

Subcontracting and the Performance of Small and Medium Firms in Japan

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ABSTRACT. This paper provides an empirical analysis of the choices made by Japanese firms with respect to subcontracting status, that is, whether to take in work as subcontractor, to outsource work to subcontractors, to do both or to do neither. It shows that the probability of working as a subcontractor, a choice made by many small firms in Japan, is negatively related to size, foreign sales and technological capability. Furthermore, profits do not appear to be higher for subcontracting firms; indeed, they are highest for the group that does not get involved in any type of subcontracting, whether as a supplier or as an outsourcer.

1. Introduction

In the Japanese economy, subcontracting has been regarded as an important source of efficiency and competitiveness for industries such as textiles, general machinery, electric machinery, and automobiles. Other countries such as Taiwan and Korea also have subcontracting though the historical background and the detailed structure are somewhat different owing to different initial conditions. In Japan the pattern of subcontracting has a close link with the pattern of firm size distribution.

Subcontracting has been a major research topic in the literature on the Japanese economy. However, the focus of research has been the mechanism of individual subcontracting arrangements, rather than the sectoral or macroeconomic implications. Quantitative analysis on the basis of official statistics has not yet been conducted extensively. In considering the applicability of subcontracting arrangements to other countries, it

is important to specify when subcontracting emerges and becomes effective. This paper briefly reviews the past literature on subcontracting in Japan and analyzes its main characteristics by using manufacturing censuses. Owing to data availability, the focus is placed on subcontracting in the manufacturing sector.

The next section clarifies the concept of sub-

contracting. Section 3 reviews the historical and theoretical background of the subcontracting system. Section 4 presents Japanese industry-level data of subcontracting from the 1960s to the 1980s. The relationship among firm size, internalization pattern, and subcontracting is explored in particular. Section 5 utilizes micro data of Japanese manufacturing firms in FY1994 to analyze the relationship between subcontracting and other characteristics of firms.

2. What is subcontracting?

Subcontracting (*shitauke*) is not always specified in an explicit manner. Surprisingly, it is not clearly defined even in official statistics. Nevertheless, this word is used quite often because Japanese share a loose consensus on the meaning of this word. In its broadest meaning, subcontracting refers to the purchase of a part of a product or process from a different company. Some researchers stress the asymmetric relationship between a large downstream firm and a small upstream firm. Kawasaki (1998, p. 38) defines a subcontracting relationship as “a contractual relationship in which a large firm asks a small firm to conduct a commissioned work (producing parts, components, or finished products) under a dominant position.”

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Small Business Economics 18: 163–175, 2002.
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There also seems to be a general consensus that subcontracting is a long-term arrangement. A one-shot transaction cannot be called a subcontracting arrangement. In addition, the relationship is sometimes expected to include risk-sharing arrangements, technology diffusion mechanism, and distinctive subcontractor control, such as “*kanban* system” (see Uekusa 1987, p. 500). However, the arrangement is not necessarily an exclusive one; a subcontractor may have multiple clients. In addition, financial links are sometimes observed.

Statistically, the Ministry of International Trade and Industry (MITI), Government of Japan (GOJ), defines subcontracting as follows:¹ “A contractual arrangement between a firm and a ‘parent’ firm with larger capital or larger number of employees. The former firm is commissioned to produce products, parts, attachments, materials, or components used as inputs in the parent firm’s production, or to produce or repair facilities, equipment, tools, and others which the parent firm uses in production. When a firm purchases non-customized parts, components, and others through a usual marketing channel, it is not regarded as subcontracting. In subcontracting, a parent firm orders the work directly to a subcontractor with assigning a plan, quality, spec, form, design, or others.”²

Although this definition is still fuzzy, the questionnaire for the statistics includes questions on subcontracting, which seem to be filled out without much difficulty.

3. Historical and theoretical foundation of subcontracting

The public view on subcontracting in Japan has drastically changed over time. Traditionally, partially under the influence of Marxian economics that dominated the academic literature in Japan, researchers emphasized the asymmetry between large and small firms in the subcontracting relationship. It was thought that large firms had monopsonic power in determining prices, imposing conditions on product quality and delivery, and using smaller firms as a buffer for business fluctuations. The dualistic structure in labor and capital markets was also emphasized as a background of the subcontracting system.

In the 1970s and 1980s, as Japanese gained

confidence on their economic system, the view swung toward the opposite end. Researchers in managerial science and the “neoclassical” school of economics highlighted the efficiency-enhancing nature of subcontracting system.³ In particular, a number of detailed case studies on the automobile industry revealed that the stratified subcontracting system enhanced static and dynamic efficiency. Since then, subcontracting has been regarded as one of the important components of the Japanese economic system,⁴ with presumed benefits in (1) saving costs to search and select new suppliers, (2) having successful quality enhancement and cost reduction in cooperation with subcontractors, (3) successfully providing incentives for subcontractors’ investment in relation-specific assets, (4) having efficient risk-sharing mechanism, and (5) sometimes maintaining a good relationship by a certain amount of share holding (but not necessarily restricting suppliers’ counterparts).

