

Transaction Structure in Japanese Small Business Sector

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ABSTRACT. An attempt has been made to examine some aspects of transaction structure of the small business sector in Japanese manufacturing. It has been found that there are some interesting findings in the industrial organization of the sector (1) In the transactions of intermediate goods with manufacturing, small businesses have more frequent transactions with other small businesses than with large firms. On the other hand, large firms have more transactions with each other than with small businesses; (2) The transactions between SMEs and large firms, and between SMEs themselves vary from industry to industry, depending on production/demand structure of an industry and product structure of its SMEs sector; (3) In engineering, such as electrical machinery and transport equipment, the intra-industry transactions from small businesses to large firms are great, suggesting a larger extent of subcontracting relationships. Also, textiles, clothing, and printing and publishing also have higher subcontracting transactions. The relationships are different between the two groups.

1. Introduction

Small and medium-sized enterprises (hereafter SMEs) are responsible for the vast majority of Japanese manufacturing. And, SMEs have larger market share in economic activity. Therefore, the economic roles of Japanese SMEs are receiving interest in the West.¹

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In general, SMEs are said to be “heterogenous and multi-vectored”. For example, SMEs include various types of firms such as vital independents, and subcontractees. Also, the extent and types of SMEs vary from industry to industry. In particular, it has been argued that the majority of SMEs are vulnerable firms which receive subcontracted work from large firms. However, in the existing studies, scant statistical attention has been paid to internal structure, such as the transactional relationship between SMEs and large firms, and the subsistence pattern of SMEs. The problem is very likely due to the unavailability of relevant statistical data. In order to examine the roles of SMEs and also disentangle the heterogeneity, it is necessary to investigate the transaction structure of SMEs sector.

The purpose of this paper is to present new evidence on the transaction structure between SMEs and large firms, and among SMEs in Japanese manufacturing, by using some available data from input-output tables. This paper is the first to examine transaction structure in Japanese SMEs sector using the input-output table. This approach may be useful for the analyses of SMEs sector from the aspect of industrial economics. In this paper, SMEs are firms with less than 300 employees. The organization of the paper is as follows: Section II examines the general transaction structure by firm size; Section III shows the transaction structure between SMEs and large firms by industry; Section IV examines subcontractees, in which firms receiving subcontract work are called “subcontractee”, while firms supplying subcontract work are called “sub-contractor”; Section V examines the subsistence patterns of subcontractees, referring to the findings observed in the previous Sections. And finally, Section VI concludes this paper, with some suggestions for further studies.

2. The general transaction structure of SMEs

At the outset, we will examine the aggregate transaction structure of SMEs in manufacturing, using Management and Coordination Agency, the *Input-Output Table, 1990*, and the revised version, the *Input-Output Table, 1990, by Size* (unpublished. Hereafter the *I-Os Table*), which was furnished by the Small and Medium Enterprise Agency. In the *I-Os Table*, each industry is subdivided into both the SMEs and large firms sectors, following the classification of “establishments with less than 300 employees and with more than 300 employees” based on the *Census of Manufactures: Report by Industry* (hereafter the *Census (Industry)*), published by the Ministry of Trade and Industry (MITI). And, the two-digit industry classification level of data was provided. The *I-Os Table* is the only available data source for examining the transaction structure in Japanese SMEs sector.

However, this approach may involve the qualification for SMEs presence, since the data are captured in terms of the size of establishments, not of firms. The possibility of a bias overstating the SMEs presence may be caused by the presence of large firms with establishments of less than 300 employees. But, the present examination seems to reflect, approximately, the pattern of inter-industry transactions by firm size.² Needless to say, the findings should be carefully interpreted.

The compilation of the transaction structure by SMEs and large firms sectors in 1990 was made, based on the *I-Os Table*. The results are shown in Table I. SMEs sold 40.5% of their output to other manufacturing industries as intermediate demand. Then, 56.6% (i.e., 22.9% of total output) of the intermediate goods are toward other SMEs, and the remaining 43.4% (i.e., 17.6% of total output) toward the large firm sector. Also, 59.5% of total output is for final demand, and 5.9% for exports. On the other hand, SMEs sourced 60.1% of intermediate input traded within the manufacturing from SMEs, and 39.9% from the large firms sector.

