Identifying firm heterogeneity in Japan by developing TEC and TEC plus data[1]

Satoru Hagino

(Summary)

For improving OECD's Trade in Value Added (TiVA) indicators, incorporating gaps in imported intermediate ratios between exporting and non-exporting firms into extended supply-use of input-output table is considered important. In this context, this paper tries to prove the existence of firm heterogeneity in such ratios between exporting and non-exporting firms, as well as domestically and foreign-controlled firms in Japan by developing Japan's Trade by Enterprise Characteristics (TEC) Statistics and its extension (TEC plus). My observation is that, in Japan, firm heterogeneity in terms of imported intermediate ratios differs between processing/assembly industries such as electronics and automobiles and primary material industries such as chemicals and textiles. Such a finding casts a question about OECD's treatment of firm heterogeneity in extended supply-use or input-output table.

1. Introduction

Global Value Chains (GVCs hereafter) have been developed in today's global economy. Under this situation, traditional measures of trade, which record gross flows of goods and services each and every time they cross borders, tend to be inflated and could be misleading. In this light, WTO and OECD developed TiVA indicators and published the first estimates in 2013. The TiVA measures flows related to the value that is added (labor compensation, other taxes on production and operating surplus, or profits) by a country in the production of any good or service that is exported.

The OECD has set up an expert group on Extended Supply Use Table (ESUT) to improve the quality of Trade in Value Added (TiVA) indicators by extending countries' supply-use or input-output tables. In this

1 The views expressed in this paper are those of the author and do not necessarily reflect the views of Fukuyama University. The author thanks Mr. Tetsuro Sakamaki and Mr. Kingo Toyoda, Executive Research Fellows of the ESRI, Mr. Shuji Hasegawa, Head of ESRI's National Accounts Department, Yosuke Tada, Head of Planning and Research Division of this Department, Ms. Maki Tokoyama and Mr. Shinji Tahara, researchers of ESRI's National Accounts Department, Ms. Sonoe Arai, researcher of the RIETI, Norihiko Yamano, economist of the OECD, and Shouji Haruna, professor of Fukuyama University, for their useful comments.

extension, the Trade by Enterprise Characteristics (TEC) and TEC plus statistics are regarded highly useful.

TEC disaggregates international trade data (imports and exports) by the characteristics of trading firms. The OECD and Eurostat have developed TEC data, based on recent research in international trade suggesting the existence of heterogeneity among firms within an industry or a country. Also, the OECD has proposed to develop TEC plus, which sheds light on intermediate imports. It is expected that by identifying additional elements of firms' heterogeneity and incorporating them in countries' input-output or supply-use tables, TiVA will draw a more accurate picture of international trade.

The OECD-Eurostat TEC exercise covers 34 countries, mainly in Europe and North America; most OECD countries in Asia-Pacific area have not participated in the regular TEC exercise. Japan and other Asia-Pacific countries have been encouraged to develop TEC and TEC plus. To allocate resources for the development of TEC and TEC plus in Japan, the usefulness and relevance of these statistical frameworks need to be well-recognized among relevant parties. Moreover, the method of compiling TEC and TEC plus could be developed, based on Japan's peculiar circumstances as to the availability of statistical data. To these ends, this paper tries to answer following questions.

- Will the TEC and TEC plus data provide a new sight on Japan's international trade by breaking it down by enterprise characteristics?
- Does heterogeneity exist in Japanese firms in terms of the use of imported intermediates?
- How could Japan's input-output table be extended by incorporating such heterogeneity?

In countries that have already developed TEC, relevant data are produced by linking customs data and business-register information at the firm level, and by covering virtually the entire population of countries' businesses involved in international trade. However, given that firm-level customs data are not available in Japan at this stage, this paper uses firm-level data collected through enterprise survey as well as input survey and census of manufacturers. Although survey data does not cover all businesses and trading firms and inquired items are not as detailed as customs data, relevant data on international trade and characteristics of enterprises are available. We used such data for compiling TEC and TEC plus data.

2. Estimation of Japan's TEC data

The OECD-Eurostat TEC exercise requests countries to provide following aggregations of the trade value

as well as the number of enterprises broken down by exports and imports.

I. Trade by Size Classes (employment size; 0-9, 10-49, 50-99, 100-249, 250 or more) and by Economic Activity (2 digit ISIC rev.4)
II. Trade by Economic Activity (3 groups*) and by Top Enterprises (top 5, 10, 20, 50, 100, 500, and 1000 enterprises in import/export value)
III. Trade by Economic Activity (3 groups) and Partner Zones
IV. Trade by Economic Activity (3 groups) and by the Number of Partner Countries (1, 2, 3-5, 6-9, 10-14, 15-19, 20+)
V. Trade by Economic Activity (2 digit ISIC rev.4) and by Commodity Group (2 digit CPC2.0)
VI. Trade by Type of Ownership (Domestically controlled enterprises, of which domestically controlled enterprises without own affiliates abroad and domestically controlled enterprises with their own affiliates abroad, foreign controlled enterprises and unknown) and by Economic Activity (2 digit ISIC rev.4)

* Sections B (Mining and Quarrying), C (Manufacturing), D (Electricity, Gas, Steam and Air Conditioning Supply), and E (Water Supply, Sewerage and Waste Management and Remediation Activities) are aggregated into a single value as industry in the table and graphs of this paper. Also, Section G (Wholesale and Retail Trade, Repair of Motor Vehicles and Motorcycles) described as wholesale and Retail Trade etc. and a group comprising all other activities are respectively presented as a single value.

For the production of TEC, both customs data and business register information are necessary in principle. Customs data provide HS codes of the products together with identification codes of businesses. This information is then matched with firm-level information available in the business register. Linking these two sources of firm-level information provides a mechanism to articulate the characteristics of enterprises engaged in international trade. In Japan, however, the business register started its operation in 2013 and such linking has not been realized yet. Thus, customs data are not available at the firm level.

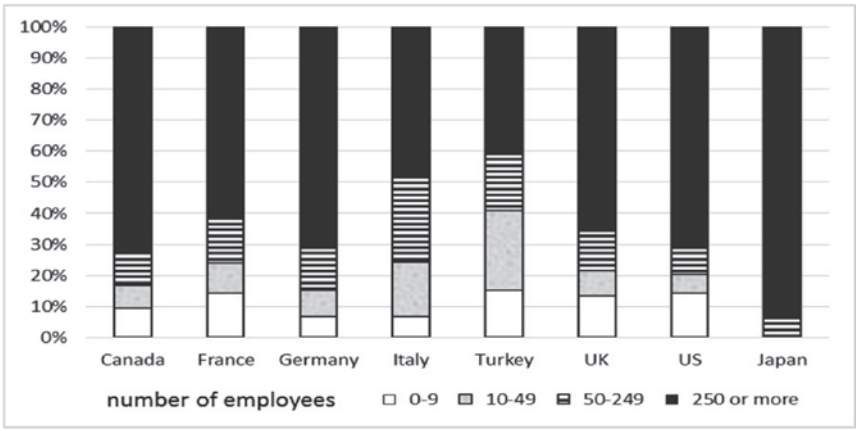
The Basic Survey of Japanese Business Structure and Activities (Basic Survey, hereafter) turned out to be useful for estimating TEC data. This survey contains information on international trade, in addition to characteristics of enterprises[2]. The Ministry of Economy, Trade and Industry (METI, hereafter) makes

2 The Basic Survey does not cover small firms with less than 50 employees or with capital of less than 30 million yen. We assume, however, that the Basic Survey broadly represents the overall picture of Japan's international trade.

available firm-level data of this survey on request. Using such data, we estimated data of some of TEC categories: international trade by size classes, by type of ownership and by economic activity. These categories are considered relevant to TEC plus as discussed later. The conformity with the OECD-Eurostat TEC framework is encured so that our estimates can be compared with TEC data of other OECD countries.