What conditions are necessary for the emergence of subcontracting? We need to approach this issue from both an historical and a theoretical perspective.

The historical perspective is essential to specifying the condition for the emergence, existence, and evolution of subcontracting system. There is an ongoing academic discussion on whether the Japanese economic system was “continuous” across the period of WW II or was rather “disrupted” by the war. However, it is at least true that the Japanese economy inherited from the pre-war economic system a portion of the economic conditions that consisted of initial conditions guaranteeing the emergence of post-war subcontracting system. What follows is a list of hypothesized initial conditions.

First, in the latter half of the 1940s and 1950s, there existed a distinctive dualistic structure between large and small enterprises, but the gap was not too large in terms of, for instance, technology and entrepreneurship to prohibit them from constructing efficient subcontracting arrangements. Second, Japan then had an international comparative advantage in labor-intensive manufactured goods, and abundant supply of labor was available for SMEs. At the same time, SMEs did not have direct access to foreign technology and an export marketing channel, which left room for

large firms to utilize SMEs. Third, the government conducted a series of SME promotion policies. For example, the policies had multiple channels helping financial arrangements, managerial practice and technology, cooperative organizations, modernization scheme through advice, and tax concessions. Financial support to compensate for liquidity constraints was particularly important.⁵ In addition, some policies were implemented to protect weak SMEs from the viewpoint of social policy as well as competition policy.⁶

Subcontracting is a long-term relationship and thus has a strong path-dependent nature. With the comfort of long-term commitments, large enterprises provided technological assistance to SMEs. The long-term relationship stabilized the financial condition of SMEs. Such a system seemed to work well in the high-growth period of 1955–73. The changes in the economic environment after 1973, however, forced firms to make some modification of the subcontracting system. The Japanese economy faced slower growth rates and became labor-scarce at the same time. SMEs were acquiring more human capital, higher technological level, and more vigorous entrepreneurship. The development of the financial sector gradually removed liquidity constraints of SMEs. From the latter half of the 1980s, the globalization of Japanese firms accelerated. In the changing economic environment, path-dependent and an interlocking nature of subcontracting sometimes slowed down necessary restructuring of industrial organization. Many SMEs faced difficulties in finding new customers when a production plant of the client moved out to foreign countries. On the other hand, there are a number of SMEs that successfully made foreign direct investment and got out of old rigid subcontracting connection.

As for the theoretical perspective, the issue is how to theoretically formalize the endogenous emergence of industrial organization structure and linkages. One of the important issues of discussion is a firm's choice of how to obtain parts and components from upstream: choices over (1) vertical integration (internalization), (2) subcontracting, and (3) competitive spot bidding. We need to specify the conditions for firms to choose 2 instead of 1 or 3. Subcontracting must be efficient in both the static and dynamic senses in some conditions.

Following Maruyama (1996), we summarize the theoretical foundation of subcontracting in four approaches. The first is the transaction cost approach.⁷ On the basis of the assumptions on bounded rationality and opportunism in human behavior, the transaction cost approach characterizes transactional environment by introducing uncertainty, frequency in transactions, and relation-specific assets. Taking these characteristics into consideration, a firm decides whether to internalize certain transactions or not. Subcontracting arrangements can be interpreted as one of the devices to save transaction costs. Along this line, Asanuma (1989) conducts a detailed case study and finds the reshuffling of subcontractors in the process of model changes in the automobile industry. He provides the detailed classification of supplier arrangements and proposes the concept of relation-specific skill. Barney (1999) explicitly discusses a firm's boundary decisions with the capabilities of its potential partners by using the concept of transaction cost, though he uses the word "outsourcing" rather than "subcontracting."⁸

The second is the game theory approach. This approach emphasizes a long-term cooperative relationship between upstream and downstream firms based on repeated game, reputation, and coordination. The formulation of coordinating relationship is explained by using the game theoretic concepts.

The third is the economics of information approach. This approach is based on the contract theory, particularly the principal-agent model in which long-term relationship works for fostering efficient risk-sharing arrangements under incomplete information.⁹

The fourth is the network approach. This approach advocates that the Japanese interfirm relationship is interpreted as an "intermediate" organization (*chuukan soshiki*) in which the market principle and the organizational principle coexist. It emphasizes that under a certain economic environment, interfirm relationship with an efficient synergy of competition and coordination is constructed.^{10, 11}

From these four approaches we can extract theoretical predictions on industrial characteristics suited for subcontracting. The transaction cost approach and the network approach suggest that

subcontracting, rather than vertical integration, is chosen when the upstream production requires specialized technology or uses particular productive factors such as specialized machines or unskilled labor in the secondary labor market. Instead of purchasing parts and components in the spot market, subcontracting may be chosen when parts and components are customized and had better be supplied from upstream firms with long-term relationship. The game approach presents the stability and path-dependent nature of subcontracting arrangements. The information approach describes the logic of saving monitoring costs, which partially explains why subcontracting is chosen instead of purchasing in the spot market. Overall, theoretical foundation of subcontracting suggests that technological characteristics are the key for an industry to develop subcontracting system.