Next, large firms sold 53.7% of their output to other manufacturing industries as intermediate demand. Then, 69.9% (i.e., 37.5% of output) of the intermediate goods is toward other large firms, and the remaining 30.1% (i.e., 16.2% of output) toward SMEs. Also, output for final demand is responsible for 46.3%; thus, being 13% points higher than SMEs, and exports are responsible for 16.9%. On the other hand, large firms bought 66.8% of total intermediate input traded within the manufacturing industry from other large firms, and the remaining 33.2% from SMEs. Therefore, large firm sectors have more transactions with other large firm sectors than with SMEs.

Thus, concerning the transaction of intermediate goods within the manufacturing industry,

TABLE I
Transactions within the manufacturing by firm size, 1990 (unit: billion yen; %)

Sector	Intermediate demand			Exports	Imports (-)	Output
	Large firms	SMEs	Subtotal			
Large Firms	63,412 (37.5%) (69.9%) [66.8%]	27,313 (16.2%) (30.1%) [39.9%]	90,725 (53.7%) (100.0%) [55.5%]	28,586 (16.9%)	11,418 (6.8%)	168,881 (100.0%)
SMEs	31,569 (17.6%) (43.4%) [33.2%]	41,161 (22.9%) (56.6%) [60.1%]	72,730 (40.5%) (100.0%) [44.5%]	10,596 (5.9%)	13,685 (7.6%)	179,481 (100.0%)
Subtotal	94,981 (27.3%) (58.1%) [100.0%]	68,474 (19.7%) (41.9%) [100.0%]	163,455 (46.9%) (100.0%) [100.0%]	39,182 (11.2%)	25,103 (7.2%)	348,362 (100.0%)

Note: SMEs are approximately captured as “establishments” with less than 300 employees, and otherwise large firms.

Source: Small and Medium Enterprise Agency, *The Input-Output Table by Size* (unpublished), 1995.

SMEs have greater transactions with other SMEs than with large firms. It has been argued that SMEs are vulnerable firms which have more frequent transactions with large firms, but the Table suggests otherwise, showing that there are larger SME to SME transactions.

Also, the ratio of final demand in total output is smaller in SMEs than in large firms. The ratio of exports is smaller in SMEs than in large firms; the ratio of exports to output is 16.9% in large firms, and only 5.9% in SMEs. This finding is consistent with the result from Doi (1991), that large firms play a very significant role in Japanese exports. On the other hand, the ratio of imports is slightly greater in SMEs versus large firms; the ratio of imports to output is 6.8% in the large firms sector, while being 7.6% in the SMEs sector.

However, the fact that SMEs (27%) have a smaller share of exports than larger firms (73%) does not necessarily mean that they do not have a significant role in exporting. It is because of SMEs, as a subcontractee, which may supply more inexpensive and better materials, parts, components and subassemblies, that induce the increased efficiency and product quality of subcontractors. In other words, SMEs may be one of the major sources of large firms' export competitiveness through their subcontracting relationships. In fact, empirical support is provided for this expectation in Doi (1988). The study, using the econometric cross-sectional approach, shows that the ratio of subcontracting transaction has a significant and positive effect on industry exports in Japanese manufacturing industries; Industries with larger ratios of subcontracting transactions tended to have larger export competitiveness. Therefore, the subcontracting relationship was likely to be a major source of the Post-World War II Japanese competitiveness. SMEs are still likely to be key contributors to the economy's overall exports.

3. The transaction structure of SMEs by industry

However, the transaction structure may vary from industry to industry, reflecting inter-industry differences in industrial structure of SMEs sector. In other words, the features of the transaction structure are likely to reflect both production

demand structure of an industry and product structure of its SMEs sector.

Therefore, the second concern is with transaction structures of output and input within manufacturing by firm size and by industry (2-digit classification). The structures are shown in Tables II (for output) and III (for input). The extent of each transaction is represented by the ratio of SME or large firm transactions to their output. The breakdown by industry reveals some interesting insights.

First, concerning the output transactions, food (17.9%), clothing (6.1%), furniture (8.3%) and precision instruments (12.2%) all have low transactions within the manufacturing industry, reflecting that firms largely produce final consumer goods. Transactions of SME output which flow to other SMEs within manufacturing are large in textiles, pulp and paper, iron and steel, and non-ferrous metals, while the greater transactions from SMEs to large firms are observed in rubber products, iron and steel, non-ferrous metals, electrical machinery, and transport equipment. On the other hand, textiles, lumber and wood products, pulp and paper, chemicals, ceramic, stone and clay, non-ferrous metals all have high ratios of large firm output which flow to SMEs. The fact suggests that large firms are major producers of those products.

