

# Offshoring and corporate headquarters: Evidence from Japanese firm-level data

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## Abstract

Offshoring requires firms to have strong corporate headquarters for monitoring and contracting with suppliers. This paper exploits the unique Japanese firm-level data, which distinguish the offshore supplier's types: own FDI subsidiaries, subsidiaries owned by other Japanese firms, and foreign suppliers. This paper finds that firms outsourcing to foreign or Japanese suppliers tend to allocate significantly more workers to corporate headquarters, compared with firms involved in intra-firm offshoring. The ownership rather than nationality of suppliers is the significant determinant for the size of corporate headquarters in offshoring firms. This finding is robust even after firm-specific effects are controlled for.

Keywords: offshoring; outsourcing; firm boundary; language barrier; firm-level data

JEL classifications: D23; F23; L24

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## 1. Introduction

In recent years, firms are actively sourcing from suppliers across national borders, partly facilitated by trade liberalization and improved information and communication technologies. Although many of them are active in exporting and foreign direct investment (FDI), Japanese firms are supposed to be relatively inactive in offshoring of various service-related tasks due to language barriers. This paper investigates how the size of corporate headquarters in Japanese offshoring firms varies depending on the ownership or nationality of suppliers.

Firms are offshoring not necessarily to local firms in low-wage countries but also to overseas subsidiaries owned by multinationals. When the suppliers are owned by the offshoring firm herself, the offshoring is conducted within the firm boundary (intra-firm offshoring). If contracting and monitoring are more costly in arm's-length trade compared with intra-firm trade, a firm should allocate more workers to management and coordination functions when the firm is offshoring across the firm boundary (offshore outsourcing). Even when Japanese firms are involved in arm's-length offshoring, coordination and communication are likely to be less difficult in offshoring to suppliers owned by other Japanese firms. As Antràs and Rossi-Hansberg (2008) pointed out, how firms allocate workers within multinationals “to deal with the international organization of production has been less studied empirically” (pp.12-13), in spite of active theoretical research of this area. Antràs, Garicano, and Rossi-Hansberg (2008) show that more middle managers are required to handle offshoring to countries with high communication costs, but their study depends on aggregated country-level FDI data.<sup>1</sup>

This paper uses unique Japanese firm-level data, by which we distinguish the following three types of suppliers in offshoring: own FDI subsidiaries, subsidiaries owned by other

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<sup>1</sup> As a rare example of empirical studies on corporate organizations, Rajan and Wulf (2006) find that firms are becoming flatter (more positions reporting directly to CEO and fewer layers between division heads and CEO) in the sample of more than 300 U.S. firms, but they do not examine offshoring or outsourcing.

Japanese firms, and foreign suppliers. As theoretical models of offshoring typically consider the binary choice between foreign suppliers vs. own FDI subsidiaries, previous empirical studies have examined intra-firm trade shares based on trade statistics (e.g. Nunn and Trefler, 2008). However, this paper further distinguishes the third category unavailable in previous data: offshoring to suppliers located overseas but owned by multinationals headquartered in the same home country as the offshoring firm. This paper compares Japanese firms offshoring to own FDI subsidiaries with those offshoring to subsidiaries owned by other Japanese multinationals, for isolating the effect of language barriers from the effect of firm boundary on corporate organizations. By linking our unique offshoring data with official corporate statistics at the firm level, we control for various firm-characteristics, such as firm size, factor intensity, R&D intensity, firm age, export, and the ownership structure of the offshoring firms. Unobservable time-invariant firm-specific effects are also controlled for in panel regressions.

The investigation of Japanese firms provides us with a rare opportunity to test the impact of language barriers, since the Japanese language is nearly always used in transactions between Japanese firms but seldom used in transactions with foreign firms. This contrast is remarkably sharp almost uniquely in Japanese, since all other languages used in major economies, such as English, French, Spanish, or Chinese, are used actively also abroad and/or multiple languages are used in the home country, thus made the contrast blurred in other countries.<sup>2</sup> As language barriers occupy non-negligible share in trade cost, we cannot ignore it in discussing the impact of offshoring on corporate organization.<sup>3</sup> We must note that what this paper calls as “language barriers” includes not only expensive translations of different languages but also other coordination costs caused by differences in legal systems or in business practices. In this sense,

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<sup>2</sup> This uniqueness of the Japanese language is confirmed in the Ethnologue Database (Lewis, 2009), which catalogues languages around the world. We will discuss this in detail in the next section.