4. Sectoral pattern of subcontracting

Data on subcontracting in Japan are from *Chuushou Kigyou Sougou Kihon Chousa (Basic Survey of SMEs)* (1966) and *Kougyou Jittai Kihon Chousa (Basic Survey of the Industrial Sector)* (1971, 1976, 1981, 1987) conducted by the Small and Medium Enterprise Agency (SMEA) and MITI.¹² These are based on a carefully designed sampling survey with 176 industries and 11 employment sizes. They include the data of by-industry shares of firms working as subcontractors.

Table I presents the percentage of firms working as subcontractors by industry from 1966 to 1987. The table includes firms with less than 300 workers only. The figures indicate that the importance of subcontracting arrangements widely varies across industries. Industries such as food products and petroleum and coal products do not use subcontracting system much. On the other hand, industries extensively using subcontracting include the ones that have labor-intensive production process such as textiles and clothing and

TABLE I
The percentage of firms working as subcontractors

	1966	1971	1976	1981	1987
Manufacturing total	53.3	58.7	60.7	65.5	55.8
Food products	16.5	30.2	14.5	17.5	8.2
Textiles	79.8	75.9	84.5	84.9	79.6
Clothing	73.6	71.4	83.9	86.5	79.0
Wood and wood products	35.0	43.8	42.9	48.0	21.7
Furniture and fixtures	45.6	49.4	41.2	51.6	38.5
Pulp, paper, and paper products	51.1	43.9	44.8	51.6	41.1
Publishing and printing	46.3	51.0	50.8	59.0	21.7
Chemicals	40.2	38.7	37.1	38.5	—
Petroleum and coal products	30.0	30.7	27.0	38.9	18.1
Plastic products	—	—	—	—	68.5
Rubber products	62.3	54.3	61.1	71.8	65.3
Leather and skin products	60.0	64.5	62.5	68.8	64.6
Ceramics, soil and stone products	33.8	34.0	29.4	36.6	35.4
Iron and steel	66.0	66.0	70.4	72.0	52.3
Nonferrous metal	67.0	69.7	68.7	73.6	61.7
Metal products	66.3	71.7	74.8	48.6	70.9
General machinery	70.7	75.8	82.7	84.2	74.5
Electrical machinery	81.4	78.9	82.3	85.3	79.4
Transport equipment	67.1	77.9	86.2	87.7	79.6
Precision machinery	72.4	70.7	72.4	80.9	70.1
Other manufacturing	50.9	58.7	56.5	62.2	43.4

The figures are only for firms with less than 300 workers.

Data sources: SMEA and MITI (1969, 1974, 1979, 1984, 1990).