Next, according to Table III, showing the input transactions, SMEs source greater inputs from other SMEs than from large firms in some industries: Among the industries are food, clothing, lumber and wood products, furniture, pulp and paper, leather products, and ceramic, stone and clay. In these industries, SMEs are responsible for a larger share of output.

On the contrary, SMEs source greater input of petroleum and coal products and iron and steel from large firms than from SMEs, suggesting that those products are produced mainly by large firms. In fact, the suggestion is confirmed by SME ratio in Table V, which follows later.

Furthermore, large firms source more inputs from SMEs than from other large firms in many industries, being consistent with the above suggestion. However, they source more inputs from large firms than from SMEs in iron and steel, general machinery, and transport equipment.

Finally, we will look in particular at the intra-

TABLE II
Transaction structure of output, by firm size and industry, 1990

Output industry	From SMEs to			From large firms to		
	SMEs	Large firms	Total	SMEs	Large firms	Total
Food	14.7%	3.2%	17.9%	0.4%	1.8%	2.2%
Textiles	53.9	5.3	59.2	88.5	8.7	97.2
Clothing	4.2	1.9	6.1	1.3	2.0	3.3
Lumber and wood products	38.5	7.6	46.1	54.6	5.5	60.1
Furniture	5.1	3.2	8.3	6.0	3.8	9.8
Pulp and paper	44.8	20.0	64.8	43.8	34.3	78.1
Printing and publishing	20.8	15.4	36.2	11.6	8.6	20.2
Chemicals	31.1	26.8	57.9	32.6	29.1	61.7
Petroleum and coal products	5.7	28.0	33.7	14.1	21.0	35.1
Rubber products	30.4	34.1	64.5	26.9	38.1	65.0
Leather products	34.2	8.0	42.2	—	—	—
Ceramic, stone and clay	15.5	7.9	23.4	31.3	29.7	61.0
Iron and steel	52.2	42.1	94.3	28.6	56.5	85.1
Non-ferrous metals	53.6	59.8	113.4	46.1	59.6	105.7
Fabricated metal products	21.4	13.6	35.0	17.9	11.7	29.6
General machinery	18.6	12.3	30.9	13.0	12.7	25.7
Electrical machinery	15.7	33.0	48.7	8.1	25.3	33.4
Transport equipment	17.3	62.4	79.7	6.1	32.0	38.1
Precision instruments	10.8	1.4	12.2	6.6	10.4	17.0
Miscellaneous	33.8	21.3	55.1	24.7	16.4	41.1

Note: (1) The ratios of SMEs' and large firms' output in an industry which flows to SMEs and large firms within manufacturing as intermediate demands respectively.

(2) In non-ferrous metals, the totals exceed 100.0 percent, since imports were very large, and were included in intermediate transactions.

Source: Small and Medium Enterprise Agency, *The Input-Output Table by Size* (unpublished), 1995.

industry transaction by firm size. Table IV shows the internal transactions by industry: (1) the ratios of SME output in an industry which flow to SMEs and large firms within the industry, respectively; and (2) the ratio to SME output in an industry, of their input sourced from large firms in that industry. The intra-industry transactions may reflect the extent of intra-industry completion of products in an industry, and also suggest either the degree of internal vertical integration or the extent of outsourcings. The latter includes arm's length and subcontracting transactions.

The first finding from the Table IV is that there is inter-industry difference in SME intra-industry transactions. The intra-industry transaction ratio is low in clothing (1.4%), furniture (2.3%), petroleum and coal products (5.3%), rubber products (5.7%), ceramic, stone and clay (9.6%), and fabricated metal products (5.8%). On the contrary, the ratio is higher in textiles (24.5%), pulp and paper (22.3%), chemicals (29.6%), non-ferrous

metals (43.9%), general machinery (20.9%), electrical machinery (36.5%), and transport equipment (72.3%). The ratio is particularly remarkable in transport equipment.

