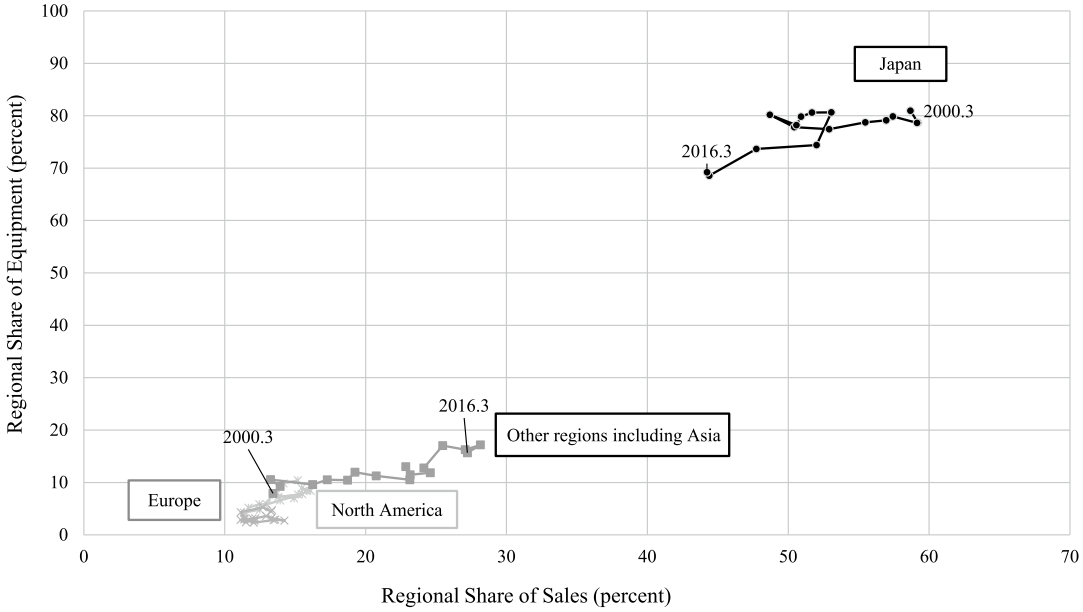


Figure 1-2(b) Regional Shares of Sales and Total Assets in Electrical Machinery Industry from Fiscal Year ending in March 2000 to Fiscal Year ending in March 2010

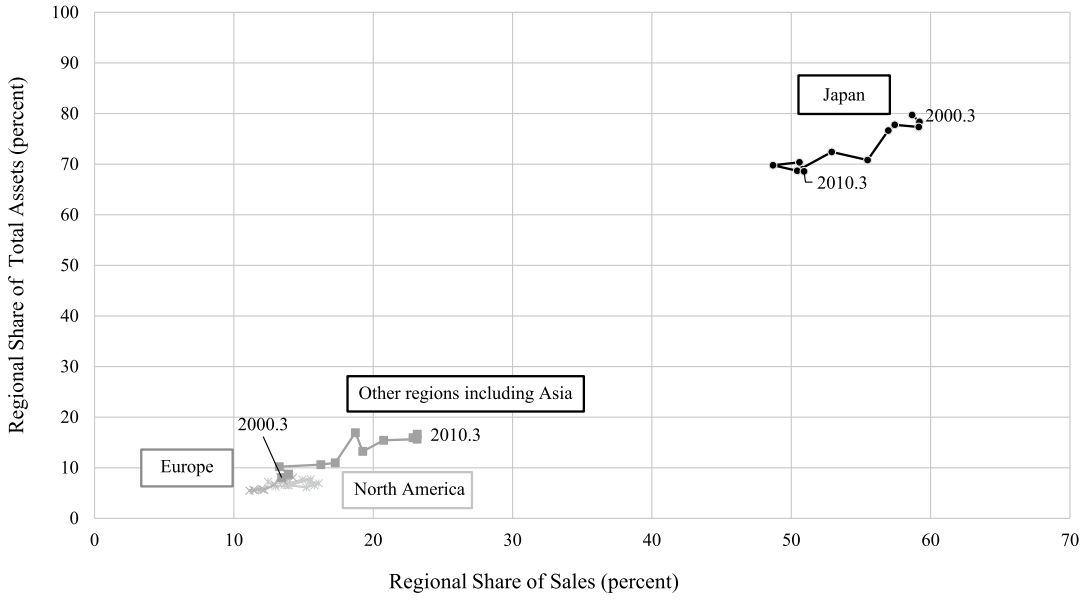


Figure 1-3(a) Regional Shares of Sales and Equipment in General Machinery Industry from Fiscal Year ending in March 2000 to Fiscal Year ending in March 2016