<sup>3</sup> For empirical evidence for impacts of languages on trade cost, see Melitz (2008), for example.

by focusing on Japanese firms, this paper tries to identify the nationality effect separated from the ownership effect in offshoring. The empirical investigation of Japanese offshoring is worth exploring on its own right, since it will be useful to know how traditional Japanese corporate organizations, such as relatively small corporate headquarters<sup>4</sup>, and intensive inter-firm trade networks among Japanese firms change with a new mode of cross-border operation: offshoring.<sup>5</sup>

To preview our principal results, outsourcing firms tend to allocate significantly more workers to corporate headquarters compared with firms involved in intra-firm offshoring. Higher share of corporate headquarters is found not only in firms outsourcing to foreign suppliers but also in firms outsourcing to offshore suppliers owned by other Japanese firms, suggesting that the size of corporate headquarters is related with ownership, rather than language barriers. This relation is confirmed robust even after firm-specific effects are controlled for.

The rest of the paper is organized as follows. Section 2 describes our survey on offshoring and report summary statistics. Section 3 presents the estimation results from the firm-level panel regressions. Section 4 adds concluding remarks.

## **2. Description of the data**

### **2.1. Description of the survey**

This paper derives firm-level data from a unique offshoring survey linked with official mandatory corporate statistics. The questionnaire was sent to 14,062 firms in Japan, of which 39% returned their answer sheets.<sup>6</sup> As the population of firms for this survey is chosen as the

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<sup>4</sup> Management studies have referred to weak headquarters contrasted with strong factory as one of the characteristics of Japanese firms. See Fujimoto (2006), for example.

<sup>5</sup> Inter-firm transactions within Japanese keiretsu networks have been extensively analyzed by early studies, such as Head et al. (2004).

<sup>6</sup> The survey was conducted by Japan's Research Institute of Economy, Trade and Industry (RIETI) for our research project. For details of the survey, see Ito et al. (2007).

same as those used for the previous wave of the annual legal mandatory survey, these firms coincide virtually all large- or medium-sized firms in all manufacturing industries, and thus should be regarded as reasonably reliable in deriving implications to the whole manufacturing.<sup>7</sup> While this survey was conducted only once at 2006, the retrospective question on the firm's offshoring experience five years ago is included to alleviate the limitation of a one-shot survey.

The "offshoring," or offshore sourcing, is defined by contracting-out to other firms<sup>8</sup> located overseas based on explicit contracts specifying specifications or other dimensions of the offshored tasks. Purchases of standardized commodities at marketplace are not counted as offshoring in this survey. We choose this restrictive definition to focus on costs of coordination and management. Offshoring of both production and service tasks are covered. Our survey also collects data on domestic sourcing explicitly distinguished from offshore sourcing; i.e. sourcing of specialized inputs (goods or services) from suppliers located within Japan.

As the most unique and informative contribution, the survey distinguishes the following three types of suppliers in offshoring:

- (A) offshore subsidiaries owned by the offshoring firm,
- (B) offshore subsidiaries owned by other Japanese multinational firms ("Japanese suppliers" for short, hereinafter), and
- (C) foreign suppliers.

"Subsidiary" is defined by the majority ownership. While 10% threshold is often used in FDI studies, the majority ownership is practically central and conceptually critical in discussing a

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<sup>7</sup> The questionnaire was sent to all firms surveyed by *The Basic Survey of Business Structure and Activities (Kigyo Katsudo Kihon Chosa*, in Japanese), which covers all firms with 50 or more employees and capitalized at no less than 30 million yen.

<sup>8</sup> Imports from branch offices/factories are not included as they are not independent legal entities.

controlling stake.<sup>9</sup> The last category (C) includes not only local firms but also subsidiaries owned by multinationals headquartered in countries other than Japan, typically in U.S. or E.U.

The offshoring in the first category (A) is intra-firm offshoring within a multinational corporation, while the other two categories correspond to offshore outsourcing across the firm boundary. Although they are often used interchangeably, we distinguish “offshoring” and “outsourcing.” Offshoring refers to cross-border sourcing (intra-firm or arm’s-length), while outsourcing is sourcing across firm boundary (offshore or domestic). The identification of the first category (A) is for investigating the effect of ownership, while the distinction of the category (B) from (C) is designed to detect the possible effects of language barriers.

As in offshore sourcing, suppliers located in Japan are not necessarily independent suppliers, but can include subsidiaries. Unfortunately, the survey cannot distinguish domestic supplier types as in offshoring. This paper controls for the firm’s domestic sourcing status (whether or not the firm is involved in domestic sourcing) in examining the relation between offshore sourcing and corporate organization.