Looking at trade by size classes, TEC reveals that exports are highly concentrated among large firms in terms of the number of employees. However, there are some differences among countries. In Italy and in Turkey, small and medium firms play an important role in exports (Graph 1). Japan's export structure is similar to that of Germany as well as Canada and U.S. in that large firms account for most of the country's exports.

(Graph 1) Exports by Size Classes (2011)



Source: OECD and author for Japan (firm-level data of the Basic Survey)

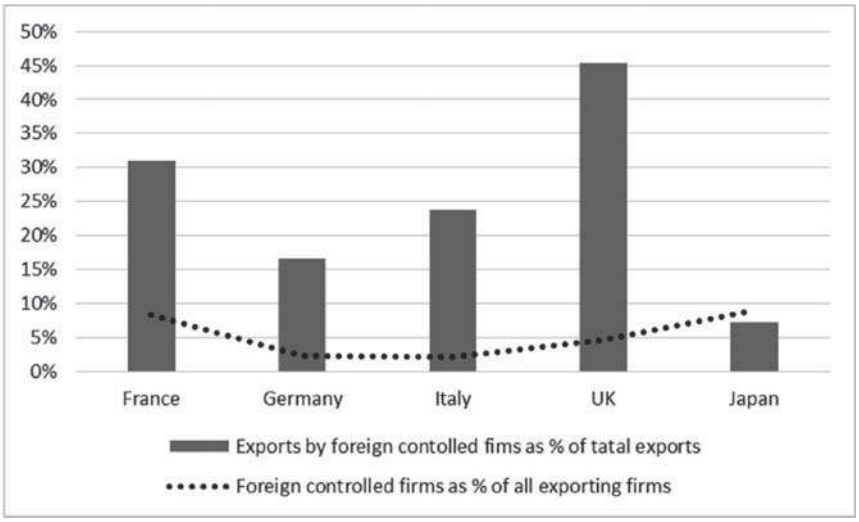
From the 2014 data collection, the TEC framework includes data by type of ownership, i.e. foreign-controlled enterprises or domestically-controlled enterprises. TEC displays trade values and the number of enterprises disaggregated by type of ownership and by economic sector of traders. The notion of control for an enterprise implies the ability to appoint a majority on the board of directors to run the enterprise, to guide its activities, and to determine its strategy. This ability is exercised by a single direct investor or a group of associated shareholders acting in concert and controlling the majority (+50%) of ordinary shares or voting power. The control of an enterprise may be direct or indirect, immediate or ultimate.

Integrating ownership information enables the analysis of trade pattern by ownership status. For major European countries, TEC reveals the importance of foreign-controlled firms in export markets. A large

portion of countries' exports, from 15 percent in Germany and 45 percent in the U.K., are handled by foreign-controlled firms. However, the number of foreign-controlled firms represents only a tiny portion of exporting firms; two percent in Germany and Italy, five percent in the U.K., and eight percent in France (Graph 2). This means that foreign-controlled exporting firms are relatively big in size and export goods in large amounts.

In Japan, foreign-controlled firms are not as important in the export market as they are in major European countries. The share of exports by foreign-controlled firms represents only seven percent. The number of foreign-controlled firms explains nine percent of the exporting firms covered in the Basic Survey (Graph 2). From this result, the size of foreign-controlled firms appears to be relatively small.

(Graph 2) Exports by Foreign-controlled Firms (2011)



Source: Eurostat and author for Japan (firm-level data of the Basic Survey).

The question then is whether trading firms are manufacturers using intermediates for producing goods, or wholesalers and retailers reselling intermediate or final goods. This can be observed by breaking down exporting firms into Industry (manufacturers), Wholesale and Retail Trade, and Others in line with the TEC framework.

Data sub-classified by economic activity indicate relative weights between Industry and Wholesalers and Retail Trade in terms of the value and the number of enterprises. In several countries, Wholesale and Retail Trade accounts for 30-50 percent of imports and exports and is more important than Industry (Table 1). In most countries, Wholesale and Retail Trade accounts for larger shares in terms of the number of enterprises.

This implies that relatively small wholesalers and retailers are engaged in the cross-border intermediation of goods. In contrast, Industry accounts for more in trade value than in a number of enterprises in Europe and North America. Thus, relatively large firms deal directly with their imports and exports. In Italy, in particular, direct exports by Industry account for almost 80 percent of total export value but its share remains 40 percent in terms of the number of enterprises. Thus, it appears that very large firms engage in direct exports in Italy.

In Japan, the share of Industry in international trade is high in terms of both the number of enterprises and the trade value (Table 1). Comparing the relevant figures of Italy, it can be induced that exporting activities by medium-size exporters are relatively important in Japan. For imports, Wholesale and Retail Trade accounts for almost half of the import value but only one-third of importing enterprises. This implies that in Japan, relatively large wholesalers and retailers engage in the import of goods. Industry's imports account more in the number of enterprises than in the value. This suggests the existence of a large number of medium-size importing manufacturers in Japan.

(Table 1) Trade by Economic Activity (2011)

	Industry		Wholesale and Retail Trade		Other	
	Number of Enterprises	Trade Value	Number of Enterprises	Trade Value	Number of Enterprises	Trade Value
(Exports)						
Canada	41.6%	70.5%	28.8%	9.7%	29.6%	19.8%
France	28.6%	63.0%	47.0%	31.4%	24.4%	5.6%
Germany	21.3%	53.6%	50.9%	24.9%	27.7%	21.5%
Italy	43.3%	79.2%	45.2%	17.9%	11.5%	3.0%
Turkey	42.9%	59.4%	44.1%	36.5%	13.0%	4.1%
UK	22.8%	50.6%	39.5%	34.3%	37.7%	15.1%
US	28.6%	64.2%	46.3%	24.9%	25.1%	10.9%
Japan	71.2%	73.3%	25.7%	25.8%	3.2%	0.8%
(Imports)						
Canada	21.7%	41.5%	37.0%	39.7%	41.3%	18.8%
France	21.3%	45.8%	57.8%	45.4%	20.9%	8.8%
Germany	13.4%	33.3%	53.0%	43.5%	33.6%	23.2%
Italy	24.6%	49.9%	54.8%	45.2%	20.6%	4.8%
Turkey	34.3%	52.9%	47.6%	32.5%	18.1%	14.6%
UK	16.8%	34.4%	50.0%	50.0%	33.1%	15.7%
US	22.0%	49.3%	58.7%	39.8%	19.3%	10.9%
Japan	59.7%	51.1%	33.8%	47.5%	6.5%	1.4%

Source: OECD and author for Japan (firm-level data of the Basic Survey).

3. Challenges toward TEC plus

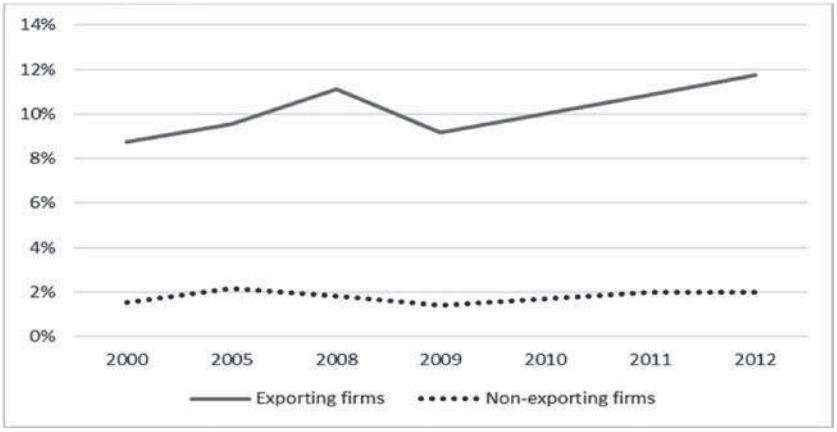
TEC is based on firm-level data, and, as such, its framework can be used to identify firm heterogeneity in international trade and GVCs. With respect to the enhancement of TEC, the OECD has envisioned several directions as to answering key analytical and policy relevant questions on OECD countries' traders and their characteristics (OECD, 2011a). Among them, its main proposal is to concentrate efforts on extending the exercise to address hot topics to draw more attention to TEC data, which can, in turn, mobilize more resources in the future. Then OECD considers, at this stage, the hottest topic is how to improve the quality of TiVA indicators. Thus, identifying firm heterogeneity in GVCs and incorporating this information into the estimates of TiVA indicators has become one of the most prominent contributions of the TEC exercise.