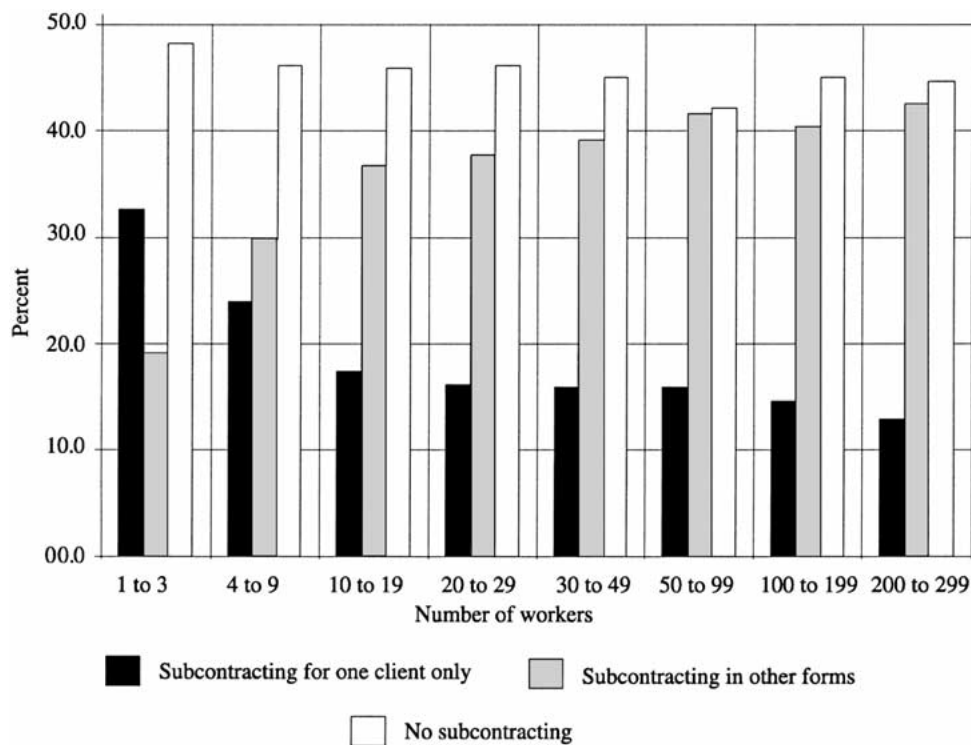


Figure 1. Pattern of subcontracting, 1971.

the ones that have multi-layered vertical production flows such as machinery industries. The nature of production technology certainly affects the effectiveness of subcontracting system. It must also be noted that each industry's figures are largely stable over time.

Subcontracting is a long-term arrangement but is not necessarily a rigid, exclusive contract. Figure 1 shows subcontracting patterns in 1971 with firms classified into three modes: (1) working as a subcontractor for one client only, (2) working as a subcontractor not for one client only, and (3) not working as a subcontractor.¹³ The figure indicates that it is rather common for an SME to work as a subcontractor for multiple clients, and for this to happen more frequently as firm-size increases.

Figure 2 presents the by-size pattern of subcontracting for selected industries in 1987. The firm size and the percentage of working as subcontractors are negatively correlated in most of the industries. Such a pattern was not very obvious in earlier years possibly owing to vigorous re-

shuffling in the high growth era but became clearer through the 1970s and 1980s. Transport equipment industry is an exception in that the subcontracting system has three or four layers and some subcontractors are actually quite large in size.

5. Subcontracting and the characteristics of individual firms

So far we reviewed the historical data of the Japanese subcontracting system and investigated the pattern of subcontracting across industries as well as its relationship with the size distribution of firms. Unfortunately, the data used in the last section are available only at the aggregated level, and thus it is difficult to further analyze subcontracting with connecting various characteristics of individual firms. To supplement the analysis, we use the questionnaire-level micro data of *Kigyō Katsudō Kihon Chōsa* (*Basic Survey of Business Structure and Activity*), 1994 F/Y compiled by MITI (hereinafter we call it BS94) in this section.

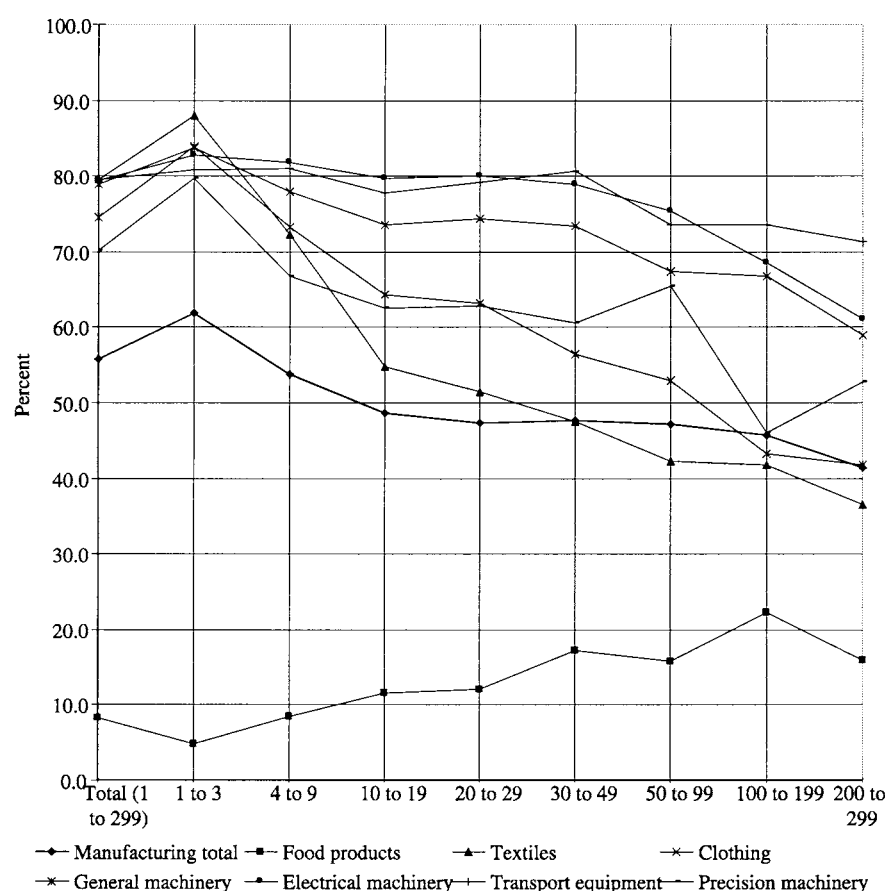


Figure 2. The percentage of firms working as subcontractors by firm size, 1987.