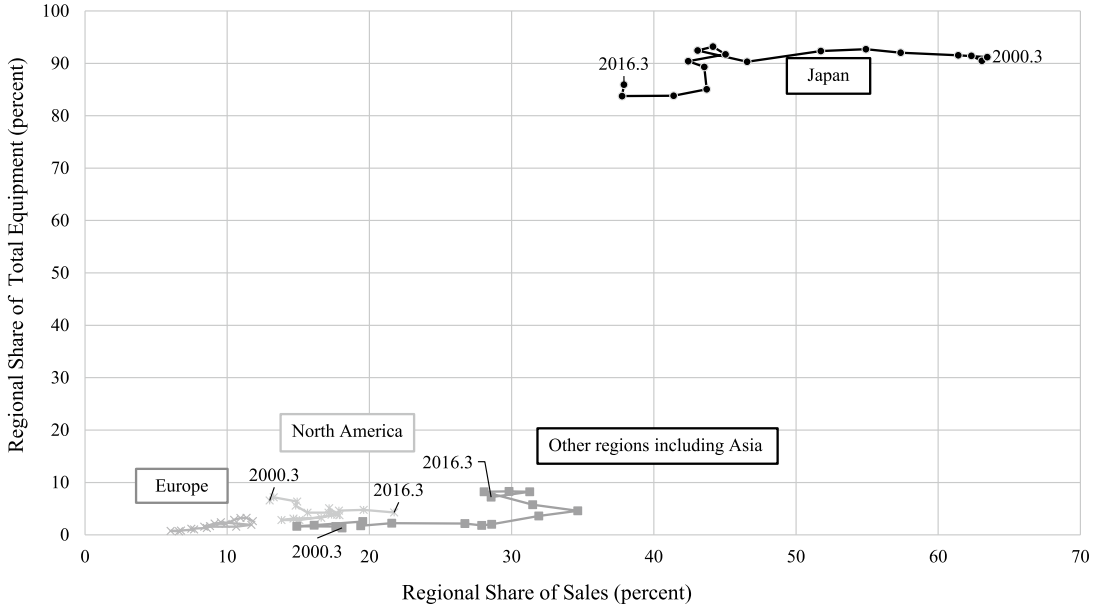
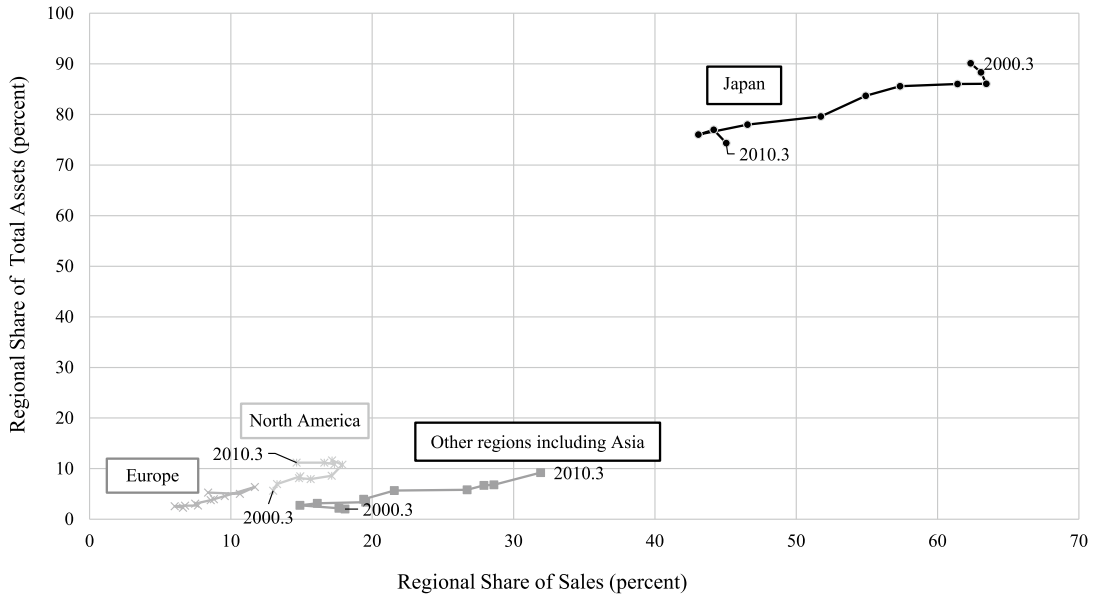


Figure 1-3(b) Regional Shares of Sales and Total Assets in General Machinery Industry from Fiscal Year ending in March 2000 to Fiscal Year ending in March 2010



Therefore, Figure 1-2(b) and Figure 1-3(b) show the plots for only 11 years from FY1999 (March 2000) to FY2009 (March 2010).

The share of total assets by region also shows similar patterns as those shown by the share of equipment by region: the declining trend in Japan and the increasing trend in other regions, while the shares in North America and Europe are relatively stable.

IV-3. The Geographical Distribution of Production and Export

Next, we examine the importance of each region in terms of production and its overseas exporting capability.

As an indicator to represent plants' overseas exporting capability, or export bases, we employ the ratio between industry-aggregated internal sales (sales to other subsidiaries in other regions) by region and industry-aggregated sales to outside customers by region. The ratio is considered an indicator to represent the relative size of the amount of internal sales appropriated in the region (the proxy for intra-firm export from the region) compared to the amount of sales to outside customers appropriated in the region (the proxy for domestic sales in the region).

Figure 2-1, Figure 2-2, and Figure 2-3 are scattered graphs showing the share of equipment by region (industry-aggregated outstanding of equipment by region / total industry-aggregated outstanding of equipment of all regions) on the vertical axis and the ratio between the internal sales and sales to outside customers (henceforth, internal sales ratio) in the region for the automobile, electrical machinery, and general machinery industries, respectively. Thus, the graphs represent the importance of production capability by region on the vertical axis and overseas exporting capability on the horizontal axis.

There are the following three observations from the graphs. The first is that among the three major industries, in the automobile industry (Figure 2-1) and the general machinery industry (Figure 2-3), only the Japan region has a very high internal sales ratio, while none of other three regions have such a high ratio. This shows the significant importance of the Japan region for production's overseas exporting capability.

Second, in the electrical machinery industry (Figure 2-2), the internal sales ratio in other regions (including Asia), is almost equal to the ratio in Japan (from 0.40 to about 0.50), which indicates that plants of the electrical machinery industry in Asia play a similar role to plants in Japan exporting their goods abroad.