The framework of input-output tables is used for calculating TiVA indicators. The improvement of the accuracy of such indicators is often hampered by the aggregate nature of such tables. Data are displayed for aggregate industries and necessary assumptions are used to construct input-output tables. TEC can overcome some of the limitations of industry level analyses by providing a finer level of detail of industry aggregation, and thus reflect heterogeneity of enterprises, in particular, in the use of imported intermediate goods and services (OECD, 2011b). Specifically, TEC data could be used in input-output tables or supply-use tables to distinguish between exporting and non-exporting firms and/or foreign and domestically controlled firms, as suggested by the OECD.

Using firm-level data of Japan's Basic Survey, we identified a difference in the use of imported intermediate goods between exporting (engaging in direct exports) and non-exporting firms (not engaging direct exports at all) and/or between foreign controlled firms, whose majority (+50%) of ordinary shares or voting power is held by non-residents, and domestically controlled firms in Japan.

The estimate reveals that the ratio of imported intermediate goods to the output is almost 10 percent higher in exporting firms than in non-exporting firms, and that the gap has expanded in recent years (Graph 3).

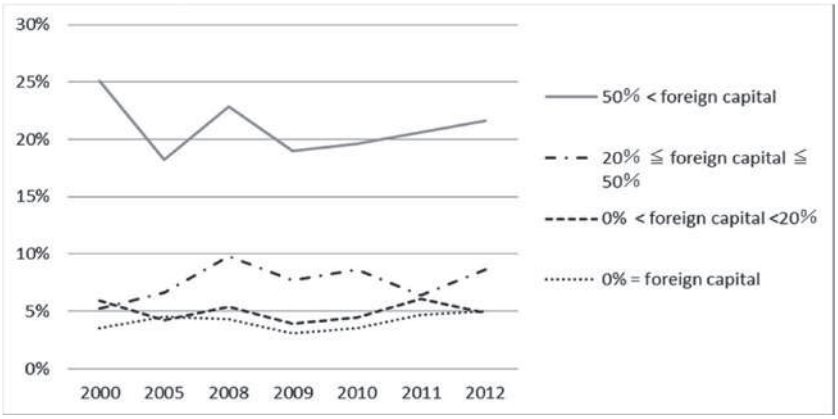
(Graph 3) Ratio of Imported Intermediate Goods to the Output for Exporting and Non-exporting Firms



Source: Author (firm-level data of the Basic Survey).

In terms of the type of ownership, the ratio of imported intermediate goods to the output is more than 15 percent higher in foreign-controlled firms than in domestically controlled firms. It is to be noted that among domestically controlled firms, differences in the share of foreign capital (foreign capital ratio = 0%, 0% < foreign capital ratio < 20%, 20% ≤ foreign capital ratio ≤50%, for subsidiaries of the last category, equity method is applied in preparing consolidated financial statement) do not have critical impact on the imported intermediate ratio (Graph 4).

(Graph 4) Ratio of Imported Intermediate Goods to the Output for Foreign and Domestically Controlled Firms

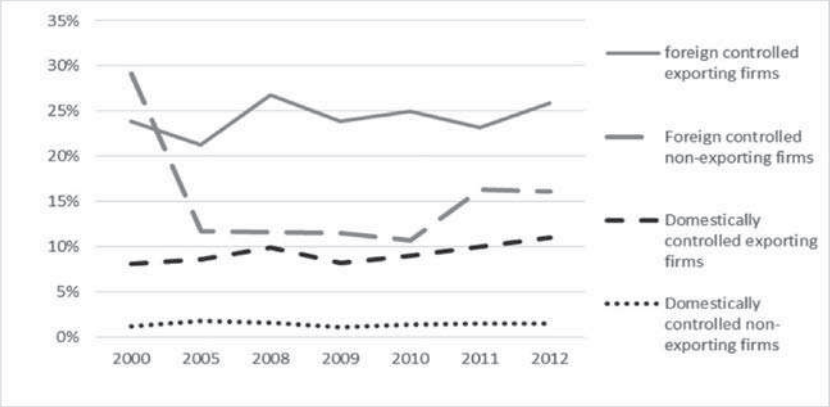


Source: Author (firm-level data of the Basic Survey).

When firms are cross-classified by foreign/domestically controlled and exporting/non-exporting, the gaps between the highest (for foreign-controlled exporting firms) and the lowest (for domestically controlled non-

exporting firms) ratios represent more than 20 percent (Graph 5). It should be noted that the ratio of foreign-controlled non-exporting firms tend to fluctuate year by year by a large degree, mainly because their sample size is small.

(Graph 5) Ratio of Imported Intermediates to Output by Foreign/Domestically Controlled and Exporting/ Non-exporting Firms

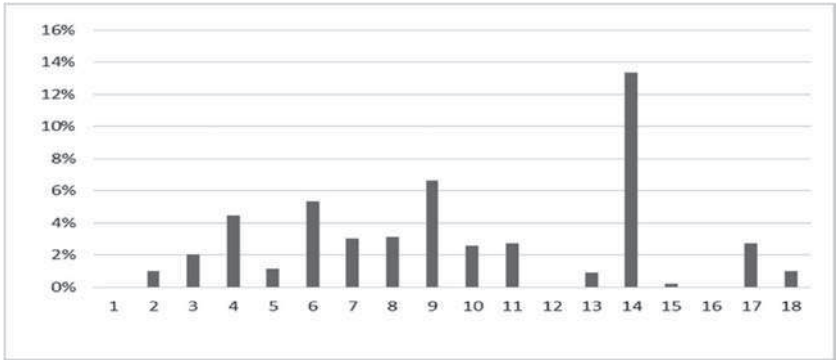


Source: Author (firm-level data of the Basic Survey).

As far as firms in Japan are concerned, the gap between foreign-controlled and domestically-controlled firms is larger than the gap between exporting and non-exporting firms. However, given the limited magnitude of foreign-controlled firms in Japan's export market as discussed above (Graphs 2), the priority should be given to the distinction between exporting and non-exporting firms.

When looking at the ratio of imported intermediate goods to the output between exporting and non-exporting firms by industry, wholesale and retail trade, hotels and restaurants (category 14) has the largest gap of 13.4 percent. Within Industry of the TEC framework, in which imported intermediate goods are used for producing goods, electronic and optical equipment manufacturers have the largest gap of 6.6 percent. This is followed by chemicals and non-metallic mineral products and textiles, textile products, leather and footwear (Graph 8). This result appears reasonable as we can enumerate many international firms, within these industries, deeply involved in GVCs.