The variations imply both production/demand structure of an industry, and product configuration of its SMEs. For example, low ratio in clothing and furniture are due to the fact that in these industries, SMEs largely produce final goods in a short and simple production process. Also, the ratio is low in petroleum and coal products, rubber products, ceramic, stone and clay, and fabricated metal products, because these industries have a high extent of integrated production. On the other hand, in the high ratio industries suggested above, such as textiles, chemicals and non-ferrous metals, SMEs supply materials, components, parts and subassemblies for firms producing finished goods.

Second, the ratio of SME output, by industry, which flows to large firms in 1990 is: 15.7% in chemicals, 13.8% in iron and steel, 22.0% in non-

TABLE III
Transaction structure of input, by firm size and industry, 1990

Input industry	SMEs' input from			Large firms' input from		
	SMEs	Large firms	Total	SMEs	Large firms	Total
Food	21.0%	3.2%	24.2%	15.7%	4.5%	20.2%
Textiles	29.6	17.4	47.0	22.0	14.0	36.0
Clothing	34.5	6.0	40.5	34.0	3.9	37.9
Lumber and wood products	19.5	3.2	22.7	33.3	6.8	40.1
Furniture	34.2	7.5	41.7	35.1	7.7	42.8
Pulp and paper	29.9	14.2	44.1	26.1	18.4	44.5
Printing and publishing	18.2	14.2	32.4	19.3	19.8	39.1
Chemicals	20.5	21.1	41.6	18.6	24.8	43.4
Petroleum and coal products	6.2	22.6	28.8	1.4	3.1	4.5
Rubber products	21.1	14.2	35.3	22.2	19.5	41.7
Leather products	45.3	4.7	50.0	—	—	—
Ceramic, stone and clay	15.7	8.3	24.0	13.8	10.8	24.6
Iron and steel	8.5	43.8	52.3	7.9	51.7	59.6
Non-ferrous metals	26.5	20.2	46.7	18.9	25.2	44.1
Fabricated metal products	20.6	17.8	38.4	13.1	21.3	34.4
General machinery	25.2	16.1	41.3	6.7	21.2	27.9
Electrical machinery	22.3	19.8	42.1	20.3	25.4	45.7
Transport equipment	27.0	25.8	52.8	23.6	41.4	65.0
Precision instruments	18.7	13.9	32.6	22.9	17.6	40.5
Miscellaneous	28.9	18.3	47.2	29.6	17.4	47.0

Note: The ratios to SMEs' and large firms' output in an industry, of their input which is sourced from SMEs and large firms within manufacturing respectively.

Source: Small and Medium Enterprise Agency, *The Input-Output Table by Size* (unpublished), 1995.

ferrous metals, 9.8% in general machinery, 26.3% in electrical machinery, 62.4% in transport equipment, and 10.7% in precision instruments. In particular, transport equipment has a much higher ratio. SMEs in these industries may be affected by the bargaining power of large firms. Also, if SMEs have subcontracting relationships with large firms, the destination of the majority of output of SMEs in an industry is probably large firms. In these industries, a larger extent of subcontracting relationships, as suggested later, is likely to be reflected. The subcontracting relationships will be examined in the latter sections.

Third, the transactions from SMEs to other SMEs vary among industries. In many industries, the ratio is high, being consistent with the aggregate finding from Table I. For instance, textiles have 22.4% of the SME to SME transaction ratio. Also, the ratio may capture the second and third-tier subcontracting transactions between SMEs, since there frequently exist "multi-tier transactions" from large firms to SMEs.

Finally, the SMEs' ratio of outsourcings from

large firms within the same industry is high in textiles (7.6%), pulp and paper (11.3%), chemicals (15.9%), iron and steel (41.3%), non-ferrous metals (18.0%), electrical machinery (12.5%), and transport equipment (14.7%). SMEs in these industries may be subjected to the greater bargaining power of large firms.

The transactions from large firms to SMEs also depend on production structure and firm size structure. When large firms produce main materials, SMEs' ratio of outsourcings from large firms is likely to be higher. In fact, among the industries with such a relationship are textiles, pulp and paper, chemicals, iron and steels, and non-ferrous metals. Also, in electrical machinery and transport equipment, large firms produce main inputs. Furthermore, industries with a high presence of large firms tend to show high ratio of transactions from SMEs to large firms. This relation holds true for industries such as chemicals, iron and steel, non-ferrous metals, electrical machinery, and transport equipment. These industries, as shown in Table V, have low SME ratio.