Third, as commonly observed in the three major industries, the importance of Japan for exporting plants steadily increased over time from FY1999 (March 2000) to FY2006 (March 2007), and then steeply declined after the global financial crisis. While the importance of the production capability of Japan did not change even during the global financial crisis, the importance of capability to export their products abroad of Japan was intensified until the mid-2000s, seemingly reflecting the declining home demand in Japan and strong demand from the US and European economies. However, the graphs also suggest that once the global financial crisis occurred, exports from Japan significantly declined.

Figure 2-1 Ratio of Internal Sales to Foreign Sales by Region in Automobile Industry from Fiscal Year ending in March 2000 to Fiscal Year ending in March 2016

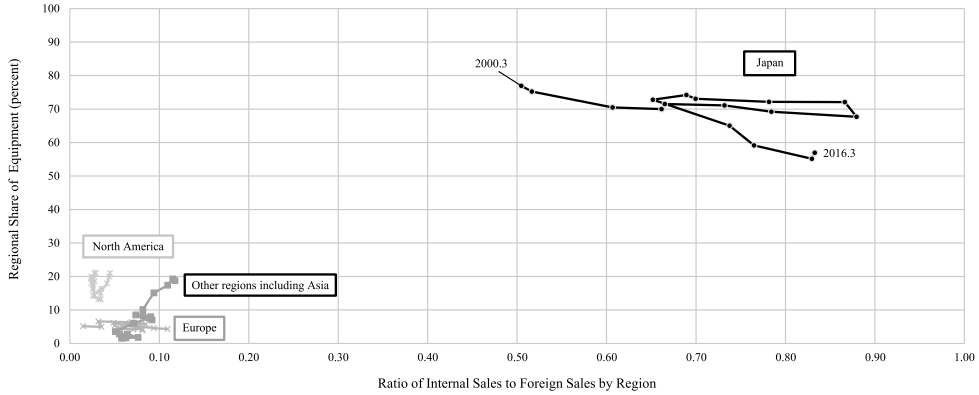


Figure 2-2 Ratio of Internal Sales to Foreign Sales by Region in Electrical Machinery Industry from Fiscal Year ending in March 2000 to Fiscal Year ending in March 2010

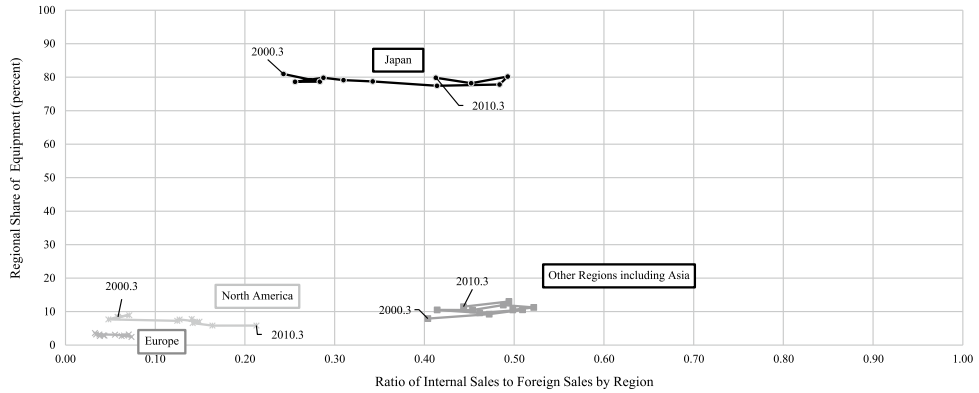
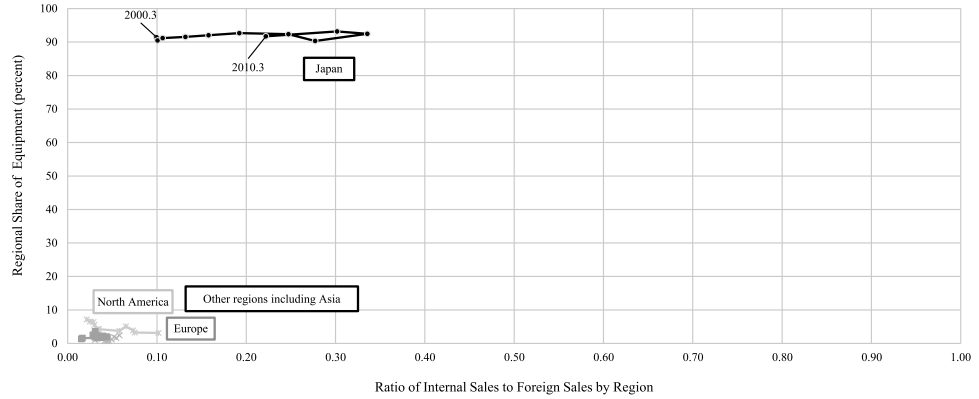


Figure 2-3 Ratio of Internal Sales to Foreign Sales by Region in General Machinery Industry from Fiscal Year ending in March 2000 to Fiscal Year ending in March 2010



IV-4. The Geographical Distribution of Operating Profit

Finally, we examine how much cash flow the sample firms earn in four regions. Figure 3-1, Figure 3-2, and Figure 3-3 show the ratio calculated as industry-aggregated operating profit by region divided by industry-aggregated sales by region of the three major industries. There are 17 years of data from FY1999 (March 2000) to FY2015 (March 2016) for the automobile industry, but only 11 years of data for the electrical machinery industry and the general machinery industry.