While the intra-firm trade share has been often used to analyze the offshore outsourcing vs. integration decision (e.g. Nunn and Trefler, 2008), this binary measure ignores language barriers in arm’s-length outsourcing transactions. As far as the authors know, this paper is the first attempt at distinguishing three types of suppliers in offshoring.

The investigation of Japanese offshoring is suitable for our research purpose. The database by Lewis (2009), *Ethnologue*, confirms this as follows. Within Japan, second-language speakers are less than one-percent of the total population. The probability that any two people of Japan selected at random would have different mother tongues is as low as 0.028, one of the

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<sup>9</sup> As a support for the focus on majority-owned FDI, Nunn and Trefler (2008) confirm that “for a very large proportion of ownership positions in the BEA data, once the position is more than 10%, it is also more than 50%” (p.21).

lowest in the world.<sup>10</sup> Besides, people using the Japanese language are extremely few outside of Japan.<sup>11</sup> These facts indicate that communications between Japanese people are almost certainly in Japanese language but those with non-Japanese people are extremely unlikely to be in Japanese. Such a sharp contrast is implausible for other languages used in major economies in the world. While it is practically impossible to identify the actual language used in contracting and monitoring, this paper assumes that firms headquartered in Japan (“Japanese firms”) and the suppliers, even if they operate overseas, owned by Japanese firms with majority ownerships (“Japanese suppliers”) use the Japanese language. As top management positions in FDI subsidiaries owned by Japanese firms are predominantly occupied by people with Japanese nationality dispatched from parent companies, this assumption is reasonable.<sup>12</sup>

## 2.2. Descriptive statistics

Before investigating the regression results in the next section, it will be useful to briefly summarize descriptive statistics from our survey.

Table 1 reports how many firms are active in offshoring and choose different categories of suppliers in offshoring at the more recent year in our sample 2006.<sup>13</sup> The percentage in each row is worth noting.

First, merely 21% of the firms in our sample are actively offshoring. This participation rate may sound extremely low in a sample of offshoring of both production and service tasks by large- or medium-sized firms in a developed country, but is consistent with high fixed entry

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<sup>10</sup> Almost all the other countries with low probability are with small population, except Korea. While Brazil, Columbia, Venezuela, and Portugal are ranked similar to Japan, those countries use the languages widely spoken abroad (Spanish or Portuguese).

<sup>11</sup> Even in Taiwan, there are at most ten-thousand people who can use Japanese as a second language, mostly in retirement ages.

<sup>12</sup> In more than 90% of Japanese offshore affiliates, people with Japanese nationality occupy the president position at 2006, according to a survey by Japan Institute for Labor Policy and Training.

<sup>13</sup> Comparable figures at 2001 are available upon request.

costs for offshoring as has been formalized in theoretical models (e.g. Antràs and Helpman, 2004).<sup>14</sup>

The next three rows in Table 1 present the percentages among offshoring firms. As some firms are simultaneously procuring from multiple sources, the sum of these percentages naturally exceeds 100. Around half of the offshoring firms are contracting-out their tasks to their own FDI subsidiaries, indicating an important role of intra-firm trade in offshoring. Merely less than quarter of the offshoring firms choose suppliers owned by other Japanese multinationals. This figure clearly contradicts with the presumption that Japanese firms are offshoring each other within traditional Japanese inter-firm networks. On the other hand, as many as 60% of the offshoring firms choose foreign suppliers. These percentages combined suggest that offshoring is strongly motivated by incentives to seek low production costs overseas at the same time by integration incentives, but appear to be less induced by easiness of communications (the commonality of language).

By disaggregating offshoring firms based on the types of suppliers, Table 2 compares the communication activities and corporate structures. The measures are defined as follows. First, the activeness of communication is measured by “information and communication expenditures” divided by sales, both in yen. Next, to evaluate the size of corporate headquarter within firms, this paper reports the employment share of corporate function sections (*honsha-kinou bumon*, in Japanese) relative to the total number of workers (regular employees)  $L^{HQ}/L$ , since the workers in this category perform such corporate functions as legal, financial, personnel administration, corporate planning, international coordination, and not directly involved in manufacturing.<sup>15</sup> This ratio could also be interpreted as a proxy for the share of

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<sup>14</sup> Tomiura (2007) reports that only 3% of the manufacturing firms are outsourcing production offshore at 1998 in Japan among 118,300 surveyed firms, of which nearly 80% are with less than 50 workers.

<sup>15</sup> “Corporate function sections” in this statistics also include R&D section and information



non-production workers, which has been repeatedly analyzed in the U.S. or Europe.