We must note that the experience of Japan in the 1990s may not be directly relevant to the current LDCs because Japan faced various types of structural adjustment issues as a developed country, not issues for developing countries. The subcontracting system was probably an efficient device for enhancing resource allocation in the past but was rather critically reviewed in the 1990s.

This survey was first conducted in FY1991, then in FY1994, and annually afterward. The main purpose of the survey is to capture the overall structure of Japanese corporate firms in light of their diversification, internationalization, interfirm linkages, and strategy on R&D and information technology. The strength of the survey is its complete census coverage and the reliability of figures. We must, however, be careful that the survey only covers large domestic firms and large foreign affiliates in specific industries. The

domestic firms to be covered have more than 50 workers, capital of more than 30 million yen, and be in mining, manufacturing, wholesale and retail trade, or restaurants. The foreign affiliates are defined as being 50 percent Japanese owned percent. The survey includes questions on commissioning production (*itaku seisan*) or not, using subcontractor(s) (using *shitauke*) or not, and working as a subcontractor (doing *shitauke*) or not.

We concentrate on the Japanese machinery industry (general machinery, electric machinery, transport equipment, and precision machinery), for which subcontracting arrangements are particularly important. Table II summarizes the major characteristics of Japanese firms in machinery industries in FY1994. The statistics covers 3,723 firms located in Japan. In the table, firms located in Japan are classified as firms with 50–300 workers, firms with 301–1,000 workers, and firms

TABLE II
Characteristics of firms in Japanese machinery industry, 1994

	(a) With 50–300 workers	(b) With 301–1,000 workers	(c) With 1,001 or more workers
Firm size:			
Number of regular workers (L)	137	534	4,178
[number of persons]	(67)	(188)	(8,706)
Total sales (SALES)	3,304	16,332	209,231
[millions of yen]	(3,295)	(12,896)	(631,186)
Economic performance:			
Ratio of tangible assets to regular workers (KLRATIO) [millions of yen per person]	6.44 (6.69)	7.14 (6.64)	9.89 (7.09)
Ratio of operating surplus to total sales (PAIRATIO)	0.0549 (0.1636)	0.0416 (0.0442)	0.0383 (0.0331)
Ratio of gross value added to total sales (VARATIO)	0.5527 (0.2318)	0.4625 (0.2089)	0.4233 (0.1972)
Foreign sales (1) (PROBEXP): 1 positive; 0 zero	0.2588 (0.4381)	0.4259 (0.4948)	0.6883 (0.4639)
Foreign sales (2) (REXP): ratio to total sales	0.0319 (0.095)	0.0529 (0.1274)	0.1400 (0.1847)
Product differentiation:			
R&D expenditure (1) (PROBRD): 1 positive; 0 zero	0.4596 (0.4985)	0.6926 (0.4617)	0.8827 (0.3223)
R&D expenditure (2) (RRD): ratio to total sales	0.0090 (0.0236)	0.0141 (0.0231)	0.0299 (0.0302)
Ratio of advertisement expenditure to total sales (RADV)	0.0024 (0.0059)	0.0031 (0.0177)	0.0034 (0.0050)
Linkage:			
Commissioning production (PROBCOM): 1 yes; 0 no	0.8872 (0.3164)	0.9086 (0.2883)	0.9136 (0.2814)
Using subcontractor(s) (PROBUSUB): 1 yes; 0 no	0.7350 (0.4414)	0.8012 (0.3993)	0.8519 (0.3558)
Working as a subcontractor (PROBWSUB): 1 yes; 0 no	0.4550 (0.4981)	0.3383 (0.4734)	0.1636 (0.3705)
Ratio of foreign stock ownership (FRATIO)	0.0101 (0.0877)	0.0210 (0.1187)	0.0692 (0.2031)
Number of establishments (ALLEST)	2.70 (2.72)	5.68 (7.23)	19.63 (32.90)
Number of domestic affiliates (DAFFI)	0.40 (1.14)	1.23 (2.29)	11.36 (24.53)
Number of foreign affiliates (FAFFI)	0.05 (0.53)	0.36 (1.49)	4.73 (9.50)
Number of firms in the sample:	2,589	810	324

Notes:

Machinery industry includes general machinery, electrical machinery, transportation equipment, and precision machinery.

Figures are unweighted averages. Standard deviation is in parenthesis.