We have the following three observations from Figure 3-1, Figure 3-2, and Figure 3-3. First, the head office and subsidiaries in Japan earned a significantly large operating profit compared to the subsidiaries in the other three regions before the aftermath of the global financial crisis (March 2008).

Second, after the global financial crisis, while operating profit in all regions and all three major industries declined steeply, the operating losses in Japan for the automobile industry and the electrical machinery industry were significantly large.

Third, if we focus on the automobile industry (Figure 3-1), which has data during the recovery period from the global financial crisis after FY2010 (March 2011), the operating profit in Japan quickly recovered until FY2012 (March 2013) and then the level of operating profit almost returned to that of the pre-crisis period.

In summary, the evidence that Japan has a significantly large operating profit strongly suggests that head offices in Japan of Japanese manufacturers earned a significantly large cash flow during all periods except for during the global financial crisis. However, the level of operating profit in Japan is much more volatile than those of other three regions.

Results in this chapter indicate the following three remarkable findings. First, the three industries reduced Japan's share of their sales and assets continuously and substantially while increasing the share for the others including Asia continuously and substantially between the beginning of the 2000s and the mid-2010s. Second, as of the mid-2010s, Japan was still positioned as a production base for exports characterized by large existing production capacity and massive sales to other regions. Third, the operating profit ratio for Japan was remarkably higher than for other regions in the observation period, excluding several years after the global financial crisis.

Figure 3-1 Ratio of Regional Operating Income to Total Sales in Automobile Industry from Fiscal Year ending in March 2000 to Fiscal Year ending in March 2016

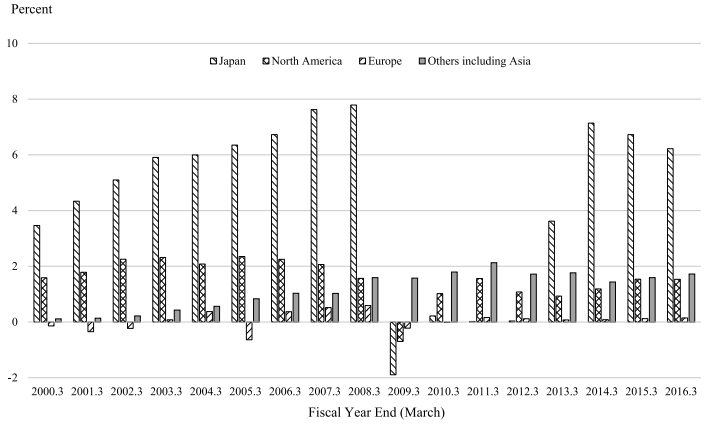


Figure 3-2 Ratio of Regional Operating Income to Total Sales in Electrical Machinery Industry from Fiscal Year ending in March 2000 to Fiscal Year ending in March 2010

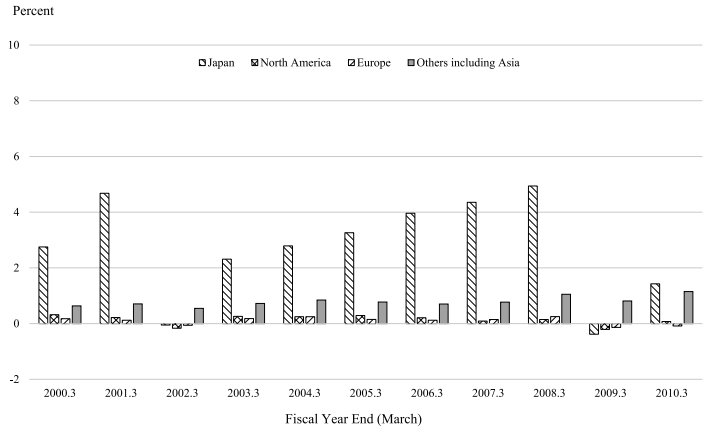
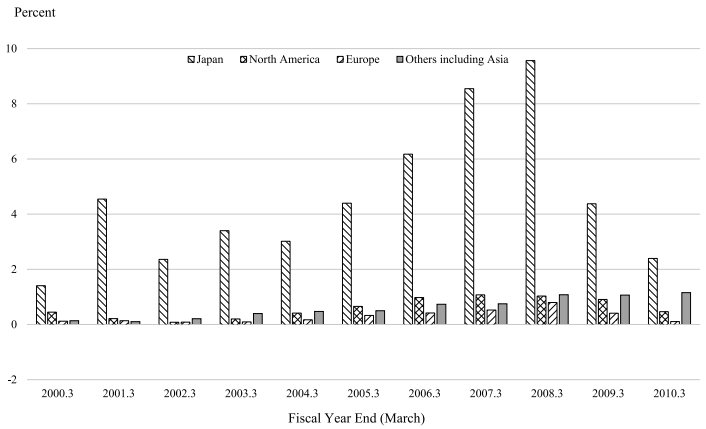


Figure 3-3 Ratio of Regional Operating Income to Total Sales in General Machinery Industry from Fiscal Year ending in March 2000 to Fiscal Year ending in March 2010



V. Cash Flow and Capital Investment by Region in Three Major Industries

As seen in the last chapter, the head office and subsidiaries in Japan earned significantly large operating profits compared to the subsidiaries in the other three regions before the aftermath of the global financial crisis. Though the operating profit in all regions and of all three major industries declined steeply, it quickly recovered after the global financial crisis. The evidence that Japan earned significantly large operating profits for most of the period in 2000s and 2010s strongly suggests there is abundant cash inflow into Japan's head office comparing to the other three regions. However, while there is such characteristics in geographical distribution of cash flow, where do Japanese firms in the three major industries invest their funds? To examine this, in this chapter, we divide the sample period into several periods, and then compare the cumulative cash flow (measured by cumulative operating profit) with cumulative cash outflow for investment opportunities (measured by net capital investment).