Unfortunately, Japanese corporate or industrial statistics do not contain employment data disaggregated by occupations, skills, or educational attainments. In the same table, the share of international affairs section in total employment  $L_{int}/L$  is also shown, as the international affairs section within corporate headquarters is supposed to handle coordination with offshore firms. Table 2 reports the averages at 2006 for these variables. Firm size is measured in the total number of workers, and expressed relative to the overall mean. To make comparisons easier, the shares of communication expenses and of international section are expressed by percentage multiplied by one-hundred. Noteworthy points are as follows.

First, firms offshoring to foreign suppliers on average spend more on communications, compared with firms offshoring to suppliers owned by Japanese firms, followed by firms offshoring within firm boundary. Although identifying the languages used in actual offshoring cases is practically impossible, this ordering seems reasonable due to costly communications with foreign suppliers.

Second, the average firm involved in intra-firm offshoring allocates fewer workers to its headquarters compared with the average firm offshoring across firm boundary, especially the average firm offshoring to foreign suppliers.

Third, the share of international section is the highest in firms active in intra-firm offshoring, followed by firms offshoring to foreign suppliers. The firms not involved in offshoring at all tend to have the smallest international section. The firms offshoring to Japanese suppliers on average have intermediate shares.

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processing section. Although management of R&D projects at the corporate level and human resource management of data centers should be regarded as corporate management functions, we cannot exclude scientists and data entry workers. We will adjust this problem by disaggregating headquarters in Section 3.2.2.

As Crémer et al. (2007) formalize in their theoretical model of the firm, common codes and hierarchies are substitutes. In our offshoring context, an offshoring firm chooses between Japanese and the language necessary to be translated (e.g. English). If a Japanese firm is offshoring to a foreign supplier, the offshoring firm needs to form a more hierarchical organization, compared with a firm offshoring to Japanese supplier sharing the common language (Japanese). Larger corporate headquarters in the firms offshoring to foreign suppliers appears consistent with their theory.<sup>16</sup>

Finally, however, we must note that firms offshoring to different types of suppliers on average varies noticeably in size. Combined with the figures in the previous table, only large-sized firms are actively offshoring to other Japanese firms. The ordering in communication expenditure share and in corporate headquarter share just reported above may be at least partly affected by firm-specific factors. We need to control for various firm-characteristics before jumping to the final conclusion.

### 3. Empirical results

#### 3.1. Empirical specifications

This paper estimates the following reduced-form regression linking corporate headquarters with the type of suppliers in offshoring:

$$\frac{L_{jt}^{HQ}}{L_{jt}} = \beta \cdot Supplier_{jt} + \gamma \cdot Z_{jt} + \mu_j + \varepsilon_{jt}. \quad (1)$$

The firm is identified by the suffix  $j$  in (1). *Supplier* is a vector of the following three dummy variables based on the type of suppliers in offshoring: (A) offshoring to own subsidiaries, (B) offshoring to Japanese suppliers, and (C) offshoring to foreign suppliers. If a firm is offshoring

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<sup>16</sup> Impacts of social networks on international trade have been examined by such pioneering work as Rauch (1999), though offshoring or ownership was not mentioned at all.

to a supplier in each category, the corresponding dummy takes the value one. When a firm is sourcing from multiple suppliers in different categories, two or three dummies are non-zero. The dependent variable  $L^{HQ}/L$  is the employment share of corporate headquarters (%), defined in the previous section. Since offshoring data are available at the two years  $t = 2001$  and  $2006$ , we estimate (1) in a panel format to control for time-invariant firm-specific effects  $\mu$ . The idiosyncratic disturbance term is denoted by  $\varepsilon$ . We should not interpret (1) as indicating the direction of causality.

Other variables, summarized by  $Z$  in (1), are given based on standard definitions as follows. The firm size is measured in the number of workers. The capital-labor ratio is defined by the book value of machine and equipment divided by the number of workers.<sup>17</sup> The R&D intensity is the percentage of R&D expenditure relative to sales. These three continuous variables are in logarithms.<sup>18</sup> The squared term is added to the firm's *Age* to consider possible non-linearity. *Export* is the dummy variable identifying a direct exporter. The last two variables are on the ownership of the offshoring firm. *Foreign Share* measures the share owned by foreign stockholders (residents outside of Japan), while *Parent Share* measures the share owned by the parent firm (Japanese or foreign combined).<sup>19</sup> The firm-level data for these variables are derived from annual official statistics. This paper also controls for the effects of domestic sourcing by introducing the dummy (*Domestic Sourcing*) taking the value one when the firm is sourcing from a supplier located within Japan. We add dummies for 24 industries to control for industry-specific effects.