TABLE IV
Intra-Industry transaction ratio of SMEs, 1990

Industry	From SMEs to			From large firms to SMEs within the same industry
	SMEs	Large firms	Total	
	within the same industry			
Food	13.9%	2.9%	16.8%	0.9%
Textiles	22.4	2.1	24.5	7.6
Clothing	1.4	0.03	1.4	0.0
Lumber and wood products	14.2	1.1	15.3	1.3
Furniture	2.3	0.3×10^{-4}	2.3	0.1
Pulp and paper	14.4	7.9	22.3	11.2
Printing and publishing	11.2	7.9	19.1	3.1
Chemicals	13.9	15.7	29.6	15.9
Petroleum and coal products	1.0	4.3	5.3	3.6
Rubber products	3.2	2.5	5.7	2.0
Leather products	13.3	—	13.3	0.0
Ceramic, stone and clay	8.8	0.8	9.6	3.2
Iron and steel	4.9	13.8	18.7	41.3
Non-ferrous metals	21.9	22.0	43.9	18.0
Fabricated metal products	4.4	1.4	5.8	0.9
General machinery	11.1	9.8	20.9	6.0
Electrical machinery	10.2	26.3	36.5	12.5
Transport equipment	9.9	62.4	72.3	14.7
Precision instruments	7.1	10.7	17.8	4.3
Miscellaneous	17.2	3.4	20.6	4.3

Note: The ratios of SMEs' output in an industry which flows to SMEs and large firms within the industry respectively; the ratio to output of an industry's SMEs sector of input from large firms in the industry.

Source: Small and Medium Enterprise Agency, *The Input-Output Table by Size* (unpublished), 1995.

4. Subcontracting transactions

The third concern is with SMEs as subcontractee. The transactions between large firms and SMEs may reflect the subcontracting relationship.³

A great number of existing studies have conducted case analyses. But, there are a few studies which examine the aggregate or macro presence of subcontractees. Subcontractees are an important form of subsistence: More than half of SMEs in Japanese manufacturing are reported to be subcontractees. For example, according to the Small and Medium Enterprise Agency's questionnaire survey, the ratio of subcontractees in the total number of SMEs (hereafter subcontractee ratio), as shown in Table V, is 65.5% in 1981, 55.9% in 1987, and 51.6% in 1996 (SMA, 1997, p. 147). And, in the vastmajority of subcontractees, subcontracted works are responsible for more than half of their total transactions. Thus, although the

subcontractee ratio may tend to decrease, it is still of a high level.⁴

However, the subcontractee ratio is different from industry to industry. The ratios by industry in 1981, 1987 and 1996 are shown in Table V. The sources are SMA (1983, p. 390), (1989, p. 102) and (1997, p. 174). SME ratio in 1990 is included as well. The SME ratio is defined as the share of industry value of shipments, accounted for by firms with less than 300 employees. In practice, the ratio was computed as: 1 minus the share of industry value of shipments accounted for by firms with more than 300 employees. It is because data for firms with less than 20 employees is not available in the *Census*. The value of shipments for firms with more than 300 employees is from the *Census of Manufactures: Report by Firm*, and the industry value of shipments is from the *Census (Industry)*. This approach is better than the existing one, since it can represent SME presence

TABLE V
Ratios of subcontractees and SMEs

Industry	Subcontractee ratio			SME Ratio
	1981	1987	1996	
Food	17.5%	8.6%	18.8%	56.4%
Textiles	84.9	80.1	51.3	76.4
Clothing	86.5	79.3	55.6	92.6
Lumber and wood products	48.0	21.5	38.5	88.6
Furniture	51.6	38.3	52.0	84.0
Pulp and paper	51.6	41.8	43.2	62.6
Printing and publishing	59.0	42.5	31.7	56.9
Chemicals	38.5	22.9	33.3	27.3
Petroleum and coal products	38.9	16.9	29.0	13.3
Plastic products	n.a.	69.0	67.6	71.5
Rubber products	71.8	66.2	58.4	33.8
Leather products	68.8	65.7	42.5	94.0
Ceramic, stone and clay	36.6	36.3	39.3	68.1
Iron and steel	72.0	53.5	50.0	31.5
Non-ferrous metals	73.6	62.8	57.6	38.9
Fabricated metal products	78.6	71.1	66.0	75.6
General machinery	84.2	75.0	70.1	56.3
Electrical machinery	85.3	80.9	78.5	19.4
Transport equipment	87.7	81.2	72.8	12.0
Precision instruments	80.9	71.1	64.8	46.6
Miscellaneous	62.2	43.5	44.8	66.7
Total	65.5	55.9	51.6	42.4