Table 1, Table 2, and Table 3 show the relationship between cumulative operating profit and net capital investment in all regions, Japan, North America, Europe, and other regions of the automobile industry, electrical machinery industry, and general machinery industry, respectively.

Table 1 (the automobile industry) shows that industry-aggregated cumulative operating profit in all regions amounted to more than 56 trillion yen during all periods from FY1999 to FY2015. Cumulative operating profit coming from Japan is more than 28 trillion yen, which is 50.6 percent of total operating profit in all regions. North America earns the second largest cumulative operating profit, which amounts to 14 trillion yen, 25.7 percent of all regions. Subsequently, other regions including Asia have almost the same amount of operating profit during the whole sample period while Europe earns only less than 1 trillion operating profit, which is a 1.8 percent share of all regions.

In contract to the significantly large amount of operating profit in Japan, net capital investment in Japan never shows a significant increase during the 16 years, which is only 200 billion yen in entire period, and the growth rate is 2.6 percent from FY2000 to FY2015. In this sense, capital equipment in Japan of the automobile industry is almost constant over 16 years. This evidence suggests that Japanese manufacturers implemented capital investment only to compensate the depreciation, and very few implemented new capital investments to increase production capability in Japan. The region with the largest net capital investment in all regions during the entire period is other regions including Asia, in which the net capital investment amounts to 2.4 trillion yen. This region's growth rate from FY2000 is 1,597 percent during the entire sample period. North America is the region with the second largest new investment during the entire period, with investment amounting to more than 1 trillion yen and the growth rate being slightly less than 70 percent.

If we divide the entire sample period into four sample periods, cumulative operating profit declined to losses in sample period III (from FY2008 to FY2011). Interestingly, in the

Table 1 Cumulative Amount of Cash Flow and Capital Investment by Region in Automobile Industry

Total of all regions Unit: million yen

	I FY2000-FY2003	II FY2004-FY2007	III FY2008-FY2011	IV FY2012-FY2015	Entire period FY2000-FY2015
Cumulative Operating profit	12,970,783	20,152,257	4,956,068	18,401,331	56,480,439
Net capital Investment	554,793 (5.6%)	1,908,143 (18.2%)	-1,972,559 (-15.9%)	3,332,940 (32.0%)	3,823,317 (38.6%)

Japan

	I	II	III	IV	Entire period
Cumulative Operating profit	8,476,173 [65.3%]	11,313,292 [56.1%]	-642,652 [-13.0%]	9,415,622 [51.2%]	28,562,435 [50.6%]
Net capital Investment	-142,138 (-1.9%)	1,435,270 (19.2%)	-1,348,371 (-15.1%)	251,171 (3.3%)	195,932 (2.6%)

North America

	I	II	III	IV	Entire period
Cumulative Operating profit	3,869,845 [29.8%]	5,200,146 [25.8%]	1,581,292 [31.9%]	3,885,447 [21.1%]	14,536,730 [25.7%]
Net capital Investment	465,487 (28.7%)	-282,681 (-13.5%)	-434,902 (-24.1%)	1,374,151 (100.3%)	1,122,054 (69.2%)

Europe

	I	II	III	IV	Entire period
Cumulative Operating profit	-16,882 [-0.1%]	678,976 [3.4%]	13,380 [0.3%]	318,449 [1.7%]	993,923 [1.8%]
Net capital Investment	89,280 (17.4%)	58,710 (9.8%)	-251,674 (-38.1%)	181,841 (44.5%)	78,157 (15.3%)

Other regions

	I	II	III	IV	Entire period
Cumulative Operating profit	641,647 [4.9%]	2,959,843 [14.7%]	4,004,048 [80.8%]	4,781,813 [26.0%]	12,387,351 [21.9%]
Net capital Investment	142,164 (93.6%)	696,845 (236.9%)	62,388 (6.3%)	1,525,777 (144.9%)	2,427,173 (1,597.4%)

(Note) Figure in parentheses in operating profit represents the percent to total of all regions in the period. Figure in parentheses in net capital investment represents the growth rate of capital outstanding during the period.

Table 2 Cumulative Amount of Cash Flow and Capital Investment by Region in Electrical Machinery Industry

Total of all regions Unit: million yen

	Ⅰ FY2000-FY2003	Ⅱ FY2004-FY2007	Ⅲ FY2008-FY2009	Entire period FY2000-FY2009
Cumulative Operating profit	7,121,382	11,399,880	1,399,574	19,920,836
Net capital Investment	-486,999 (-6.3%)	1,097,604 (15.1%)	-846,643 (-10.1%)	-236,038 (-3.0%)

Japan

	Ⅰ	Ⅱ	Ⅲ	Entire period
Cumulative Operating profit	5,044,784 [70.8%]	8,562,898 [75.1%]	542,899 [38.8%]	14,150,581 [71.0%]
Net capital Investment	-527,478 (-8.4%)	957,534 (16.6%)	-706,230 (-10.5%)	-276,174 (-4.4%)

North America

	Ⅰ	Ⅱ	Ⅲ	Entire period
Cumulative Operating profit	304,966 [4.3%]	430,269 [3.8%]	-80,116 [-5.7%]	655,119 [3.3%]
Net capital Investment	-125,366 (-19.2%)	23,421 (4.4%)	-111,216 (-20.2%)	-213,161 (-32.6%)