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<sup>17</sup> The value of tangible fixed assets is often used to construct the capital-labor ratio, but our measure is superior in excluding volatile fluctuations in values of land and plant construction.

<sup>18</sup> R&D expenditures and capital for firms without available data are set at zero. Negligible  $10^{-8}$  is added before taking logarithm.

<sup>19</sup> When a parent company is a subsidiary of multinationals headquartered outside of Japan, both dummies take the value one.

## 3.2. Estimation results

### 3.2.1. Regressions of corporate headquarters

Table 3 reports the panel regression results of corporate headquarters as specified in (1). All the firms, of which the offshoring data both at 2001 and 2006 are available, are included in random-effect generalized least-squares estimations.<sup>20</sup> In the regressions, we concentrate on the firms in the balanced panel to control for time-invariant firm-specific effects. In the table, the first column includes supplier's type dummies only, while the second column adds standard variables relevant for offshoring or integration decisions along with 24 industry dummies to the explanatory variables. The third column further adds the variables on the ownership structure of the offshoring firms. The last column drops statistically insignificant variables from the right-hand side. Robust standard errors are in parentheses. This section discusses the results and relates them with theoretical predictions.

Noteworthy findings are in Table 3 as follows. As the most notable result, the firms active in offshore outsourcing tend to have significantly larger corporate headquarters compared with the firms engaged in intra-firm offshoring, which in turn are not significantly different from non-offshoring firms in their headquarters share. While the foreign supplier dummy is significant at least at 5% significance level in all cases in the table, the Japanese supplier dummy is significant once relevant firm-characteristics and industry-effects are controlled for in the columns (2)-(4). Firms engaged in domestic sourcing also tend to allocate significantly more workers to corporate headquarters.<sup>21</sup> Theoretical models often assume that offshoring entails high costs for management, but our results imply that these costs vary depending on whether the

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<sup>20</sup> Since less than six percent of the surveyed firms switched from non-offshoring to offshoring or vice versa, it is practically difficult to precisely estimate the effect of offshoring in a fixed-effect model.

<sup>21</sup> We must note again that our survey cannot distinguish intra-firm sourcing from outsourcing within domestic sourcing.

offshoring is across the firm boundary. Intra-firm transaction appears to reduce costs associated with contracting and monitoring, as predicted by the theory of vertical integration. This principal result remains robust irrespective of the inclusion of various firm-level control variables.

This finding is also consistent with results from previous empirical work, though studies squarely on this issue have been limited. For example, Hortaçsu and Syverson (2009) find that the share of non-production workers declines in vertically integrated plants based on U.S. plant-level data, and interpret this as implying that plant's management is replaced by intangible inputs provided within a vertically integrated firm. On the other hand, Delmastro (2002) reports, in the 438 Italian plants, that "North-American multinationals whose headquarter is very far from the production unit may prefer to delegate activities completely to the plant level" (p.131). Morrison Paul and Yasar (2009) report that higher share of subcontracted inputs is related with higher share of administrative and technical workers in the case of Turkish apparel plants.<sup>22</sup> Although none of these examined offshoring, these results are basically in line with our finding of larger headquarters in the outsourcing firms.

Offshoring may anyhow result in higher share of corporate headquarters if firms are offshoring tasks intensive in production workers, such as final assembly. However, this replacement effect (weaker demand for production workers at the plants in the offshoring firm) should be observed irrespective of the supplier type. Our finding of different impacts depending on the supplier type indicates stronger demand for coordination and management tasks, rather than weaker demand for production tasks, appears to be the key channel connecting offshoring with corporate organization.

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<sup>22</sup> As an example of empirical studies related with international aspects, Guadalupe and Wulf (2008) find that corporate organization tends to be flatter as import competition becomes intensified in the case of U.S. firms when NAFTA was signed.

As another point to note, the firms offshoring to Japanese suppliers tend to have larger headquarters than non-offshoring firms. While Table 2 showed that share of corporate headquarters in the firms offshoring to Japanese suppliers are in the intermediate range between the firm offshoring to foreign suppliers and those to own subsidiaries, the regression results in Table 3 suggest that statistically significant difference in corporate organization is due to ownership, rather than to language barriers.