Data source: The MITI database.

with 1,001 or more workers. Figures stand for the mean and standard deviation of each indicator. These figures include activities of all the establishments the firms have but do not include those of domestic and foreign affiliates. Because the

micro data have fat tails and some of the variables cannot be normally distributed, the means and standard deviations must be interpreted with caution.

Table II shows that larger firms tend to have

higher capital-labor ratios (KLRATIO), larger foreign sales (PROBEXP and REXP), larger R&D expenditure ratios (PROBRD and RRD), and larger advertisement expenditure ratios (RADV). The figures lucidly reveal the pattern of internalization. The ratio of gross value added to total sales (VARATIO) gets smaller as the firm size becomes larger.¹⁴ Although VARATIO can be influenced by various factors such as the type of activities and profitability, one possible interpretation is that small firms tend to be in the upstream of value chain and concentrates on production activities while large firms are likely to be in the downstream.¹⁵ The number of establishments and domestic/foreign affiliates (ALLEST, DAFFI, and FAFFI) gets larger with the firm size. The ratio of foreign stock ownership (FRATIO) also increases with the firm size. The probability of using subcontractor(s) (PROBUSUB) increases from (a) 74 percent to (b) 80 percent and (c) 85 percent. The probability of working as a subcontractor (PROBWSUB) drastically declines from (a) 46 percent to (b) 34 percent and (c) 16 percent.

An interesting fact is that the mean of the ratios of operating surplus to total sales (PAIRATIO) is the highest at 5.5 percent for (a), and then (b) 4.2 percent and (c) 3.8 percent. This of course may not simply mean that that larger, more capital intensive, more R&D and advertisement intensive, and more foreign-exposed firms perform poorly. PAIRATIO may not be a proper measure to compare the performance of firms in different size. We need to take into consideration that larger firms tend to locate in the downstream of value chain, and large firms may earn profit in their affiliates. In addition, we only check a single year's data. After all, the standard deviations, particularly the one for (a), are very large relative to the magnitude of means. Nevertheless, we can at least say that the Japanese SMEs in the machinery industry perform relatively well. This means that interfirm linkages make the de-internalization strategy of small firms effective in Japan. Small firms tend to keep themselves slim by giving up foreign operation, R&D, and advertisement and concentrate on production activities with subcontracting arrangements. In contrast, Doms and Jensen (1998) advocate that in case of the U.S. manufacturing sector, MNEs owned by Americans have superior performances when compared with

both U.S. affiliates of foreign firms and local indigenous establishments without foreign affiliates.

To see the relationship between the subcontracting pattern and the characteristics of firms, Table III classifies firms into four groups as follows: Group 1, a firm not using subcontractor(s), and not working as a subcontractor; group 2, a firm not using subcontractor(s), but working as a subcontractor; group 3, a firm using subcontractor(s), and working as a subcontractor; and group 4, a firm using subcontractor(s), but not working as a subcontractor.

Groups 2, 3, and 4 present a clear size pattern: As a firm gets larger, it is less likely to work as a subcontractor and more likely to use subcontractors. There are many firms belonging to Group 3, which implies that the subcontracting system in the Japanese machinery industry is multi-layered. Group 2 includes only 178 firms, but there probably exist a large number of firms of this type with less than 50 workers. VARATIO is the largest for Group 2 while the smallest for Group 4, confirming the upstream-downstream pattern. PAIRATIO is the highest for Group 1, though the standard deviation is quite high. This suggests that there exists a group of small high-performance firms independent of the subcontracting system.

Table IV tabulates simple correlations between pairs of variables. Except the correlation between the number of regular workers (L) and total sales (SALES), correlations are overall small so that we do not worry about a multicollinearity problem in regressions.

We do not claim any simple causal relationship among variables. A firm is supposed to decide how to utilize subcontracting arrangements, jointly with the decisions on its size, R&D, foreign sales, and others. However, some regression analysis is conducted just to see the controlled associations among variables. Table V reports the results of logit estimation in which the dependent variables are PROBUSUB and PROBWSUB.¹⁶ These are the major findings: First, the coefficients for L and KLRATIO are significantly negative in the regression for PROBWSUB, while those are positive but not significantly different from zero for PROBUSUB. This means that small firms tend to work as subcontractors while firms regardless of size may use subcontractors. The subcontracting

system is multi-layered, which is shown in positive coefficients for PROBWSUB in the PROBUSUB regression and PROBUSUB in the PROBWSUB regression.