(Graph 6) Gaps in Imported Intermediate Ratio to the Output between Exporting and Non-exporting Firms by Industry (2011)



(TiVA 18 Categories of Economic Activity)

1	Agriculture, hunting, forestry and fishing	10	Transport equipment
2	Mining and quarrying	11	Manufacturing n.e.c; recycling
3	Food products, beverages and tobacco	12	Electricity, gas and water supply
4	Textiles, textile products, leather and footwear	13	Construction
5	Wood, paper, paper products, printing and publishing	14	Wholesale and retail trade; Hotels and restaurants
6	Chemicals and non-metallic mineral products	15	Transport and storage, post and telecommunication
7	Basic metals and fabricated metal products	16	Finance and insurance
8	Machinery and equipment n.e.c	17	Real estate, renting and business activities
9	Electrical and Optical Equipment	18	Community, social and personal services

Source: Author (firm-level data of the Basic Survey)

4. Compilation of Japan's extended input-output table

The OECD uses the input-out data based on Japan's national accounts, which we call SNA input-output table, as sources to its inter-country input-output table, because such data are consistent with Japan's national account figures. Thus, it is necessary to consider the extension of the SNA input-output table, if we incorporate the TEC plus data in the TiVA calculation.

In doing so, the first step is to produce an import table corresponding to Japan's SNA input-output table, as it is the import-competitive table. The import table corresponding to the SNA input-output table could be produced by using the information in the import table of Japan's benchmark input-output table compiled every five years. Preliminary estimates for the import table for the SNA input-output table, represented in a matrix of product-by-product are shown in Table 2. The TiVA industry classification has been incorporated by simply regarding product classification of Japan's benchmark table as industry classification. The difference

in the imported intermediate ratio between exporting and non-exporting firms could be incorporated in this import table.

(Table 2) SNA import table for manufacturing sector (2011, million yen)

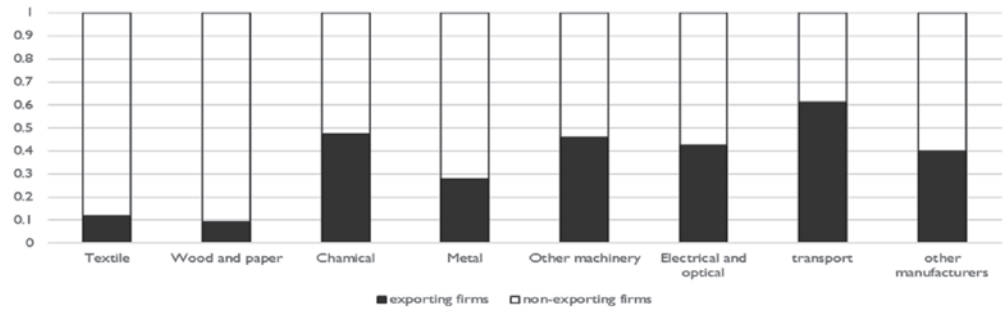
	1	2	3	4	5	6	7	8	9	10	11
	Agriculture, hunting, forestry and fishing	Mining and quarrying	Food, products, beverages and tobacco	Textiles, textile products, leather and footwear	Wood, paper, paper products, printing and publishing	Chemicals and non-metallic mineral products	Basic metals and fabricated metal products	Machinary and equipment n.e.c	Electrical and Optical Equipment	Transport equipment	Manufacturing n.e.c; recycling
1	178,688	46	1,582,679	37,380	97,985	44,199	1,767	607	1,167	740	41,103
2	3	1,205	994	1	29,542	13,187,913	3,372,444	1,436	1,177	1,453	4,796
3	22,118	135	1,482,912	19,835	6,390	61,195	1,890	1,854	2,776	1,319	1,835
4	8,577	78	3,898	278,398	12,657	22,326	865	933	3,354	20,623	4,942
5	1,820	34	17,243	1,725	615,265	26,150	6,304	4,476	7,626	4,398	20,771
6	134,295	4,419	145,086	106,571	56,734	4,314,878	106,599	59,687	157,292	259,988	465,102
7	2,271	1,349	7,834	916	4,301	72,282	2,955,214	132,532	879,068	409,774	36,688
8	23	4	223	9	105	441	12,758	692,373	565	11,073	34
9	813	19	864	186	1,394	2,886	5,283	358,196	3,261,936	188,672	7,243
10	14,702	0	0	0	0	0	0	0	0	640,009	0
11	1,273	428	39,561	23,233	39,196	45,659	14,916	20,437	50,875	20,514	369,556
12	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0
14	653	400	5,091	663	4,007	9,448	5,656	5,607	8,091	3,801	2,963
15	1,001	694	4,803	2,225	6,623	20,138	11,423	11,417	16,642	5,773	3,428
16	27,618	5,169	14,523	3,924	7,571	38,501	15,805	12,506	12,779	12,312	4,146
17	1,335	832	32,660	2,985	14,811	59,231	12,634	19,863	30,325	23,949	9,786
18	15,818	1,035	26,139	3,039	14,842	41,350	29,805	40,146	43,465	18,359	9,461
total imports	411,008	15,847	3,364,510	481,090	911,423	17,946,597	6,553,363	1,362,070	4,477,138	1,622,757	981,854

*The numbers in the first column/row represent TiVA industry classification shown under the Graph 6.

To incorporate the gap in imported intermediate ratio in Japan's input-output data, the output of exporting firms and that of non-exporting firms should be obtained. Based on output data of 2012 Census of Manufacturers, a total output of each industry has been broken down into the output of exporting firms and that of non-exporting firms (Graph 7). It turned out that in chemical product and machinery equipment manufacturers, an output of exporting firms has very large weights.

Once the output of exporting firms and that of non-exporting firms are obtained, different imported intermediate ratios can be multiplied to exporting firms' output and non-exporting firms' output. To identify gaps in imported intermediate ratio for each category of products, we linked the Input Survey of Manufacturers and the Census of Manufacturers and/or Basic Survey at the firm level.

(Graph 7) Output weight of exporting and non-exporting firms (2012)

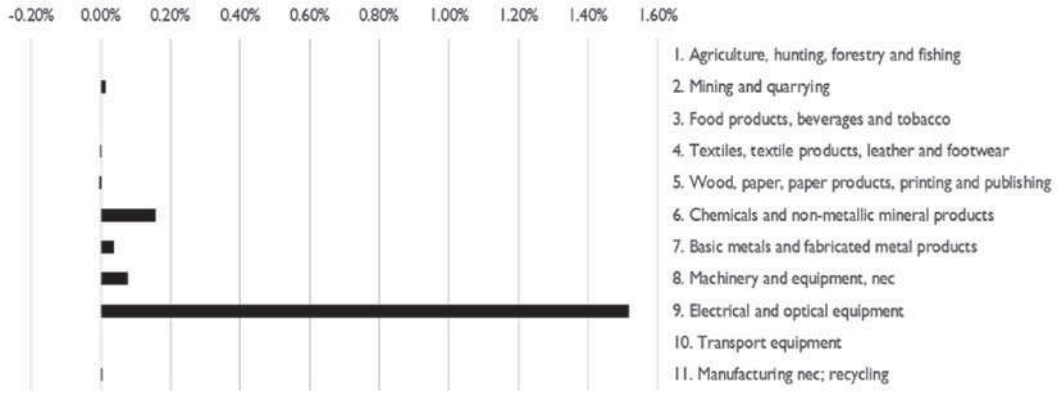


Source: Census of manufacturers

5. Measuring gaps in imported intermediate ratios

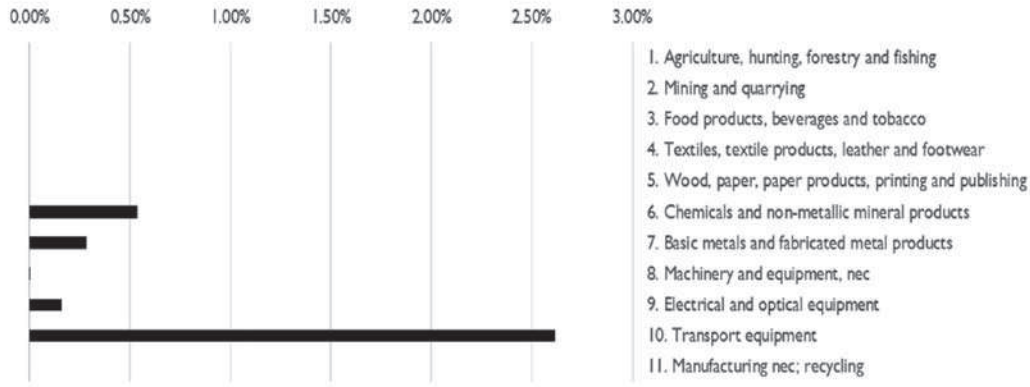
In processing and assembly industries, i.e., electronic and optical equipment (Graph 8-1) as well as transport (Graph 8-2) and other machinery equipment manufacturers (Graph 8-3), imported intermediate ratios have the largest gap between exporting and non-exporting firms in products that are produced in focused industries, typically electrical and optical equipment in electrical and optical equipment manufacturers and transport equipment in transport equipment manufacturers.