Note: Subcontractee ratio: Number of subcontractees/all SMEs, from the questionnaire survey (SMA, 1983, 1989, 1997).
SME ratio: the ratio to industry value of shipments of value of shipments of firms with less than 300 employees, from MITI (1992).
Source: Small and Medium Enterprise Agency (SMA), 1983, 1989, 1997, *White Paper on Small and Medium Enterprises*, Tokyo: Printing Bureau, Ministry of Finance; MITI, 1992, the *Census of Manufacture: Report by Industry, 1990*, and *Report by Firm, 1990*, Tokyo: Printing Bureau, Ministry of Finance.

precisely, as opposed to the traditional approach which utilizes, as an alternative indicator, shares of establishments with less than 300 employees.

For example, in 1987, among the industries with ratios over 70% are: textiles (80.1%), clothing (79.3%), fabricated metal products (71.1%), general machinery (75.0%), electrical machinery (80.9%), transport equipment (81.2%), and precision instruments (71.1%). In particular in textiles, clothing, and fabricated metal products, SMEs have high presence (i.e., SME ratio) and are also largely of a subcontractee type. In electrical machinery and transport equipment, SMEs are largely of a subcontractee type, but have low presence.

On the contrary, the ratio is low in food, lumber and wood products, furniture, chemicals, petroleum and coal products, and ceramic, stone and clay (which all have less than 40% ratio), sug-

gesting larger vertical integration or self-completion of production process. Therefore, in these industries "independent SMEs" are dominant. In particular, in chemicals and petroleum and coal products, SMEs have low presence, and are largely of an independent type as well.

The distribution is roughly consistent with the "production consignment ratios", which are computed from the *Census (Industry)*. The ratios are captured by two-fold measures: (1) the ratio of costs for outsourcings to costs of materials, power, fuels and consigned production for establishments with more than 30 employees (hereafter outsourcing costs ratio), and (2) the ratio of revenues from consigned production to value of shipments, for both establishments with more-than-30 employees and with 4-to-29 employees (hereafter consignment revenue ratio). The former reflects the extent of subcontracting transactions for

TABLE VI
Production consignment 1990

Industry	Ratio to production costs, of costs for outsourcings	Ratio to value of shipments, of Revenues from consigned production	
		Over 30	4–29
Food	1.3% (0.7)	0.9% (2.1)	2.7% (1.7)
Textiles	18.5 (2.9)	24.0 (15.8)	34.0 (10.6)
Clothing	31.9 (2.0)	33.5 (10.4)	43.5 (10.5)
Lumber and wood products	5.0 (0.3)	1.4 (0.4)	4.4 (1.3)
Furniture	14.3 (1.0)	1.1 (0.3)	6.4 (1.2)
Pulp and paper	5.2 (1.2)	1.3 (1.2)	11.9 (2.1)
Printing and publishing	49.2 (11.1)	5.0 (5.9)	19.5 (7.3)
Chemicals	2.1 (1.1)	0.5 (1.5)	3.2 (0.6)
Petroleum and coal products	0.3 (0.1)	1.1 (1.1)	1.8 (0.1)
Plastic products	13.5 (3.1)	2.0 (1.9)	14.9 (4.8)
Rubber products	10.6 (0.8)	1.0 (0.4)	15.4 (1.1)
Leather products	17.8 (0.3)	3.2 (0.2)	10.7 (0.9)
Ceramic, stone and clay	9.8 (1.5)	1.7 (1.5)	3.5 (1.6)
Iron and steel	5.4 (2.7)	1.9 (4.1)	6.8 (1.7)
Non-ferrous metals	8.5 (2.1)	3.3 (2.9)	9.9 (1.0)
Fabricated metal products	22.2 (7.3)	8.4 (12.4)	25.1 (20.5)
General machinery	23.8 (19.7)	2.2 (7.7)	18.9 (13.8)
Electrical machinery	15.3 (24.1)	3.0 (20.0)	25.7 (9.3)
Transport equipment	7.8 (12.9)	1.1 (6.6)	30.3 (6.2)
Precision instruments	22.4 (3.0)	2.8 (1.6)	20.1 (1.6)
Miscellaneous	17.6 (1.7)	2.6 (1.1)	9.7 (2.0)
Total	12.3 (100.0)	2.9 (100.0)	16.0 (100.0)

Note: (1) The 1st column: Costs for outsourcings/production costs for establishments with more than 30 employees. Production costs involve costs for materials, power, fuels and outsourcings; The 2nd and 3rd columns; Revenues from consigned production/value of shipments for establishments with more than 30 employees and with 4 to 29 employees respectively.