The finding on R&D intensity is also noteworthy. Significantly active R&D tends to be accompanied by larger headquarters, as R&D activities are likely to be complex and hard to be managed. Several previous studies have also confirmed the critical role of R&D in corporate organization. For example, Kastl et al. (2008) report that R&D intensity is positively related with the number of managers, which they interpret as a proxy for delegation, in Italian manufacturing firms. Azoulay (2004) finds that routine data-intensive projects are more likely to be outsourced compared with novel knowledge-intensive projects, in the case of U.S. clinical developments, although offshore outsourcing is not distinguished from domestic outsourcing in his analysis. Since R&D intensity is the strongly significant variable in our regressions, the importance of intangible assets in corporate organization is confirmed.<sup>23</sup>

Several interesting regularities are also found for other variables in Table 3. As predicted by the theoretical models, exporting requires more workers in headquarters possibly to overcome entry costs for foreign markets. The share of workers in headquarters does not rise proportionally with firm size, suggesting economies of scale in our sample of large-or-medium-sized manufacturing firms. No significant relation is detected for capital-labor ratio, firm age, or parent ownership. Firms with higher foreign shares tend to have larger headquarters, but we must be cautious in attributing this to costly coordination across borders since offshoring

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<sup>23</sup> Some firms, especially those without independent research laboratory, may include researchers into workers at headquarters. We will disaggregate headquarter workers in the next section.

and foreign ownership are likely to be simultaneous decisions. Our principal result on intra-firm offshore sourcing vs. offshore outsourcing remains robust even after controlling for these various firm-characteristics and unobservable firm-specific effects in our random-effect model.

In sum, the size of corporate headquarters is significantly related with the ownership. Offshoring across the boundary of the firm is likely to require more workers in management positions, compared with intra-firm offshoring. This implies that management overloads or contracting frictions should be somewhat mitigated when both parties are linked by the ownership.

Table 3 has demonstrated that the corporate organization becomes different depending on the firm boundary, not by the language barriers.<sup>24</sup> When the supplier is owned by other Japanese firms, the offshoring Japanese firms can economize on communication expenditures possibly because they can easily communicate in Japanese language, but need to allocate more workers to management and coordination positions to handle contracting with independent legal entities, compared with intra-firm offshoring. These costs of management and coordination across the firm boundary appear substantial if contracts are across firm boundary, even within the same country. While the theoretical model by Grossman and Helpman (2005) focuses on the cross-country differences in search costs for global sourcing (assumed easier to find best-match suppliers in the high-cost home country), our findings suggest that management costs associated with sourcing appear to vary substantially not only across national border, but also across firm boundary.

### 3.2.2. Disaggregating corporate headquarters by functions

While this paper has depended on the employment share of corporate headquarters, the official

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<sup>24</sup> As a related finding, Crozet et al. (2004) reports that agglomeration patterns of FDI firms in France do not vary with the FDI firm's country of origin, suggesting language effects negligible.

statistics with which we link our offshoring survey data contains more detailed firm-level data on corporate headquarters structures. Specifically, workers in the corporate function sections are disaggregated based on their functions into the following five sub-categories: corporate planning, international affairs, R&D, information processing and general administration (human resource management and miscellaneous administration). Among these categories, Table 2 has already reported the share of international affairs section. This classification is useful in investigating the corporate organization, as some sections such as R&D or information sections are supposed to play functions different from typical corporate management. For example, the firms may hire scientists and data entry workers within the corporate headquarters when they have no separated research laboratory or information data centre. By using these disaggregated data, we replace the left-hand side dependent variable in (1) as follows:

$$\frac{L_f^{HQ}}{L_{jt}} = \beta_f \cdot Supplier_{jt} + \gamma_f \cdot Z_{jt} + \mu_{fj} + \varepsilon_{fjt}. \quad (2)$$

$L_f^{HQ}$  denotes the number of workers for the corporate function  $f$  ( $f = \text{Planning, General, International, R\&D, and Information}$ ) within the corporate headquarters. By definition,  $\sum_f L_f^{HQ} = L^{HQ}$ . All the explanatory variables used in previous regressions are kept included to facilitate comparisons. Also to make comparisons easier, the denominator on the left-hand side of (2) is the total employment as in (1). We estimate (2) for each function  $f$  separately.

Table 4 presents the regression results for disaggregated shares. The sub-category within corporate headquarters is shown in the first row of each column. Several results are informative. First, the firms offshoring to foreign suppliers tend to allocate significantly more workers in the corporate planning section, international affairs section, or corporate R&D section. The share of planning section is high also for the firms engaged in domestic sourcing. As the corporate



planning section is the very core part of the typical corporate management, we confirm that the offshoring to foreign suppliers (offshoring across both firm boundary and national borders) is really related with more workers allocated to corporate management.