(Graph 8-1) Gaps for electrical and optical equipment manufacturers (2011)



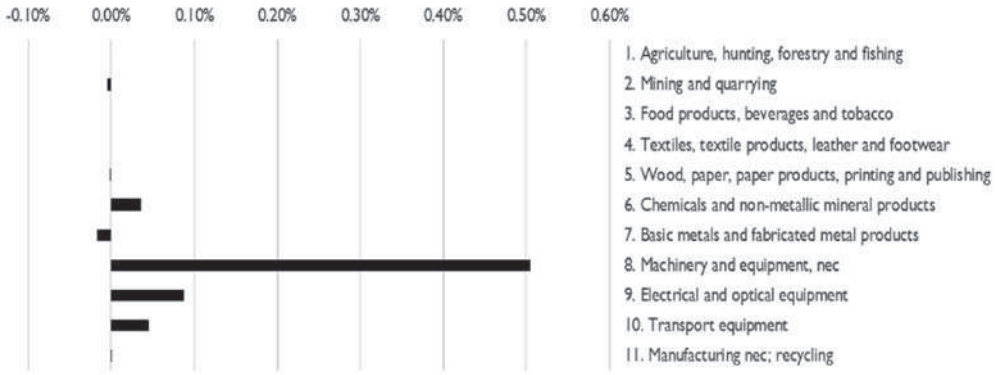
Source: Authors (firm-level data of Input survey of manufacturers linked to Census of Manufacturers and Basic Survey)

(Graph 8-2) Gaps for transport equipment manufacturers (2011)



Source: Authors (firm-level data of Input survey of manufacturers linked to Census of Manufacturers and Basic Survey)

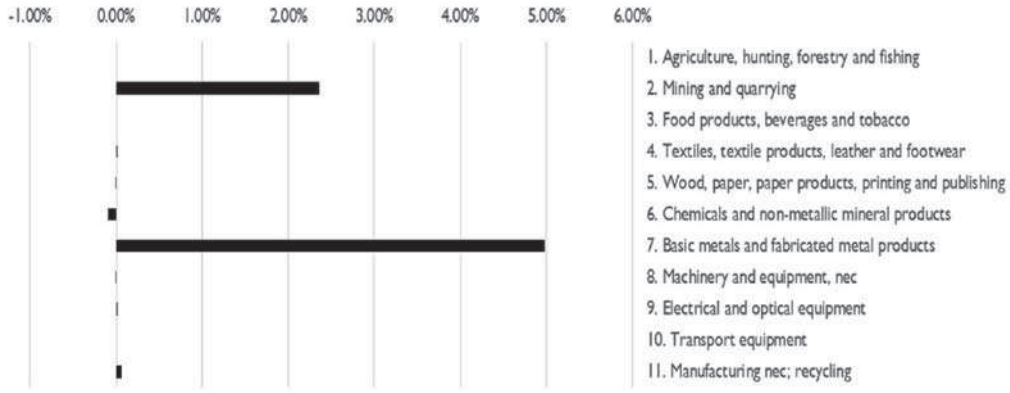
(Graph 8-3) Gaps for other machinery manufacturers (2011)



Source: Authors (firm-level data of Input survey of manufacturers linked to Census of Manufacturers and Basic Survey)

In Metal product manufacturers, gaps in imported intermediate ratio become largest in products that are produced in their own industries (Graph 8-4), which is the same pattern as the processing and assembly industries.

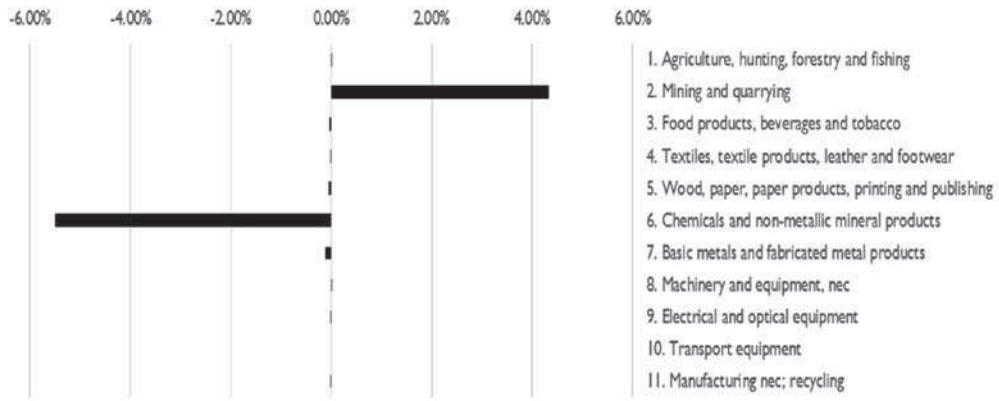
(Graph 8-4) Gaps for metal product manufacturers (2011)



Source: Authors (firm-level data of Input survey of manufacturers linked to Census of Manufacturers and Basic Survey)

In other primary material producing industries such as textile and chemical product manufacturers, gaps become negative in certain product types (Graph 8-5 and 8-6). Such results are not consistent with the assumptions that exporters import more than non-exporters.

(Graph 8-5) Gaps for chemical product manufacturers (2011)



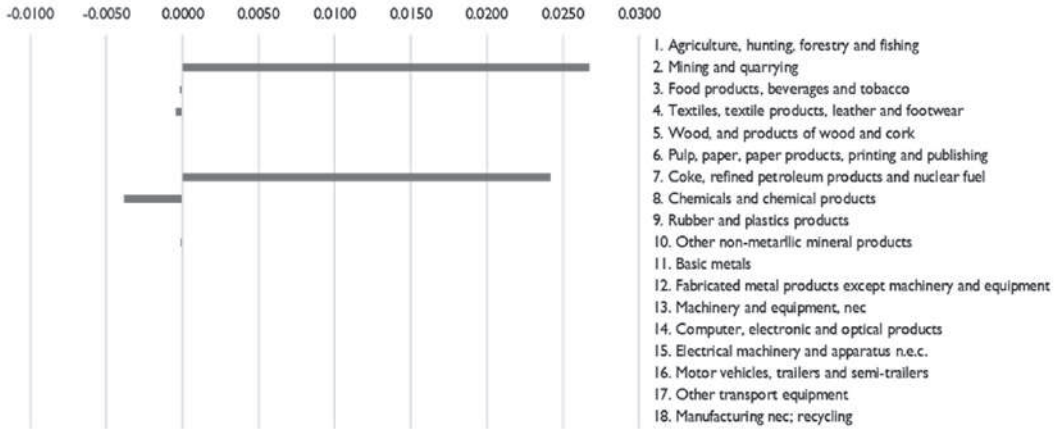
Source: Authors (firm-level data of Input survey of manufacturers linked to Census of Manufacturers and Basic Survey)

As to chemical product manufacturers, negative gap in chemical product may derive from multiple stages of production chain: raw materials (e.g. naphtha, natural gas), processed materials (e.g. ethylene, propylene), derived products (e.g. polyethylene, polypropylene), intermediate products (e.g. plastics, synthetic fibers) and final products. Importing firms provide processed products to domestic firms while exporting firms process domestically produced products. This appears to be the reason why non-exporters import more than exporters.

