

Choice of Invoice Currency in Global Production and Sales Network: The Case of Japanese Overseas Subsidiaries*

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Abstract

This paper empirically investigates the invoicing decision in trade of Japanese production subsidiaries, using the novel dataset obtained from the questionnaire survey. We sent out questionnaires in August 2010 to all Japanese subsidiaries located in North America, Europe and Asia to collect the product-level information on the choice of invoice currency in importing intermediate inputs and exporting production goods along the production chain. By conducting the Probit and Logit estimation, we demonstrate that the invoicing choice of intra-firm trade along the production chain depends on the destination of subsidiary's exports as well as the degree of exchange rate volatility. Subsidiaries tend to choose yen invoicing only in exports of intermediate inputs to Japan, while major currencies such as the US dollar and, to a lesser extent, the euro are typically chosen in subsidiary's exports of finished goods to other countries. To accommodate the currency mismatch caused by the choice of foreign currency invoicing, Japanese subsidiaries need efficient management of the exchange rate risk in the face of large fluctuations of the local currency.

Keywords: Invoice currency, exchange rate pass-through, overseas subsidiary, intra-firm trade, production network, exchange rate risk

JEL classification: F31, F33, F23

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1. Introduction

Invoicing decision in international trade is strategically important for firm's overseas operation and global business strategy. Through active foreign direct investment, firms become more internationalized than before and have built a global sales and procurement network. Japanese firms, for instance, have developed regional production network in Asia. How do the globally operating firms accommodate the impact of the exchange rate volatility in their pricing or invoicing decision under their global production and sales network?

Recent studies such as Gopinath and Rigobon (2008), Gopinath, Itskhoki and Rigobon (2010), and Goldberg and Tille (2013) empirically analyze the degree of exchange rate pass-through at the H.S.10-digit commodity level conditional on the choice of invoice currency that is obtained from the unpublished customs level data. Although using a highly disaggregated trade data, these studies do not distinguish between intra-firm trade and arm's length trade. Fitzgerald and Haller (2013) examine the pricing-to-market (PTM) for plant level exports of disaggregated product at 6- or 8-digit level. Although it is a significant advance from the previous studies, Fitzgerald and Haller (2013) do not fully utilize the information on the destination specific invoicing choice due to the limitation of the data availability.

This paper uses the firm-level data on the invoicing decision by Japanese overseas subsidiaries that are obtained by the questionnaire survey conducted in 2010. We collected the information on the choice of invoice currency for each subsidiary and for each product traded. Specifically, we obtain the information on which currency is used for production subsidiary's imports/procurements and exports/sales, who is a trading partner (intra-firm trade or arm's length trades), and from which source (destination) country the subsidiary imports (exports). The product name of import and export goods is also obtained to identify whether it is a differentiated product in terms of Rauch (1999). By utilizing both the product level and firm level information, we empirically analyze what determines the choice of invoice currency in overseas subsidiary's exports and imports along the global production chain.

There have been a few studies that empirically examine the firm level choice of invoice currency. Friberg and Wilander (2008) empirically analyze the invoicing choice of Swedish exporting firms by conducting a questionnaire survey, but neither destination breakdown data on invoicing choice nor the invoicing share of intra-firm trade were used in their analysis. Ito, Koibuchi, Sato and Shimizu (2013) conduct the questionnaire survey with all Japanese manufacturing firms listed in the Tokyo Stock

Exchange and investigate the choice of invoice currency in Japanese exports to various destination countries. While it is the comprehensive questionnaire study, Ito, Koibuchi, Sato and Shimizu (2013) basically focus on the invoicing behavior in Japanese exports, and the invoicing decision of overseas subsidiaries along the production chain is only partially examined.

This paper has found that in production subsidiary's exports to Japan, intra-firm trade along the production chain facilitates yen-invoicing transactions, especially in the case of intermediate goods transactions. The larger the exchange rate volatility, the less the yen is used for export invoicing to Japan. In contrast, intra-firm trade has less significant impact on the choice of invoice currency in subsidiary's exports to other countries (excluding Japan). While the exchange rate risk is major determinant of the invoice currency, international division of labor within group companies from Japanese parent company and overseas subsidiaries may promote yen invoicing transactions.

The remainder of this paper is organized as follows. Section 2 describes the questionnaire survey. Section 3 shows the results of the questionnaire survey. Section 4 discusses the empirical model and data issues. Results of Logit estimation are presented. Finally, Section 5 concludes.