Europe

	Ⅰ	Ⅱ	Ⅲ	Entire period
Cumulative Operating profit	262,687 [3.7%]	406,325 [3.6%]	-124,239 [-8.9%]	544,773 [2.7%]
Net capital Investment	15,207 (7.2%)	1,068 (0.5%)	-13,091 (-5.8%)	3,184 (1.5%)

Other regions

	Ⅰ	Ⅱ	Ⅲ	Entire period
Cumulative Operating profit	1,508,945 [21.2%]	2,000,388 [17.5%]	1,061,030 [75.8%]	4,570,363 [22.9%]
Net capital Investment	150,638 (24.5%)	115,581 (15.1%)	-16,106 (-1.8%)	250,113 (40.6%)

(Note) The figure in parentheses under operating profit represents the percent of total of all regions in the period. The figure in parentheses under net capital investment represents the growth rate of capital outstanding during the period.

Table 3 Cumulative Amount of Cash Flow and Capital Investment by Region in General Machinery and Heavy Equipment Industry

Total of all regions Unit: million yen

	I FY2000-FY2003	II FY2004-FY2007	III FY2008-FY2009	Entire period FY2000-FY2009
Cumulative Operating profit	1,548,238	3,877,854	1,153,308	6,579,400
Net capital Investment	-211,117 (-8.7%)	224,873 (10.1%)	117,942 (4.8%)	131,698 (5.4%)

Japan

	I	II	III	Entire period
Cumulative Operating profit	1,300,471 [84.0%]	2,799,192 [72.2%]	660,696 [57.3%]	4,760,359 [72.4%]
Net capital Investment	-179,955 (-8.1%)	217,296 (10.6%)	90,424 (4.0%)	127,765 (5.8%)

North America

	I	II	III	Entire period
Cumulative Operating profit	87,686 [5.7%]	451,161 [11.6%]	166,902 [14.5%]	705,749 [10.7%]
Net capital Investment	-65,291 (-41.0%)	-26 (-0.0%)	-14,235 (-15.1%)	-79,552 (-49.9%)

Europe

	I	II	III	Entire period
Cumulative Operating profit	47,074 [3.0%]	253,936 [6.5%]	63,817 [5.5%]	364,827 [5.5%]
Net capital Investment	9,610 (58.1%)	20,172 (77.1%)	-6,658 (-14.4%)	23,124 (139.7%)

Other regions

	I	II	III	Entire period
Cumulative Operating profit	113,007 [7.3%]	373,565 [9.6%]	261,893 [22.7%]	748,465 [11.4%]
Net capital Investment	24,519 (76.0%)	-12,569 (-22.1%)	48,411 (109.5%)	60,361 (187.0%)

(Note) The figure in parentheses under operating profit represents the percent of total of all regions in the period. The figure in parentheses under net capital investment represents the growth rate of capital outstanding during the period.

same period, the cumulative operating profit in North America, which was the epicenter of the global financial crisis, indicates a slightly positive value (1.6 trillion yen) while other regions including Asia also earned 4 trillion yen in cumulative operating profit during the same period. Conversely, in this period III, Japan had 640 billion yen in operating losses and the amount of net capital investment declined by 1.3 trillion yen (-13 percent comparing to the previous sample period).

Table 2 (the electrical machinery industry) and Table 3 (the general machinery industry) share the same features with Table 1 (the automobile industry) in several aspects. Regarding the electrical machinery industry, while cumulative operating profit in Japan during the entire sample period was about 71 percent of cumulative operating profit of all regions, the amount of net capital investment in Japan is negative, meaning the capital stock shrunk by 4.4 percent over 10 years in the 2000s. Regarding the general machinery industry, while cumulative operating profit in Japan was about 72 percent of all regions, net capital investment in Japan increased by only 5.8 percent, which suggests that outstanding capital in Japan is almost constant over 10 years. Both in the electrical machinery industry and the general machinery industry, the share of cumulative operating profit of other regions including Asia over all regions is the second largest behind Japan, at 23 percent and 11 percent, respectively. On the other hand, regarding net capital investment, other regions are the largest region by amount of net capital investment and its growth rate in the electrical machinery industry. In the general machinery industry, the other regions have the largest growth rate of net capital investment though the amount of net capital investment is behind Japan.

In summary, the results in this chapter indicate that robust cash flow and fewer opportunities for plant and equipment investment characterize head offices and subsidiaries of Japanese companies located in Japan.

VI. Conclusion

In this paper, we construct indicators to represent the geographical distribution of production, sales, assets, and capital investment of three major industries using data available in the annual financial reports of Japanese listed companies.

Observed results indicate the following four remarkable findings. First, the three industries reduced Japan's share of their sales and assets continuously and substantially while increasing the share for the other regions including Asia between the beginning of the 2000s and the mid-2010s. Second, as of the mid-2010s Japan was still positioned as a production base for exports characterized by a large existing production capacity and massive sales to other regions. Third, the operating profit ratio for Japan was remarkably higher than for other regions in the observation period, excluding several years after the global financial crisis. Fourth, growth in plant and equipment investment in Japan was slower than in the other regions over a long term. Given these findings, a region-by-region breakdown of production, sales and assets at major Japanese export-oriented manufacturers indicates that robust cash flow and fewer opportunities for plant and equipment investment characterize head offices

and corporate divisions of Japanese companies located in Japan that have built networks of local subsidiaries in major regions of the world.