(2) Figures in parentheses are an industry's share of the costs and revenues.

Source: MITI, the *Census of Manufacture: Report by Industry, 1990*. Tokyo: Printing Bureau, Ministry of Finance.

subcontractors, while the latter shows the size of subcontracting transactions for subcontractees. The 1990 ratios are shown in Table VI.

The outsourcing costs ratio is high in industries like textiles, clothing and printing and publishing, and also in fabricated metal products, general machinery, precision instruments and miscellaneous industries. Outsourcings do not always mean subcontracting relationships. But, the findings suggest that firms in these industries have "relational" or subcontracting transactions with other firms, and in particular with SMEs. On the contrary, among the industries with lower ratio are food, lumber and wood products, pulp and paper, chemicals, petroleum and coal products, ceramic, stone and clay, iron and steel, non-ferrous metals, and transport equipment. These industries share a

common feature of larger integration or self-completion of production process; There is a smaller degree of intra-industry transactions. But the low ratio of transport equipment is worth noting. The finding is attributable to the fact that the industry has very large costs of materials, power, fuels, although, as suggested in the Table VI, it has large absolute costs or their share in manufacturing total; The denominator of the ratio is very large. Industries which have higher shares of subcontractee-type SMEs tend to show higher outsourcing cost ratio; The correlation coefficient is 0.448 between subcontractee ratio in 1987 (in Table V) and outsourcing cost ratio (in Table VI).

On the other hand, the consignment revenue ratio is very high in textiles and clothing, suggesting that relatively large firms engage in

consigned production. The importance is very high for smaller firms; in fact, as shown in the third column, SMEs with less than 30 employees have larger ratio in textiles, clothing, printing and publishing, fabricated metal products, general machinery, electrical machinery, transport equipment, and precision instrument. These findings suggest that SMEs frequently engage in subcontracted works. This suggestion is consistent with high correlation between subcontractee ratio and consignment revenue ratio (in Table VI); 0.452 for establishments with more than 30 employees, and 0.822 for establishments with 4-to-29 employees. In particular, smaller firms are largely subcontractees. Also, the extent of subcontracting relationships from the viewpoint of subcontractors is roughly consistent with its counterpart, the viewpoint of subcontractees; Correlation between outsourcing costs ratio and consignment revenue ratio is 0.458 for establishments with more-than-30 employees, and 0.585 for establishments with 4-to-29 employees.

Thus, subcontractees are the major format of SMEs in light industries like textiles, clothing, and printing and publishing, and also in the assembling and processing industries such as fabricated metal products, general machinery, electrical machinery, transport equipment, and precision instruments. Also, smaller firms such as those firms with less-than-30 employees are largely subcontractees.

5. Types of subcontractees

The above findings suggest that there are many subcontractees in Japan. *A priori* some types of subcontractees are expected. But the findings do not imply the patterns of subcontractees. The types of subcontractees may also reflect transaction structure. It is difficult to present statistical evidence for the types. Here, we will examine the types, referring to above findings, based on existing studies.

Subcontractees may be classified into three major patterns.⁵ The first case is that in which SMEs carry out the processing of a material, component, part, or subassembly for subcontractors. In this type, multi-tier subcontracting relationships are common, and are frequently referred to as a pyramid-type. Sub-contractees play the role of “branch plants responsible for part of the produc-

tion process of subcontractors” (SMA, 1983, p. 392). This case is found in assembling industries such as electrical machinery and transport equipment. This type is one of dominance, since subcontracting relationships in fabricated metal products, general machinery, electrical machinery, and transport equipment, and precision instruments, as shown in Table VI, are responsible for the majority of subcontracting transactions.