2. Questionnaire Survey

We conducted a questionnaire survey in August 2010 to overseas subsidiaries of Japanese firms¹. 16,020 subsidiaries are chosen from the Toyo Keizai's Overseas Japanese Companies database (henceforth, the "OJC database"). These subsidiaries operate either in twenty-one Asia-Pacific countries (areas), five North-American countries (areas), thirty-seven European countries (areas). These subsidiaries operate a business of either manufacturing, wholesales or controlling office. 1,479 overseas subsidiaries responded to the questionnaire, and the response rate is 9.2 percent.

While collecting the data on the invoice currency for both production subsidiaries and sales subsidiaries, this paper focuses on the invoicing decision of the production subsidiaries. Japanese firms have built global production and sales network where intra-firm trade plays an important role. In particular, regional production fragmentation in Asia has recently gained a great deal of attention. Thus, we investigate

¹ Manufacturing subsidiaries mainly owned by Japanese firms are chosen in this questionnaire survey. If sales subsidiaries and controlling office are owned not by Japanese manufacturing firms but by sales companies or financial institutions, they are excluded in the questionnaire survey.

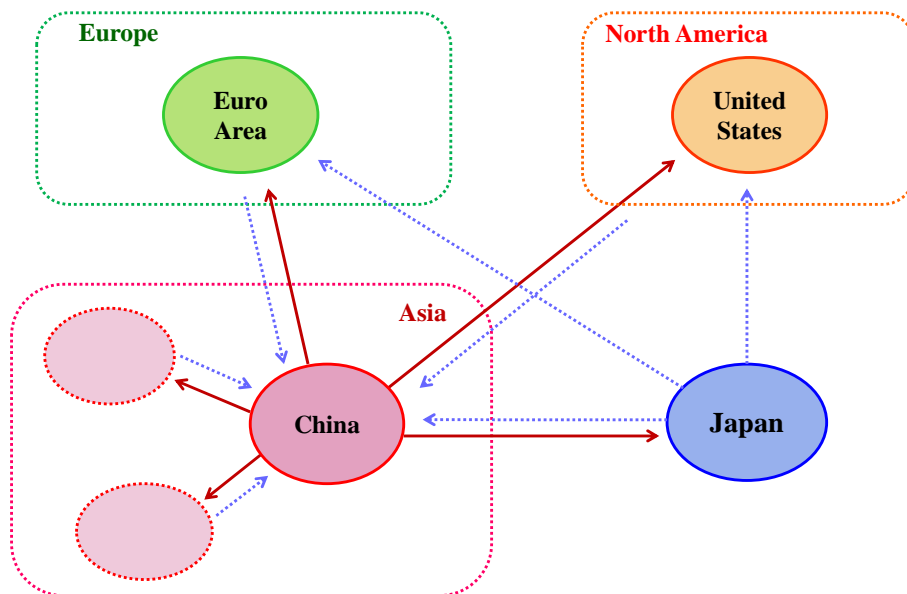
which currency is chosen by overseas production subsidiaries in importing intermediate inputs and also in exporting their products to various destination countries.

Table 1 reports the distribution of subsidiaries by industry. For comparison, we present the data obtained from the METI survey as well as our questionnaire survey. The distribution of subsidiaries by industry is similar between our questionnaire survey and the METI survey. Simple arithmetic average of subsidiary’s sales amount shows similar pattern between two surveys, although the sales amount of our questionnaire survey is somewhat larger than the corresponding METI survey. Given this similarity, we analyze the results of the questionnaire survey in details.

3. Overview of Subsidiaries’ Trade and Invoicing Pattern

Through the questionnaire survey, we obtain the information on sales (export) and procurement (import) pattern of Japanese subsidiaries. The information on the trading partner and the choice of invoice currency for each transaction are collected as well. In Figure 1, suppose one sample subsidiary (respondent) operates in China. This manufacturing subsidiary imports or procures intermediate inputs from various source countries or domestic market (shown by the dotted arrow in blue), and exports or sells products in various destination countries or in local markets (shown by the thick arrow in red). For each transaction, we collect the information on which currency is used for trade invoicing. We have two types of data on trade invoicing.