Second, in the column (3), the firms offshoring to own subsidiaries hire on average more workers in the international affairs section. Combined with the first finding, this result shows that the international affairs section handles offshoring both to foreign suppliers and to own offshore subsidiaries. Offshoring to foreign suppliers are delegated to international section possibly due to the language barriers or the section's abilities to handle cross-border coordination. Contracts with FDI subsidiaries are handled in international affairs section, probably because this section is responsible for the control of any activities associated with offshore subsidiaries.

Third, as shown in the column (2), the firm offshoring to Japanese suppliers tend to hire more workers in miscellaneous general management divisions. While these firms on average have significantly smaller international section within headquarters, this negative effect of offshoring to Japanese suppliers is more than offset by larger general administration division. Although offshoring entails cross-border transactions of goods or services, Japanese firms handle contracts with suppliers located overseas but owned by Japanese firms as a part of general administration activities. While this allocation choice is likely to be affected by language barriers, the previous finding of significantly larger headquarters in the firms offshoring to Japanese suppliers is confirmed even at this more disaggregated categories.

Finally, the share of workers in the information processing section has no significant relationship with offshoring in any category of suppliers. As workers in the information procession sections are likely to be responsible for specific information tasks rather than for corporate management, this result of insignificance is rather natural.

The overall effect previously reported in Table 3 is likely to be influenced by the result on miscellaneous general management section, as this section is on average larger than any other sub-categories of headquarter sections (occupying over eight percent of all workers). While the intra-firm offshoring is positively related with the share of international affairs section, its impact on overall share is insignificant because the international affairs section is small (far less than one percent of all workers). As the classification of these sub-categories may vary across firms, we should not further investigate peculiarities of each sub-section. However, as the management not classified in other sections (General/miscellaneous) is the typical sections that we imagine as the corporate headquarters only next to corporate planning, we should interpret these additional disaggregated results as rather strengthening the robustness of our principal finding.

The results on explanatory variables other than offshoring dummies are also informative. Among them, corporate functions significantly required for exporting are planning, international affairs, and R&D within headquarters. Firms with higher parent shares tend to have significantly smaller international and information sections within headquarters, suggesting that these functions are instead performed by parent companies. As consistent with the results from aggregated headquarters, large-sized firms tend to have smaller headquarters in all subcategories.

#### **4. Concluding remarks**

This paper has empirically investigated how the share of workers allocated to management positions in offshoring firms varies depending on the types of suppliers. Firms involved in offshore outsourcing to independent suppliers across the firm boundary tend to allocate significantly more workers to corporate headquarters, but firms offshoring to own subsidiaries

within the firm boundary do not. While Japanese firms spend more on communications with foreign suppliers than with Japanese suppliers in offshoring, the ownership, rather than language barriers, appears to dictate the result on the corporate organization. This finding remains robust even after various firm-characteristics are controlled for in panel regressions.

While this paper has found previously unexplored relationships between offshoring and corporate organizations, there remain several important extensions. For example, our survey contains no quantitative information on how much each firm is offshoring and on how much each subsidiary is owned. These additional data will be informative, if gathered by future independent surveys, to evaluate the magnitude of ownership effect on corporate organizations.

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Table 1 Percentages of firms

	%
Offshoring firms/All firms	20.93
Firms offshoring to own subsidiaries/Offshoring firms	50.39
Firms offshoring to Japanese suppliers/Offshoring firms	22.93
Firms offshoring to foreign suppliers/Offshoring firms	60.14

Notes: Percentages are in the number of firms at 2006. Some firms are offshoring to multiple suppliers. See text for definitions.

Table 2 Comparison of averages

	Communication expenditures (relative to sales, 100*percent)	Share of Headquarter $L^{HQ}/L$ (percent)	Share of Int'l Section $L_{Int}/L$ (100*percent)	Firm Size $L$
All firms	36.34	14.14	27.47	1
Firms offshoring to own subsidiaries	40.78	15.73	72.52	3.30
to Japanese suppliers	46.10	16.09	47.08	4.08
to foreign suppliers	46.17	16.60	69.69	2.45

Notes: Averages at 2006 are shown. See text for definitions. Firm size is in the number of workers, expressed relative to overall mean.