To investigate the reasons why the gap in import intermediate ratio of chemical product become negative in chemical product manufacturers, this classification has been broken down further into four sub-classifications: petrochemical industry, chemical industry, rubber and plastic industry and glass and ceramic industry.

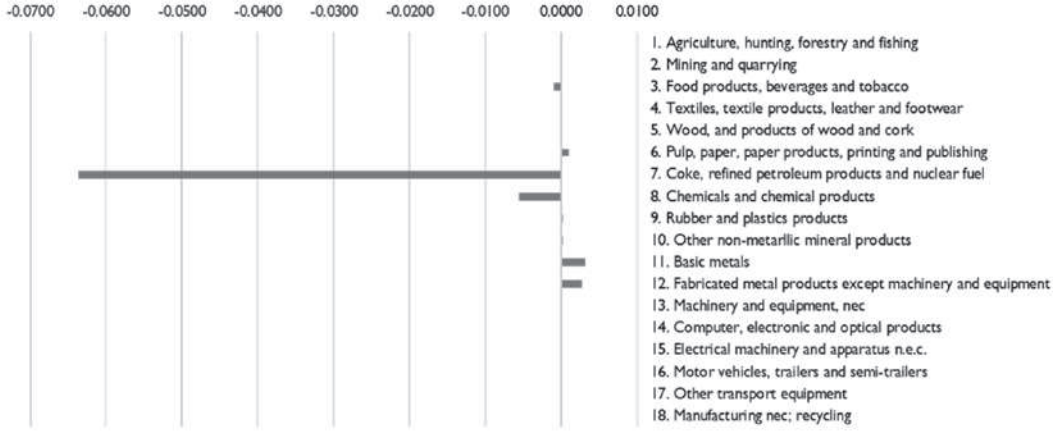
A positive gap in oil and coal products exists in the petrochemical industry (Graph 8-5-1), while a negative gap exists in oil and coal products in the non-petro chemical industry (Graph 8-5-2). This implies that petrochemical industry has many exporting firms that process imported raw materials in an integrated production system. In contrast, it appears that, in non-petro chemical industry, there are many small and medium-size firms and they rather engage in a certain part of the production system, importing materials and provide intermediates only to local firms. As a result, exporting firms import more in the petrochemical industry, while non-exporting firms import more in the non-petro chemical industry. Such structures produce a positive gap in petrochemical industry and a negative gap in non-petro chemical industry. In addition, non-exporting firms seem to import raw materials including inorganic chemical goods such as raw salt.

(Graph 8-5-1) Gaps for petrochemical industry (2011)



Source: Authors (firm-level data of Input survey of manufacturers linked to Census of Manufacturers and Basic Survey)

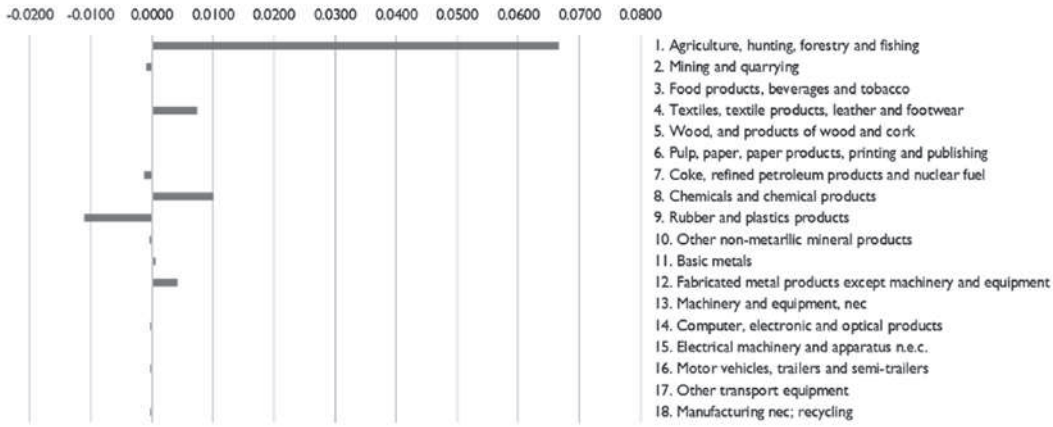
(Graph 8-5-2) Gaps for non-petro chemical industry (2011)



Source: Authors (firm-level data of Input survey of manufacturers linked to Census of Manufacturers and Basic Survey)

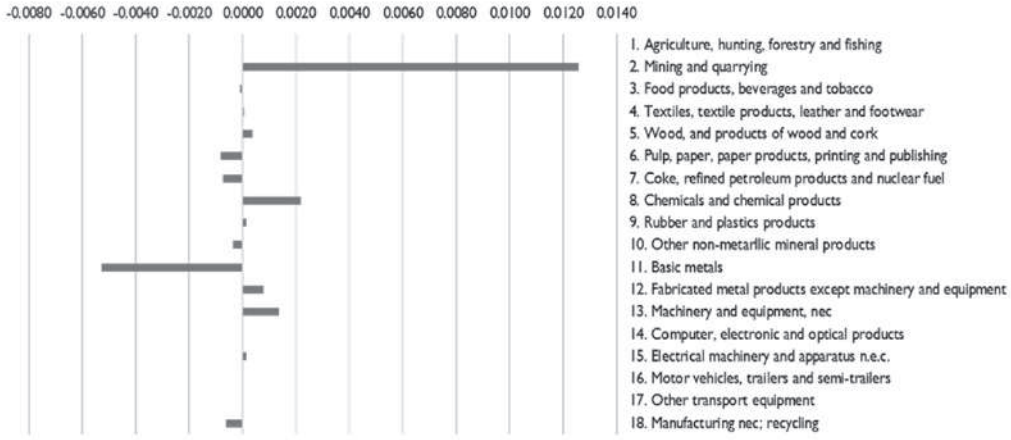
A large positive gap in agricultural products exists in rubber and plastic industry (Graph 8-5-3) and a large positive gap in mining products exists in glass and ceramics industry (Graph 8-5-4). Both industries have large exporting firms that have an integrated production system processing imported raw materials. Positive gaps in chemical products are caused by such large firms. Rubber and plastic, as well as glass and ceramic industries, have negative gaps in oil and coal products. Also, rubber and plastic industry has negative gaps in rubber and plastic products and glass and ceramic industry has a negative gap in metal products. It appears that the gaps of these product types become negative because exporting firms purchase them in the domestic market.

(Graph 8-5-3) Gaps for rubber and plastic industry (2011)



Source: Authors (firm-level data of Input survey of manufacturers linked to Census of Manufacturers and Basic Survey)

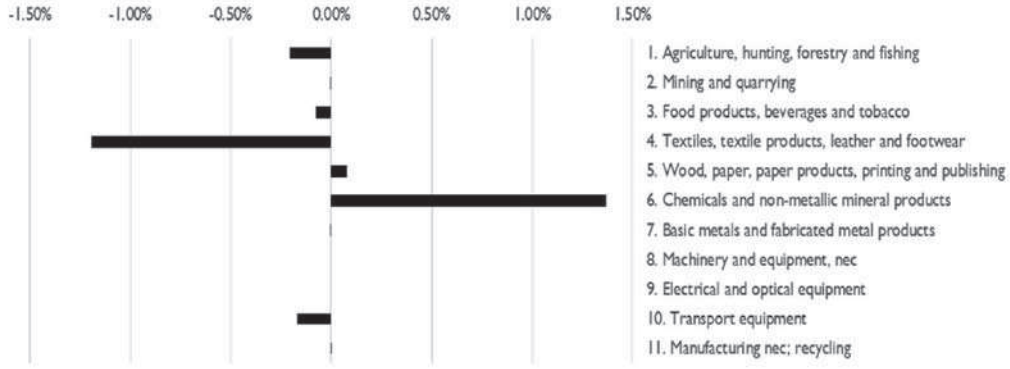
(Graph 8-5-4) Gaps for glass and ceramics industry (2011)



Source: Authors (firm-level data of Input survey of manufacturers linked to Census of Manufacturers and Basic Survey)

As to textile product manufacturers, a negative gap in agricultural and textile products is caused by the fragmentation of production processes (Graph 8-6). In Japan, thread makers, which import raw materials of threads, provide thread products to domestic cloth makers. Then such clothes are sent abroad for sewing. Textile makers import sewed products and provide domestic wholesalers and retailers. As a result, non-exporting firms import more than exporters.