Figure 1. Sales and Procurement Pattern of Overseas Subsidiaries



Note: Dotted arrow shows the subsidiary's procurements (imports) of intermediate or finished goods from Japan. Thick arrow represents the subsidiary's sales (exports) of intermediate or finished goods to various destinations.

First, we get the *share* of invoice currency for each subsidiary's exports and imports, which is a firm-level invoicing data. Second, we obtain the data on the choice of invoice currency for each *product*. Since we get the product level information (i.e, the name of products traded and which currency is used for the product), we can distinguish the invoicing decision between differentiated product and homogeneous product and also between final consumption goods and intermediate input goods. As we also collect the information on who is the trading partner, a group company (including the parent company) or other non-related company, for each product or intermediate input traded, which enables us to distinguish the invoicing choice between intra-firm trade and arm's length trade.

Table 2 shows both import/procurement and export/sales information of manufacturing subsidiaries by source/destination country and by location of the subsidiaries. As for the import/procurement pattern, local procurements account for the largest share in most of countries. Imports of intermediate input goods from Japan are the second largest, and subsidiaries in Asia on average import 34.8 percent of intermediate inputs from Japan. The export/sales pattern differs markedly across regions. In North America, subsidiaries have strong tendency to sell their products in local market: 85 percent of sales are directed toward local market. In Europe, 62.7 percent are sold in the local market. The share of exports to other countries accounts for 31 percent, most of which are likely to be other European countries. In contrast, the share of local sales is just 47.9 percent in Asia, and 28.0 percent of exports are destined for Japan, which is much higher than in North America and Europe. In addition, 24.1 percent of their exports are directed to other countries, which means that Asian subsidiaries have strong tendency for exports abroad.

Tables 3 and 4 show the summary table for the import (procurement) and export (sales) pattern by location of subsidiaries. First, in sales in and procurements from the local market, local currency is generally used in all locations of subsidiaries. Second, in imports from and exports to Japan, the share of the yen is very large: 54 percent of imports and 46 percent of exports by Asian subsidiaries are invoiced in the yen. More interestingly, the share of US dollar invoicing is also large: 40.3 percent of imports from Japan and 48 percent of exports to Japan are invoiced in US dollars. Third, in North America and Europe, the US dollar and the euro are largely used, respectively,

for both exports to and imports from other countries including Japan. Fourth, Asian subsidiaries tend to use the US dollar invoicing in exports to and imports from other countries excluding Japan.

Tables 5 and 6 show that the yen invoicing transactions account for the largest share in exports to and imports from Japanese head office. Second, in Asian subsidiary's exports to foreign countries excluding Japan, the US dollar is much more used as long as group companies are a trading partner (Table 7).

4. Empirical Analysis

4.1 Empirical Model and Data Description

While we have two types of data on the invoice currency, we empirically analyze the product level decision of the invoice currency. We conduct the Probit and Logit estimation of the following equation:

$$\begin{aligned}
\Pr(\text{Invoice}_{ijkl}) = & \beta_0 + \beta_1 \text{ExrVol}_{kl} + \beta_2 D(\text{EXFinish})_{ijkl} \\
& + \beta_3 D(\text{EXIntrafirm})_{ijkl} + \beta_4 D(\text{Rauch})_{ij} \\
& + \beta_5 \text{USdependence}_{ij} + \beta_6 \text{IMIntrafirm}_{jk} \\
& + \beta_7 \text{IMInvoiceShare}_{jk} + \beta_8 D(\text{Netting})_j \\
& + \beta_9 D(\text{Industry})_{ij} + \varepsilon_{ijkl}
\end{aligned} \tag{1}$$

where Invoice_{ijkl} is the binary variable that takes 1, if product i of subsidiary j located in country k is invoiced in JPY (or USD) in exports to country- l ; and otherwise 0. $D(\)$ denotes the dummy variable, and ε_{ijkl} indicates the error term.

This empirical model is motivated by the partial equilibrium model of the invoice currency choice (Bacchetta and van Wincoop, 2005 and Friberg, 1998). Exchange rate risk and product differentiation are major determinants of invoice currency in the literature. We use the exchange rate volatility (ExrVol) as an explanatory variable in Equation (1) to measure the effect of exchange rate variability on the invoicing choice. 2-year exchange rate volatility for FY2008-2009 is calculated based on the conditional variance obtained from GARCH(1,1) model. The daily series of the bilateral nominal exchange rate between export country k and destination country l .

The daily exchange rates are taken from the CEIC Database.