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Appendix 1. List of Sample Firms

Table A-1 Automobile Industry (36 firms)

Final Goods Producers (Automotive Manufacturers)	Parts Suppliers (Automotive components manufacturers)
Toyota Motor Corporation^{T} (7203) (US)	
Daihatsu Motor^{T} (7262) (Reg.)	
Hino Motors^{T} (7205) (Reg.)	
	Toyota Auto Body^{T} (7221) (n.a.)
	Kanto Auto Works^{T} (7223) (Pr.)
	Toyota Boshoku Corporation^{T} (3116) (Reg.)
	Denso Corporation^{T} (6902) (Reg.)
	Aisin Seiki^{T} (7259) (Pr.)
	Toyota Industries Corporation^{T} (6201) (Pr.)
	Toyoda Gosei^{T} (7282) (Pr.)
	JTEKT Corporation^{T} (6473) (Pr.)
	Toyoda Machine Works^{T} (6206) (merged with Koyo Seiko to be JTEKT in 2005)
	Koito Manufacturing^{T} (7276) (Reg.)
	Tokai Rika^{T} (6995) (Reg.)
	Futaba Industrial^{T} (7241) (Reg.)
Nissan Motor^{N} (7201) (Pr.)	
	Unipres Corporation^{N} (5949) (Reg.)
	Nissan Shatai^{N} (7222) (Pr.)
	Calsonic Kansei Corporation^{N} (7248) (Reg.)
	Aichi Machine Industry^{N} (7263) (Pr.)
Honda Motor^{H} (7267) (US)	
	Yachiyo Industry^{H} (7298) (Reg.)
	TS Tech^{H} (7313) (Reg.)
	Keihin Corporation^{H} (7251) (Reg.)
	Showa Corporation^{H} (7274) (Reg.)
Mitsubishi Motors Corporation (7211)(Pr. & Reg.)	
Subaru Corporation (7270)(Pr.)	
Isuzu Motors (7202)(NA)	
Mazda Corporation (7261)(Reg.)	
Suzuki Motor Corporation (7269)(Pr.)	
	NSK (6471)(Pr.)
	NOK Corporation (7240)(Pr.)
	NTN Corporation (6472)(Reg.)
	NHK Spring (5991)(Pr.)
	Takata Corporation (7312)(Reg.)
	KYB Corporation (7242)(Pr.)

(Note) Superscripts attached to firm name represents: T for firms affiliated with the Toyota keiretsu group, N for firms affiliated with the Nissan keiretsu group, and H for firms affiliated with the Honda keiretsu group. The figure in parentheses attached to the firm's name is the listed company code on the Tokyo Stock Exchange. Information in parentheses next to the company code represents: (US) the company adopted US accounting standards before FY2010, (Pr.) the company adopted segment information by product according to management approach after FY2010, (Reg.) the company adopted segment information by region according to management approach after FY2010, (n.a.) the company omitted both segment information by product and by region, and (Pr. & Reg.) the company reports both of segment information by product and by region.
(Source) Listed firms in automobile industry with industry-segment-sales more than 200 billion yen as of FY2013 listed in *Saishin Gyokai Chizu* 2014 (The Latest Map of Industry as of Year 2014) by Seibido Shuppan Publisher.

Table A-2 Consumer Electronics and Electronic Components (24 firms)

Final Goods Producers (Consumer Electronics)	Parts Suppliers (Electronic components, semiconductors, and LCDs)
NEC Corporation (6701)(Pr.)	
Fujitsu (6702)(Pr.)	
Panasonic Corporation (6752)(US)	
Sharp Corporation (6753)(Pr.)	
Hitachi (6501)(US)	
Mitsubishi Electric Corporation (6503)(US)	
Toshiba Corporation (6502)(US)	
Sony Corporation (6758)(US)	
Daikin Industries (6367)(Pr.)	
Fujitsu General (6755)(Pr.)	
	TDK Corporation (6762)(US)
	Alps Electric (6770)(Pr.)
	IBIDEN (4062)(Pr.)
	OMRON Corporation (6645)(US)
	Nitto Denko corporation (6988)(Pr.)
	Nidec Corporation (6594)(US)
	Hosiden Corporate (6804)(Pr.)
	Minebea (6479)(Pr.)
	Murata Manufacturing (6981)(US)
	Elpida Memory (6665)(n.a.)
	Renesas Electronics Corporation (6723)(n.a.)
	ROHM (6963)(Pr.)
	Japan Display (6740)(n.a.)
	Kyocera Corporation (6971)(US)

(Note) The figure in parentheses attached to the firm's name is the listed company code on the Tokyo Stock Exchange. Information in parentheses next to the company code represents: (US) the company adopted US accounting standard before FY2010, (Pr.) the company adopted segment information by product according to management approach after FY2010, (Reg.) the company adopted segment information by region according to management approach after FY2010, (n.a.) the company omitted both of segment information by product and by region, and (Pr. & Reg.) the company reports both of segment information by product and by region.
(Source) Listed firms in electric industry with industry-segment-sales more than 200 billion yen as of FY2013 listed in *Saishin Gyokai Chizu 2014* (The Latest Map of Industry as of Year 2014) by Seibido Shuppan Publisher.

Table A-3 General Machinery and Heavy Equipment (12 firms)

Capital Goods Producers (Construction Machinery, Machine Tools, Industrial Robots, Semiconductor Manufacturing Equipment, and Heavy Equipment)
Kubota Corporation (6326)(US)
Komatsu (6301)(US)
Hitachi Construction Machinery (6305)(Pr.)
FANUC Corporation (6954)(Pr.)
Yaskawa Electric Corporation (6506)(Pr. & Reg.)
Tokyo Electron (8035)(Pr.)
IHI Corporation (7013)(Pr.)
Sumitomo Heavy Industries (6302)(Pr.)
Hitachi Shipbuilding Corporation (7004)(Pr.)
Mitsui Engineering & Shipbuilding (7003)(Pr.)
Mitsubishi Heavy Industries (7011)(Pr.)
Kawasaki Heavy Industries (7012)(Pr.)