The second case is observed in industries in which a product is completed through separated, vertical multi-stage production processes. Main contractors request different specialist firms in each stage of the vertical process to carry out processes, and then finally receive the finished goods from firms of the final stage. Therefore, specialist firms are similar to “production plants of main contractors” as sellers of finished goods (SMA, 1983, p. 392). The product flow or transaction is conducted directly between different firms in the vertical process, following the example of main contractors. Those specialist firms are in most cases subcontractee-type SMEs. And, main contractors are usually either distributors (including trading companies), or large firms in one stage of the process. This type is found in textiles, clothing, furniture, and printing and publishing. In this case, there is a larger extent of transactions between SMEs. For example, in textiles and clothing, as Tables II, III and IV suggest, SMEs have both high subcontracting relationships and high SME to SME transactions. The findings are consistent with the fact that these industries have high SME ratio.

The final type is one in which subcontractees make finished goods for subcontractors in the same industry, and then supply the goods to them. This type exhibits “horizontal” division of labor, rather than vertical, and is similar in concept to “OEM production” or “capacity subcontracting.” This type is observed in foods, textiles, toys, sporting goods, and office supplies, but there are a few cases applicable to this type, relative to the two types mentioned above.

Thus, the first type functions in the assembling and processing industries, while the second and third types are observed in the light industries. These patterns, although difficult to be distinguished, as previously suggested, are likely to be involved in the above Tables.

6. Concluding remarks

An attempt has been made to examine some aspects of the transaction structure of SMEs sector in Japanese manufacturing. It has been found that there are some interesting findings in the industrial organization of SMEs sector. Now, we will summarize the major findings.

- (1) In the transactions of intermediate goods within manufacturing, SMEs have greater transactions with other SMEs than with large firms. Conversely, large firms have more transactions with each other than with SMEs.
- (2) The transactions between SMEs and large firms, and between SMEs vary from industry to industry, depending on production/demand structure of an industry and product structure of its SMEs sector.
- (3) In engineering, such as electrical machinery and transport equipment, the intra-industry transactions from SMEs to large firms are large, suggesting a larger extent of subcontracting relationships. Also, textiles, clothing, and printing and publishing also have higher subcontracting transactions. But, there is difference in type of subcontractee between the two industry groups.

It is necessary to analyze the multi-vectored structure of SMEs sector in an economy. But, the present paper is concerned with only the structure of the transaction between SMEs and large firms. The structure involves more dimensions, including subcontractees and independents. The behavior and performance of those firms should be analyzed at a disaggregated level. Also, it is necessary to examine the effects of SMEs through inter-industry transaction. Finally, it is interesting and important to make international comparisons on the transaction structure of SMEs sector. Unfortunately our study was restricted to Japanese manufacturing, due to the availability of data. These problems will be left to further papers.

Notes

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¹ See OECD (1997, pp. 179–197), Sato (1989), Thoburn and Takashima (1992), Trevor and Christie (1988), and Whittaker (1997) for the summary of SMEs presence and the existing studies in Japan. Also, for the detailed examinations of SMEs presence, see Doi and Cowling (1995, 1998).

² The shares (S) of small- and medium-sized establishments with less than 300 employees were computed for 336 manufacturing industries, using the *I-Os Table*. The distribution in 1991 is (S is in terms of percentage); 75 industries for $100 \geq S \geq 91$; 32 industries for $90 \geq S \geq 81$; 34 industries for $80 \geq S \geq 71$; 25 industries for $70 \geq S \geq 61$; 33 industries for $60 \geq S \geq 51$; 29 industries for $50 \geq S \geq 41$; 25 industries for $40 \geq S \geq 31$; 19 industries for $30 \geq S \geq 21$; 19 industries for $20 \geq S \geq 11$; and 45 industries for $10 \geq S \geq 0$. Thus, 199 (i.e., 59%) out of 336 industries have SMEs' share of more than 50%. The 1990 shares are not shown in the *I-Os Table* used here.

³ The definitions and patterns of subcontracting are discussed in for example Imrie (1986).

⁴ Also, the pre-1981 subcontractee ratio is; 53.3% in 1966, 58.7% in 1971, and 60.7% in 1976. Therefore, the ratio increases until 1981, but beyond the year tends to decline. Also, the ratio of subcontractors tends to decline in recent years. See SMA (1997, p. 147).

⁵ The types and thier examples are from SMA (various years) and Nikkei (1992).

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