To measure the extent of product differentiation on the invoicing choice, we use the dummy variable for product differentiation in terms of Rauch (1999). Since we have the name of traded products, we categorize the products according to Rauch (1999) index, and $D(Rauch)$ takes 1 if the product is classified into differentiated products; otherwise 0. We also have information on whether export goods are intermediate goods or final consumption goods. We use the dummy for finished goods, $D(EXFinish)$, that takes 1 if the product is the final consumption goods; otherwise 0.

In the literature on exchange rate pass-through, costs of production also affect the firm's pricing behavior, and the producer price index is typically used in the empirical model. Instead of using such cost variables, we include the share of invoice currency in subsidiary's imports of intermediate inputs. is considered as factor in

To analyze the effect of intra-firm transactions on the choice of invoice currency, we include both the dummy for intra-firm exports ($EXIntrafirm$) and for the share of invoice currency in imports of intermediate goods ($IMIntrafirm$). We also include the ratio of consolidated sales in the United States to the total consolidate sales as an explanatory variable to check whether the export and sales dependence on the US market at a consolidated base affect the choice of invoicing currency. The data on consolidated sales are obtained from Annual Securities Report of respective companies.

Finally, we include the dummy variable for "marry and netting". In the questionnaire survey, we collect the information on whether subsidiaries use the marry and/or netting for exchange rate risk management. The dummy variable, $D(Netting)$, takes 1 if subsidiary j uses the marry and netting in trade transactions. To check the difference in invoicing decision across industries, we include industry dummies as well in our empirical analysis.

4.2 Empirical Results

We empirically test the hypothesis about the determinants of an invoice currency by using the various explanatory variables explained above. The yen invoicing is largely used in subsidiary's trade with Japan, especially Asian subsidiary's trade with Japan, we empirically analyze what determines the choice of the yen (or US dollar) in their exports to Japan. In addition, subsidiary's exports to foreign countries (excluding Japan) are invoiced in US dollars and in euro, we also test what is the determinants of US dollar or euro invoicing.

Table 8 presents the results of Logit estimation for subsidiary's invoicing

decision in exports to Japan, where the dependent variable is a binary variable that takes 1 if the yen or US dollar is used as an invoice currency; and 0 otherwise.

The results of estimation when subsidiaries export to Japan using the yen as the invoice currency are presented in columns (1) through (4). First, exchange rate volatility is negative and statistically significant, which indicates that the larger the bilateral exchange rate volatility against the yen, the less the yen is chosen as the invoice currency. Second, intra-firm trade promotes yen-invoicing in subsidiary's exports to Japan, as both intra-firm exports and imports are significantly positive. In addition, if importing intermediate inputs by invoicing in the yen, subsidiaries tend to choose the yen invoicing in their exports to Japan. Third, the type of export goods also have significant impact on the choice of invoice currency. If they export intermediate inputs to Japan, subsidiaries tend to use the yen for trade invoicing, while subsidiary's finished goods exports tend to lower the yen invoicing transactions. The dummy for Rauch (1999) index is positively significant at least at the 5 percent level, which indicates that exports of differentiated products to Japan are invoiced in the yen. Fourth, if subsidiaries use the marry and netting for exchange rate risk management, the yen tends to be chosen for export invoicing. If subsidiaries use "re-invoicing", subsidiaries tend to lower the yen invoicing exports. Finally, the higher the export and sales dependence on the US market is in terms of the group company's consolidated sales, the lower the tendency to choose the yen for export invoicing.

To confirm the above invoicing choice of subsidiary's exports to Japan, we conduct the Logit estimation for subsidiary's US dollar invoicing in exports to Japan, where the binary dependent variable takes 1 if the US dollar is used as an invoice currency; and 0 otherwise. Columns (5) through (8) in Table 8 clearly support the above findings of what determines the yen invoicing.