Second, the coefficient for VARATIO is negative in the PROBUSUB regression while it is positive in the PROBWSUB regression. Our

interpretation is that firms using subcontractor(s) de-internalize a part of the production activities, and firms working as a subcontractor concentrate on production activities. On the other hand, the coefficients for REX and RRD are positive in the PROBUSUB regression and negative in the PROBWSUB regression. Firms using subcon-

TABLE III
Characteristics of firms in Japanese machinery industry, 1994, by subcontracting pattern

	Group 1	Group 2	Group 3	Group 4
Using subcontractor(s)	No	No	Yes	Yes
Working as a subcontractor	No	Yes	Yes	No
Firm size				
Number of regular workers (L)	477	212	282	925
[number of persons]	(2,992)	(272)	(560)	(3,835)
Total sales (SALES)	17,790	4,063	8,253	43,401
[millions of yen]	(142,895)	(5,645)	(24,497)	(288,333)
Economic performance				
Ratio of tangible assets to regular workers (KLRATIO)	7.21	5.71	5.89	7.77
[millions of yen per person]	(7.87)	(6.19)	(5.02)	(7.47)
Ratio of operating surplus to total sales (PAIRATIO)	0.0561	0.0441	0.0481	0.0501
	(0.0802)	(0.0529)	(0.2126)	(0.0648)
Ratio of gross value added to total sales (VARATIO)	0.5418	0.5728	0.5368	0.4929
	(0.2311)	(0.2574)	(0.2397)	(0.2112)
Foreign sales (1) (PROBEX)	0.3236	0.1461	0.1944	0.4810
1 positive; 0 zero	(0.4682)	(0.3542)	(0.3959)	(0.4998)
Foreign sales (2) (REX)	0.0460	0.0156	0.0174	0.0745
ratio to total sales	(0.1207)	(0.0660)	(0.0682)	(0.1440)
Product differentiation				
R&D expenditure (1) (PROBRD)	0.4979	0.2809	0.4356	0.7009
1 positive; 0 zero	(0.5003)	(0.4507)	(0.4960)	(0.4580)
R&D expenditure (2) (RRD)	0.0117	0.0057	0.0068	0.0173
ratio to total sales	(0.0261)	(0.0197)	(0.0208)	(0.0268)
Ratio of advertisement expenditure to total sales (RADV)	0.0032	0.0010	0.0015	0.0035
	(0.0120)	(0.0024)	(0.0118)	(0.0064)
Linkage				
Commissioning production (PROBCOM)	0.8006	0.7921	0.9427	0.9081
1 yes; 0 no	(0.3999)	(0.4069)	(0.2324)	(0.2890)
Ratio of foreign stock ownership (FRATIO)	0.0146	0.0033	0.0027	0.0340
	(0.1067)	(0.0412)	(0.0412)	(0.1510)
Number of establishments (ALLEST)	3.88	2.49	2.94	7.22
	(5.77)	(3.25)	(4.13)	(16.95)
Number of domestic affiliates (DAFFI)	1.04	0.36	0.65	2.68
	(6.26)	(1.05)	(2.56)	(11.44)
Number of foreign affiliates (FAFFI)	0.32	0.03	0.14	1.03
	(1.90)	(0.21)	(1.46)	(4.61)
Number of firms in the sample	717	178	1,327	1,501

Notes:

Machinery industry includes general machinery, electrical machinery, transportation equipment, and precision machinery. Figures are unweighted averages. Standard deviation is in parenthesis.

Data source: Same as Table II.

TABLE IV
Simple correlations between variables

	L	SALES	KLratio	PAIRatio	VARatio	REX	RRD	RADV	PROBcom	PROBUSUB	PROBWSUB	Fratio
L	1.0000											
SALES	0.9123	1.0000										
KLratio	0.0925	0.0974	1.0000									
PAIRatio	-0.0191	-0.0157	0.0654	1.0000								
VARatio	-0.0783	-0.0759	-0.0349	0.1045	1.0000							
REX	0.1887	0.1622	0.1914	0.0271	-0.0646	1.0000						
RRD	0.1793	0.1357	0.0538	0.0450	-0.0055	0.2529	1.0000					
RADV	0.0414	0.0365	0.0543	0.0372	0.0245	0.0938	0.1449	1.0000				
PROBcom	-0.0047	0.0018	-0.0248	-0.0160	-0.0337	0.0210	0.0157	0.0084	1.0000			
PROBUSUB	0.0303	0.0260	-0.0017	-0.0130	-0.0643	0.0284	0.0321	-0.0104	0.1743	1.0000		
PROBWSUB	-0.0887	-0.0690	-0.1249	-0.0174	0.0693	-0.2017	-0.1741	-0.1031	0.0823	0.2354	1.0000	
Fratio	0.1841	0.1552	0.0642	0.0176	-0.0031	0.1568	0.0910	0.0427	-0.0443	0.0269	-0.1104	1.0000

Number of observations = 3723.