Table 3 Basic regressions results

$L^{HQ}/L$ (percent)	(1)	(2)	(3)	(4)
<i>Offshoring to Own Subsidiaries</i>	0.3394 (0.5311)	0.5607 (0.5480)	0.5560 (0.5487)	0.6759 (0.5421)
<i>Offshoring to Japanese Suppliers</i>	0.9899 (0.7386)	1.6532 (0.7424)	1.6142 (0.7416)	1.4309 (0.7278)
<i>Offshoring to Foreign Suppliers</i>	1.2308 (0.5044)	1.1170 (0.5117)	1.0818 (0.5122)	0.9639 (0.5001)
<i>Domestic Sourcing</i>	-----	0.9354 (0.3201)	0.9081 (0.3196)	0.8118 (0.3165)
<i>Export</i>	-----	1.2129 (0.2980)	1.1482 (0.2984)	1.1743 (0.3021)
<i>Firm Size</i>	-----	-2.3548 (0.1792)	-2.4341 (0.1816)	-2.3880 (0.1755)
<i>Capital-Labor ratio</i>	-----	-0.0612 (0.0470)	-0.0659 (0.0471)	-----
<i>R&amp;D intensity</i>	-----	0.1617 (0.0192)	0.1626 (0.0192)	0.1481 (0.0189)
<i>Age</i>	-----	-0.0010 (0.0360)	0.0049 (0.0366)	-----
<i>Age<sup>2</sup></i>	-----	0.0001 (0.0004)	0.00002 (0.0004)	-----
<i>Foreign Share</i>	-----	-----	6.2365 (1.9718)	6.2582 (1.9744)
<i>Parent Share</i>	-----	-----	-0.0696 (0.3032)	-----
<i>Industry Dummies</i>	No	Yes	Yes	Yes
Wald $\chi^2$	7966.90	4934.84	4863.86	56630.21
Number of Firms	3,992	3,970	3,970	3,992

Notes: The dependent variable is the employment percentage of corporate headquarters in the total number of workers. Balanced-panel random-effect GLS estimation results are shown. Robust standard errors are in parentheses.

Table 4 Disaggregating corporate headquarters

$L_f^{HQ}/L$ (percent)	(1) Planning	(2) General	(3) Int'l	(4) R&D	(5) Info
<i>Offshoring to Own Subsidiaries</i>	0.1320 (0.2147)	0.5739 (0.3593)	0.2437 (0.0638)	-0.0320 (0.2968)	-0.1137 (0.1102)
<i>Offshoring to Japanese Suppliers</i>	-0.0578 (0.2090)	1.4574 (0.5057)	-0.1570 (0.0587)	0.3772 (0.4372)	0.0605 (0.1421)
<i>Offshoring to Foreign Suppliers</i>	0.3174 (0.1551)	-0.3542 (0.3242)	0.2412 (0.0720)	0.7854 (0.3051)	0.1845 (0.1040)
<i>Domestic Sourcing</i>	0.1641 (0.0865)	0.0852 (0.2288)	0.0547 (0.0249)	0.5430 (0.1599)	0.0420 (0.0775)
<i>Export</i>	0.2067 (0.1025)	0.0360 (0.2046)	0.3066 (0.0367)	0.5276 (0.1717)	-0.00003 (0.0609)
<i>Firm Size</i>	-0.1520 (0.0564)	-1.7434 (0.1151)	-0.0171 (0.0158)	-0.4327 (0.0955)	-0.0976 (0.0348)
<i>Capital-Labor ratio</i>	-0.0459 (0.0288)	0.0194 (0.0300)	-0.0064 (0.0044)	-0.0330 (0.0242)	-0.0976 (0.0348)
<i>R&amp;D intensity</i>	0.0108 (0.0062)	0.0088 (0.0138)	0.0046 (0.0022)	0.1255 (0.0100)	0.0099 (0.0039)
<i>Age</i>	-0.0018 (0.0105)	-0.0029 (0.0249)	0.0015 (0.0025)	0.0102 (0.0171)	-0.0129 (0.0151)
<i>Age<sup>2</sup></i>	0.00005 (0.0001)	0.0002 (0.0003)	-0.00001 (0.00003)	-0.0002 (0.0002)	0.0002 (0.0002)
<i>Foreign Share</i>	1.2864 (0.6938)	1.9486 (1.0578)	0.5320 (0.3420)	2.2195 (1.3928)	0.5138 (0.2826)
<i>Parent Share</i>	-0.1323 (0.0935)	0.1351 (0.2368)	-0.0883 (0.0242)	0.1378 (0.1513)	-0.1202 (0.0560)
<i>Industry Dummies</i>	Yes	Yes	Yes	Yes	Yes
Wald $\chi^2$	1551.83	452.74	470.17	767.56	143.72
Number of Firms	3,970	3,970	3,970	3,970	3,970

Notes: The dependent variable is the employment percentage of the respective corporate section in the total number of workers. Balanced-panel random-effect GLS estimation results are shown. Robust standard errors are in parentheses.