As shown in Section 3, subsidiary's exports to other countries (excluding Japan) are largely invoiced in US dollars, euro and other major currencies. We conduct the Logit estimation to analyze what determines the choice of invoice currency in subsidiary's exports to other countries. Columns (1) through (3) in Table 9 present the empirical evidence focusing on Asian subsidiaries, where the binary dependent variable takes 1 if major currency (mainly US dollar and euro, and partly other advanced country's currencies) is used as an invoice currency; and 0 otherwise. We do not find strong evidence that intra-firm trade facilitates the choice of major currencies as an invoice currency. The type of goods traded has no significant effect on the choice of invoice currency. The degree of dependence on the US market and the ratio of foreign sales to the total consolidated sales have no significant effect, either. However, the

extent of the exchange rate volatility has significant positive effect on the choice of the major currency for export invoicing. The dummy for marry and netting also takes positive and significant coefficient, though only at the 10 percent significant level. These empirical findings show that exchange rate risk management is more important determinant in the choice of invoice currency for exports to foreign countries. By using the whole sample, we conduct the Logit estimation again and the results are reported in columns (4) and (5) in Table 9. While the coefficient of dummy for marry and netting becomes insignificant, the estimated results are basically the same as the results reported in columns (1) through (3).

5. Concluding Remarks

This paper presents new findings about the choice of invoice currency by Japanese overseas subsidiaries. Utilizing the data obtained from the questionnaire survey with Japanese overseas subsidiaries conducted in August 2010, we explore which currency is used by overseas production subsidiaries along the production and sales network, which has not been empirically investigated before. The result of the questionnaire survey shows that Japanese subsidiaries tend to choose yen invoicing in their trade with Japan, while the US dollar and the euro are typically chosen in their exports to other countries. By conducting the Logit estimation, we have found that in production subsidiary's exports to Japan, intra-firm trade along the production chain facilitates yen-invoicing transactions, especially in the case of intermediate goods transactions. The larger the exchange rate volatility, the less the yen is used for export invoicing to Japan. In contrast, intra-firm trade has less significant impact on the choice of invoice currency in subsidiary's exports to other countries (excluding Japan). While the exchange rate risk is major determinant of the invoice currency, international division of labor within group companies from Japanese parent company and overseas subsidiaries may promote yen invoicing transactions.

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Table 1: Size of Manufacturing Firms

Industry:	Questionnaire Survey					METI Survey		
	All 16,020	Respon- dent 1479	Response Rate (%)	Sales Amount (Million Yen)	Average Sales (Million Yen)	Respon- dent 12,219	Sales Amount (Million Yen)	Average Sales (Million Yen)
Manufacturing Industry Total	8,990	784	8.7	11,664,500	15,149	7,742	79,159,252	10,225
Foods	453	42	9.3	219,493	5,226	387	2,191,245	5,662
Textiles & Apparel	436	22	5	31,752	1,443	368	692,900	1,883
Pulp & Papers	78	12	15.4	160,256	13,355	129	515,955	4,000
Chemicals	1,406	125	8.9	593,727	4,867	863	6,549,442	7,589
Pharmaceuticals	150	16	10.7	260,960	16,310	-	-	-
Petroleum and Coals	28	3	10.7	65,175	32,587	35	261,786	7,480
Rubber Products	249	16	6.4	203,730	12,733	-	-	-
Glass & Ceramics	225	15	6.7	83,758	5,983	199	1,136,818	5,713
Steel Products	221	22	10	137,984	6,899	219	1,890,924	8,634
Non-ferrous Metals	241	20	8.3	543,509	30,195	251	2,196,542	8,751
Metal Products	452	39	8.6	155,556	4,094	358	545,382	1,523
Machinery	1,098	97	8.8	1,001,344	10,323	1,007	5,201,492	5,165
Electric Machinery	1,812	150	8.3	3,353,868	22,359	1,438	16,295,845	11,332
Transport Equipment	1,383	136	9.8	4,444,429	33,670	1,567	37,331,187	23,823
Precision Instruments	298	22	7.4	235,896	10,723	-	-	-
Other Manufacturing	460	47	10.2	173,064	3,682	921	4,349,734	4,723
Wholesale Industry Total	6,349	655	10.3	n.a.	n.a.	4,477	66,572,090	14,870

Note: "METI Survey" denotes METI (2011) *Waga Kuni Kigyo no Kaigai Jigyo Katsudo* (Overseas Activities of Japanese Firms), No.40 (survey conducted in 2010).