TABLE V
Determinants of subcontracting status

	Dependent variables	
	PROBUSUB Using subcontractor(s) = 1 Otherwise = 0	PROBWSUB Working as a subcontractor = 1 Otherwise = 0
Constant	0.0558169 (0.360)	-1.461543** (-8.446)
L	0.0000338 (1.163)	-0.0004064** (-4.693)
KLRATIO	0.0052952 (0.885)	-0.297447** (-4.448)
PAIRATIO	-0.0849547 (-0.301)	-0.0292907 (-0.118)
VARATIO	-0.8176049** (-4.521)	0.6379953** (3.927)
REX	0.8841049* (2.251)	-3.853797** (-7.127)
RRD	6.386876** (3.167)	-13.00605** (-5.688)
RADV	0.2509413 (0.054)	-56.75889** (-5.461)
PROBCOM	1.023187** (8.882)	0.37993** (2.962)
PROBUSUB	-	1.450414** (14.993)
PROBWSUB	1.41165** (14.609)	-
FRATIO	0.0010676* (2.510)	-0.0026925** (-3.652)
Log likelihood	-1868.9965	-2155.592

Number of firms in the sample = 3723.

Note: t-statistics are in parentheses.

** Significant at the 1% level.

* Significant at the 5% level.

tractor(s) tend to internalize exporting activities and R&D while firms working as a subcontractor are likely to de-internalize these activities. The internalization pattern and subcontracting thus seem to be closely related.

Third, the coefficient for FRATIO is positive in the PROBUSUB regression and negative in the PROBWSUB regression. This suggests that affiliates of foreign firms and/or firms with a high proportion of foreign shares may actively use subcontractors in Japan while they are less likely to work as subcontractors. It may thus be unfair to

criticize that subcontracting system is a closed club only for pure Japanese participants, excluding foreigners' participation. Rather, foreign investors may simply purchase stocks of good Japanese machinery firms that use subcontractors in an effective manner.

Fourth, PAIRATIO has negative signs for both regressions though not significantly different from zero. We must at least admit that belonging to subcontracting system does not seem to be a clear strength anymore in the 1990s.

Acknowledgements

The author would like to thank Cristina Boari and other participants in the World Bank Institute's project on The Role of Small and Medium Enterprises in Development for a number of constructive comments and for encouragement. The research assistance provided by Takamune Fujii and Hiromichi Nakagawa is gratefully acknowledged.

The MITI database used in Section 5 was prepared and analyzed in the cooperation with the Research and Statistics Department, Minister's Secretariat, Ministry of International Trade and Industry, Government of Japan. However, opinions expressed in this paper are those of the author.

Notes

¹ The definition is based on SMEA and MITI (1979).

² The author made the translation into English. The MITI statistics also uses the concept of "outsourcing (gaichu)." The difference between outsourcing and subcontracting is again unclear, but it seems that subcontracting is specifically a long-term commitment between large and small firms. Watanabe (1997, pp. 101–104) obviously defines outsourcing differently though. Another concept, "commissioning production (itaku seisan)," includes outsourcing and other types of commissioned production such as OEM.

³ On the drastic change in views on SMEs, see for example Sato (1989), Tsuchiya and Miwa (1989), Miwa (1990), and Watanabe (1997).

⁴ See Asanuma (1989) and Fujimoto (1997) for example.

⁵ Nugent and Nabli (1992) claim that the access to financial resources is important for the development of SMEs.

⁶ "Unfair" trade practices of large parent companies (clients) were strongly criticized by media, and in response, the government enacted a specific law to prevent from undue delays of payments of subcontracting fees and other improper trade practices in 1956 (Shitauke Daikin Hou).

⁷ Williamson (1979, 1985) provides the theoretical foundation of transaction costs and governance structure. Macneil (1983) presents the concept of relational contract. Monteverde and Teece (1982) conduct an empirical study on a transaction cost theory of vertical integration.

⁸ The author would like to thank Christina Boari for the reference.

⁹ Kawasaki and McMillan (1987), Asanuma and Kikutani (1992), Lyons (1996), and Taylor and Wiggins (1997) are in the references.

¹⁰ Along this line, Kooij (1991) is one of the references.

¹¹ As for subcontracting system, there are a number of other research papers from different angles. For example, Suzuki (1993) and Montalvo and Yafeh (1994) investigate the nature of technology transfer relating to subcontracting. Fujimoto (1997) conducts a detailed empirical study on the product

development function of subcontracting in case of Japanese automobile industry.

¹² If available, the data for older years would provide an analysis more relevant to the current LDCs. Although the Survey was initiated in 1957, questions on subcontracting were not included until 1967, unfortunately.

¹³ The question for subcontracting modes unfortunately disappeared in the 1976 survey and after.

¹⁴ Gross value added is calculated simply by subtracting the value of purchases from the value of sales.

¹⁵ This interpretation is possible because the material cost for subcontracting work is counted for the subcontractor, not for the client, in the Japanese statistics. This may not be the case for statistics in Korea, Taiwan, and other countries.

¹⁶ The probit estimation provides similar results.

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