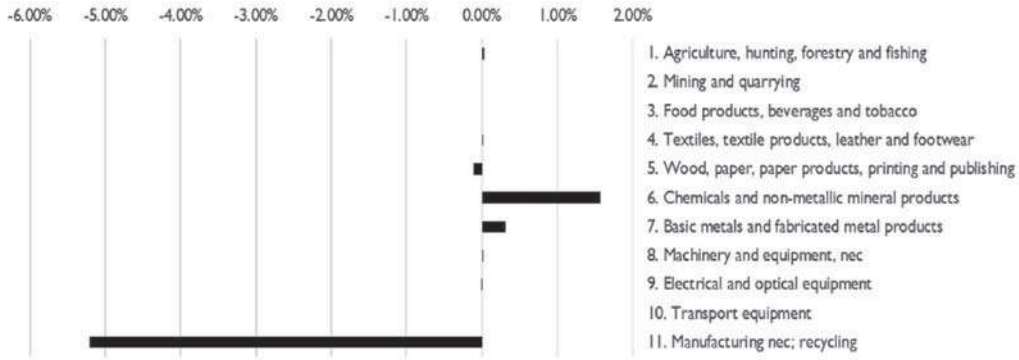
(Graph 8-6) Gaps for textile product manufacturers (2011)



Source: Authors (firm-level data of Input survey of manufacturers linked to Census of Manufacturers and Basic Survey)

In Other manufacturers, a large negative gap exists in recycled products (Graph 8-7). This is due to imports of iron scraps by non-exporting firms, which provide scraps domestically to metal and other product manufacturers.

(Graph 8-7) Gaps for other manufacturers (2011)



Source: Authors (firm-level data of Input survey of manufacturers linked to Census of Manufacturers and Basic Survey)

For sectors whose export intensities are important, we identified gaps in imported intermediate ratio for each category of products as discussed above. Incidentally, negative gaps exist in paper and pulp manufacturers. However, given that their export intensities are very small, we do not split exporting and non-exporting firms.

One technical element should be mentioned as to the compilation method of extended import table. In calculating imported intermediate ratios of exporting and non-exporting firms for each industry, the Basic Survey is used, while in calculating such gaps for each category of product, the Input Survey of Manufacturers is used, being linked to the Census of Manufacturers and/or Basic Survey. As different source data are used, the results of the latter calculation do not necessarily add up the results of the former calculation at an industry level. Thus, one product category has to be calculated as residual. Given that the ratios by latter calculation for each product category tend to be under-estimated, the differences in the calculation are attributed to product categories that have the largest gap in imported intermediate ratio. This means that the largest gap in each industry has been accentuated in the compilation of extended import table.

6. Incorporating gaps in imported intermediate ratios in Japan's import table

After the examination of estimates as mentioned above, gaps in imported intermediate ratio that should be reflected in Japan's extended import table were identified as listed below.

Industry	**Category of product**
Textile	Agricultural, Textile and Chemical products
Chemical	Mining and Chemical products
Metal	Mining and Metal products
Other machinery	Chemical products, Other machinery as well as Electrical and optical equipment*
Electrical and Optical	Chemical products as well as Electrical and optical equipment
Transport machinery	Chemical and Metal products as well as Electrical and optical as well as Transport equipment
Other manufacturers	Chemical and Recycled products

*As to other machinery industry, the gap in transport equipment products is not reflected although it is larger than the gap in chemical products. This is because imported intermediate ratio of transport equipment in non-exporting firms become negative if such gap is reflected in the calculation.

Also, services have been revised as the extended import table should cover services as well as goods. Industries' service imports are split into those of exporting and non-exporting firms by aggregating service imports of exporting firms and those of non-exporting firms based on firm-level data of the Basic Survey. Specifically, transport and storage, post and telecommunication services (category 15) is based on packing and haulage expenses in the Basic Survey. Financial intermediation services (category 16) is based on Basic Survey's expenditure for interests. Real estate, renting and business activities (category 17) is based on advertising as well as information and communication expenses in the Basic Survey (Table 3).

(Table 3) Weight of service imports by exporting and non-exporting firms

		Industry 4	Industry 6	Industry 7	Industry 8	Industry 9	Industry 10	Industry 11
category 15	exporting	0.49	0.75	0.58	0.77	0.84	0.89	0.60
	non-exporting	0.51	0.25	0.42	0.23	0.16	0.11	0.40
category 16	exporting	0.39	0.69	0.53	0.70	0.75	0.75	0.68
	non-exporting	0.61	0.31	0.47	0.30	0.25	0.25	0.32
category 17	exporting	0.53	0.81	0.60	0.72	0.90	0.96	0.78
	non-exporting	0.47	0.19	0.40	0.28	0.10	0.04	0.22

(Source) Authors (Firm level data of the Basic Survey)

For categories without substantial gaps in imported intermediate ratios or any source data, import amounts are split into exporting and non-exporting firms by their output weights. Thus, we came up with extended import table splitting exporting and non-exporting firms (Table 4) by multiplying different imported intermediate ratios to exporting firms' output and non-exporting firms' output. This can be a basis of extended

import table that is to be incorporated in OECD inter-country input-output table.

(Table 4) Extended import table splitting exporting and non-exporting firms

(2011, million yen)

	Textile		Chamical		Metal		Other machinery		Electrical and Optical		Transport		Other manufacturers	
	exporting	nonexporting	exporting	nonexporting	exporting	nonexporting	exporting	nonexporting	exporting	nonexporting	exporting	nonexporting	exporting	nonexporting
1	4,464	32,916	20,774	23,425	495	1,272	279	328	502	665	451	289	16,441	24,662
2	0	1	7,113,177	6,074,736	957,660	2,414,784	661	775	506	671	886	567	1,918	2,878
3	2,376	17,459	28,762	32,433	529	1,361	853	1,001	1,194	1,582	805	514	734	1,101
4	32,526	245,872	10,493	11,833	242	623	429	504	1,442	1,912	12,580	8,043	1,977	2,965
5	207	1,518	12,291	13,860	1,765	4,539	2,059	2,417	3,279	4,347	2,683	1,715	8,308	12,463
6	26,759	79,812	1,855,624	2,459,254	29,848	76,751	54,223	71,546	68,256	89,036	218,953	41,035	195,969	269,133
7	110	806	33,973	38,309	1,113,578	1,841,636	60,965	71,567	377,999	501,069	344,855	64,919	14,675	22,013
8	1	8	207	234	3,572	9,186	490,084	202,289	243	322	6,755	4,318	14	20
9	22	164	1,356	1,530	1,479	3,804	165,097	193,099	1,995,873	1,266,063	115,870	72,802	2,897	4,346
10	0	0	0	0	0	0	0	0	0	0	528,036	111,973	0	0
11	2,788	20,445	21,460	24,199	4,176	10,740	9,401	11,036	21,876	28,999	12,514	8,000	221,300	148,256
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	80	583	4,441	5,007	1,584	4,072	2,579	3,028	3,479	4,612	0	3,801	1,185	1,778
15	1,087	1,138	15,105	5,033	6,645	4,778	8,816	2,601	13,986	2,656	5,157	616	2,070	1,358
16	872	3,052	26,494	12,007	6,655	9,150	8,745	3,761	9,595	3,184	9,758	2,554	3,286	860
17	1,592	1,393	48,148	11,083	7,525	5,109	14,332	5,531	27,430	2,895	22,944	1,005	7,638	2,148
18	365	2,674	19,435	21,916	8,345	21,460	18,467	21,679	18,690	24,775	0	18,359	3,784	5,677
Total imports	73,247	407,843	9,211,738	8,734,859	2,144,098	4,409,265	836,991	525,079	2,544,351	1,932,787	1,282,246	340,511	482,197	499,657

*The numbers in the first column/row represent TiVA industry classification shown under the Graph 6.