(Note) The figure in parentheses attached to the firm's name is the listed company code on the Tokyo Stock Exchange. Information in parentheses next to the company code represents: (US) the company adopted US accounting standard before FY2010, (Pr.) the company adopted segment information by product according to management approach after FY2010, (Reg.) the company adopted segment information by region according to management approach after FY2010, (n.a.) the company omitted both of segment information by product and by region, and (Pr. & Reg.) the company reports both of segment information by product and by region.
(Source) Listed firms in general machinery industry and heavy equipment with industry-segment-sales more than 200 billion yen as of FY2013 listed in *Saishin Gyokai Chizu 2014* (The Latest Map of Industry as of Year 2014) by Seibido Shuppan Publisher.

Appendix 2. Equity Participation and Parent-Subsidiary Relationship among Sample Firms

Table A-4 Equity Relationship in the Automobile Industry and the Electrical Machinery Industry

(A) Toyota group companies

		Fiscal year end (March)																
code	name	2000.3	2001.3	2002.3	2003.3	2004.3	2005.3	2006.3	2007.3	2008.3	2009.3	2010.3	2011.3	2012.3	2013.3	2014.3	2015.3	2016.3
7203	Toyota Motor Corporation	Parent company																
7262	Daihatsu Motor	Consolidated subsidiary																
7205	Hino Motors	Affiliated company		Consolidated subsidiary														
7221	Toyota Auto Body	Consolidated subsidiary																
7223	Kanto Auto Works	Consolidated subsidiary													Consolidated subsidiary (Toyota Motor East Japan)			
3116	Toyota Boshoku Corporation	Consolidated subsidiary(Toyota Boshoku)						Affiliated company										
6902	Denso Corporation	Affiliated company																
7259	Aisin Seiki	Affiliated company																
6201	Toyota Industries Corporation	Affiliated company																
7282	Toyota Gosei	Affiliated company																
6473	JTEKT Corporation	Koyo Seiko						Affiliated company										
6206	Toyota Machine Works	Affiliated company(Toyota Motor)						(merged with Koyo Seiko to be JTEKT)										
7276	Koito Munufacturing	Independent																
6995	Tokai Rika	Independent																
7241	Futaba Industrial	Independent																

(C) Nissan group companies

		Fiscal year end (March)																
code	name	2000.3	2001.3	2002.3	2003.3	2004.3	2005.3	2006.3	2007.3	2008.3	2009.3	2010.3	2011.3	2012.3	2013.3	2014.3	2015.3	2016.3
7201	Nissan Motor	Parent company																
7222	Nissan Shatai	Consolidated subsidiary																
7263	Aichi Machine Industry	Consolidated subsidiary																
7248	Calsonic Kansei Corporation	Affiliated company																
5949	Unipres Corporation	Affiliated company				Independent												

(B) Honda group companies

		Fiscal year end (March)																
code	name	2000.3	2001.3	2002.3	2003.3	2004.3	2005.3	2006.3	2007.3	2008.3	2009.3	2010.3	2011.3	2012.3	2013.3	2014.3	2015.3	2016.3
7267	Honda Motor	Parent company																
7298	Yachiyo Industry	Affiliated company							Consolidated subsidiary									
7313	TS Tech	Affiliated company																
7251	Keihin Corporation	Affiliated company																
7274	Showa Corporation	Affiliated company																

(D) Consumer Electronics and Electronic Components Companies

		Fiscal year end (March)																
code	name	2000.3	2001.3	2002.3	2003.3	2004.3	2005.3	2006.3	2007.3	2008.3	2009.3	2010.3	2011.3	2012.3	2013.3	2014.3	2015.3	2016.3
6911	Panasonic Electric Works	Affiliated company(Panasonic)					Consolidated subsidiary(Panasonic)							100% owned subsidiary(Panasonic)				
6764	SANYO Electric	Independent										Consolidated subsidiary (Panasonic)		100% owned subsidiary(Panasonic)				
6755	Fujitsu General	Affiliated company(Fujitsu)																
6723	Renesas Electronics Corporation	listed in 2003.7			NEC Electronics(Merged with Renesas Technology in 2010.4) (Consolidated subsidiary(NEC))								Affiliated company (HITACHI・Mitsubishi Electric・NEC)			Independent (owned by INCJ)		
6665	Elpida Memory	listed in 2004.11				Affiliated company	Independent							applied the Corporate Rehabilitation Law in 2012.2(delisted)				
6740	Japan Display	listed in 2014.3														Independent (owned by INCJ)		

Source: Annual financial reports of each firm

Appendix 3. Methodology to Remove Duplicated Transactions within Same Industry

First, we subtract the amount of sales to firms within the same industry from the total amount of sales of all sample firms within the industry using data from "sales amount and its share to total sales by major customer" (which is released if the share to one customer exceeds 10% of total sales) in "status of production, procurement, and sales" of the annual financial report.

Second, we check the results of the first step using almost the same sales information as above, which is available in "information by major customer" in "related information" of annual financial report.

Third, we subtract the amount of sales to "related firms" (including parent firms, subsidiaries, firms accounted for equity method, and major shareholders) within the same industry from total amount of sales of all sample firms within the industry using data from "transaction with subsidiaries of parent firms submitted the consolidated financial report."