7. Conclusion

This paper described a pilot study of compiling TEC and TEC plus data, using firm-level data of the Basic Survey of Japanese Business Structure and Activities as well as the Census of Manufacturers and the Input survey of manufacturers. The estimation of Japan's TEC data identified several characteristics of international trade by firms in Japan, and thus are considered to be very relevant to Japan.

As for the TEC plus, it was confirmed that the ratios of imported intermediate goods to the output were quite different between exporting and non-exporting firms as well as between foreign and domestically controlled firms in Japan. As far as Japan is concerned, splitting exporting and non-exporting firms is more relevant than splitting foreign-controlled and domestically-controlled firms because foreign-controlled firms are not significant in Japan's export market. Thus, gaps between exporting and non-exporting firms have been investigated further by grasping gaps by products, breaking down some industry classification in more detail. Then such gaps have been incorporated in Japan's import table corresponding SNA input-output table for its extension. Once such extended table is incorporated in OECD's inter-country input-output table Japan's TiVA indicators will be more precise and relevant.

In measuring gaps in imported intermediate ratio by product category, an interesting finding was made. In primary material industries, negative gaps exist in certain product category, which implies that exporting firms import less than non-exporting. This is caused by firms engaged in a certain part of production processes: importing firms providing intermediates domestically and exporting firms procuring intermediates domestically.

The argument that exporters import more than non-exporters is based on the assumption that firms import, produce and export in an integrated manner. The existence of firms engaged in a certain part of production processes may somewhat contradict this assumption. Also, the treatment of negative gaps in imported intermediate ratio should be further examined in extending input-output or supply-use tables. Thus, an international discussion is necessary as to whether primary material industries could be treated in the same way as processing and assembly industries in compiling extended supply-use or input-output table.

It is to be noted that the results of this paper have some limitations. The coverage of the survey is not high enough to regard this paper's estimates as official statistics. As is done in Europe and North America, Japan's official TEC and TEC plus data should be compiled by linking comprehensive and detailed customs data to the business register. For this purpose, the availability of firm-level customs data should be explored in the future.

References

Ahmad, N and J. Ribarsky (2014), trade in Value Added, Jobs and Investment, Paper prepared for the IARIW 33rd General Conference.

Bernard, A, B. Jensen, S Redding and P. Schott (2012), the Empirics of Firm Heterogeneity and International Trade, CES 12-18, U.S. Census Bureau.

Bull, D et al (2014), Using the Input-Output Approach to Measure Participation in GVCs: The Case of Costa Rica, Paper prepared for the IARIW 33rd General Conference.

Crozet, M., G. Lalanne and S. Poncet (2010), wholesalers in International Trade, Centre d'Etudes Prospectives et d' Informations Internationales (CEPII) Working Paper, n. 31, Paris.

Eurostat (2010), Compilers Guide for External Trade Statistics by Enterprise Characteristics, Luxembourg.

Fetzer, J and E. Strassner (2015), "Identifying Heterogeneity in the Production Components of Globally Engaged Business Enterprises in the United States," Paper prepared for the 2nd meeting of the OECD Expert Group on Extended Supply-Use Tables.

Frederick, S (2014), Combining the Global Value Chain and Global I-O approaches, Discussion paper for the International Conference on the Measurement of International Trade and Economic Globalisation.

Hagino, S (2015), "Toward Japan's TEC and TEC plus," Paper prepared for 2nd Meeting of the OECD Expert Group on Extended Supply-Use Tables.

Hagino, S and M. Tokoyama (2016), Gaps in imported intermediate ratio between exporting and non-exporting firms in Japan Introduction, PAPAIOS 27th Conference.

Lemmers, O (2013), "Using Enterprise Data to Improve Trade in Value Added Estimates," Paper prepared for OECD Workshop "Measuring Trade in Value-Added."

Landefeld, S (2014), Implication and Challenges Associated with Developing a New System of Extended International Accounts, Discussion paper for the International Conference on the Measurement of International Trade and Economic Globalisation.

Ma, H., Z. Wang and K. Zhu (2014), Domestic Content in China's Exports and its Distribution by Firm Ownership, Discussion paper for the International Conference on the Measurement of International Trade and Economic Globalisation.

Mayer, T and G. Ottaviano (2007), The happy few: The internationalisation of European firms, New facts based on firm-level evidence, Brugel.

Mei, L. and N. Jan (2011), Profile of Canadian Exporters, 1996 to 2009, Analytical Paper, Canadian Trade Review.

Ministry of Internal Affairs and Communications of Japan (2007), Japan Standard Industrial Classification (Rev. 12, November 2007) Structure and Explanatory Notes.

Miroudot, S., R. Lanz and A. Ragoussis (2009), Trade in Intermediate Goods and Services, OECD Trade Policy Working Paper, No. 93, OECD Publishing.

OECD (2014), OECD Expert Group on Extended Supply-Use Tables Draft Terms of Reference.

OECD (2011a), Enhancing TEC's Potential: Project proposal, STD/TBS/WPTGS (2011) 31.

OECD (2011b), Integrating Trade Firm-level data in Input-Output Tables: methodology and first results using Turkish Data, STD/TBS/WPTGS (2011) 15.

OECD (2012), Collecting New Indicators of Exporting and Importing Firms, STD/TBS/WPTGS (2012) 14.

OECD, WTO, UNCTAD (2013), Implication of Global Value Chains for Trade, Investment, Development and Jobs, Prepared for the G-20 Leaders Summit, Saint Petersburg.

OECD Expert Group on Extended Supply-Use Tables (2014), "Draft: Terms of Reference."

OECD (2014), "Extending OECD's Work on Measuring Trade in Value-Added," STD/CSSP (2014) 7.

OECD (2015), "Firm Heterogeneity and Trade in Value-Added," STD/CSSP/WPTGS (2015) 23.

Rosenthal, S et al (2014), "Integrated Industry-Level Production Account for the United States Sources of the Outgoing U.S. Recovery," Survey of Current Business August 2014.

Saborío M. Gabriela (2015), "Costa Rica: An Extended Supply-Use Table," Paper prepared for 23rd IIOA Conference.

Saborío, G and F. Ramírez (2015), "Costa Rica Import Matrices Compilation: Proportionality assumption and tracking imported inputs," Paper prepared for 2nd Meeting of the OECD Expert Group on Extended Supply-Use Tables.

Statistics Canada (2009), Policy Applications of Linked Trade Data The Canadian Experience Using the Exporter/Importer Register Databases, STD/SES/WPTGS (2009) 17.

The Global Value Chain Research Project Team of China (2013), Research report on the global value chain and value-added measurement in China's trade.

U.S. Department of Commerce (2015), "Assessment of Data and Proposals for Structure of Supply-Use tables for the United States."

Young, J et al (2015), "Supply-Use Tables for the United States," Survey of Current Business September 2015.

Wakasugi, R and H. Zhang (2012), Effects of Ownership on Exports and FDI: Evidence from Chinese Firms, RIETI Discussion Paper Series 12-E-058.