Table 2. Source and Destination of Manufacturing Subsidiaries' Imports and Exports

Location of Subsidiaries:	1. Source Country/Region Breakdown				2. Destination Country/Region Breakdown			
	Number of Respondents	(a) Imports from Japan (%)	(b) Local Procurements (%)	(c) Imports from Others (%)	Number of Respondents	(a) Exports to Japan (%)	(b) Local Sales (%)	(c) Exports to Others (%)
Asia	490	34.8	48.6	16.6	492	28.0	47.9	24.1
China	133	36.9	54.2	8.9	135	36.4	49.1	14.5
Hong Kong	19	38.2	31.4	30.4	19	42.8	26.2	31.0
Taiwan	28	35.2	50.9	13.9	28	14.8	54.7	30.5
Korea	16	40.8	50.5	8.8	16	30.6	58.1	11.3
Vietnam	22	39.3	33.9	26.8	22	38.0	40.0	22.0
Philippines	25	53.2	29.0	17.8	25	30.9	31.0	38.1
Thailand	103	33.6	54.2	12.2	103	23.9	53.0	23.1
Malaysia	44	31.2	48.5	20.3	44	21.0	41.1	37.9
Singapore	31	19.3	50.2	30.5	31	15.8	31.5	52.6
Indonesia	52	31.3	45.6	23.1	51	29.9	47.6	22.5
Other Asia	17	29.9	38.8	31.3	18	6.8	91.2	2.1
Oceania	18	12.9	66.8	20.2	20	23.8	48.2	28.1
North America	178	30.5	60.0	9.6	178	5.1	85.0	9.9
United States	162	31.7	60.0	8.4	162	4.6	86.8	8.6
Other North America	16	18.5	59.9	21.6	16	10.8	65.9	23.3
Europe	108	26.4	47.5	25.1	109	6.3	62.7	31.0
Euro Area	65	27.1	53.1	18.2	65	4.8	67.1	28.1
United Kingdom	15	29.9	44.6	25.5	14	4.1	64.8	31.1
Other Europe	28	23.1	36.0	40.9	30	10.7	52.1	37.1

Table 3. Share of Invoice Currency in Manufacturing Subsidiaries' Procurements and Imports of Intermediate Inputs by Location

3A. Procurements from Local Market

Share of Invoice Currency in Local Procurements	Number of Respondents	(a) Yen (%)	(b) US Dollar (%)	(c) Euro (%)	(d) Renminbi (%)	(e) Local Currency (%)	(f) Others (%)
Asia	456	13.3	25.9	0.5	17.4	41.3	1.6
China	126	13.0	22.8	0.3	60.8	1.9	1.2
Thailand	100	11.4	10.8	0.8	0.1	75.0	2.0
Oceania	16	1.8	14.9	0.4	0.0	76.0	6.9
North America	169	4.9	87.9	0.9	0.0	6.3	0.1
United States	153	5.3	92.0	0.9	0.0	1.7	0.1
Europe	101	8.0	7.5	65.7	0.2	17.8	0.8
Euro Area	60	7.2	7.0	83.3	0.3	1.2	1.0
United Kingdom	15	14.3	5.0	37.2	0.0	43.1	0.4

3B. Imports from Japan

Share of Invoice Currency in Imports from Japan	Number of Respondents	(a) Yen (%)	(b) US Dollar (%)	(c) Euro (%)	(d) Renminbi (%)	(e) Local Currency (%)	(f) Others (%)
Asia	422	54.0	40.3	0.4	1.0	3.9	0.4
China	110	48.1	47.7	0.0	3.8	0.0	0.5
Thailand	95	62.4	25.4	1.5	0.0	10.7	0.1
Oceania	9	39.4	29.4	0.6	0.0	29.4	1.1
North America	146	19.1	79.8	0.0	0.0	0.9	0.1
United States	135	18.6	80.3	0.0	0.0	0.9	0.1
Europe	87	50.5	9.0	36.4	0.0	2.9	1.1
Euro Area	52	52.9	10.7	36.4	0.0	0.0	0.0
United Kingdom	12	48.3	0.9	31.1	0.0	19.7	0.0

3C. Imports from Other Countries (excluding Japan)

Share of Invoice Currency in Imports from Others	Number of Respondents	(a) Yen (%)	(b) US Dollar (%)	(c) Euro (%)	(d) Renminbi (%)	(e) Local Currency (%)	(f) Others (%)
Asia	282	6.1	79.0	5.6	1.0	4.9	3.5
China	49	4.0	77.5	11.9	3.8	0.5	2.2
Thailand	59	6.7	79.6	6.4	0.0	4.9	2.4
Oceania	12	0.0	67.7	17.7	0.0	12.9	1.8
North America	89	1.6	87.8	6.9	0.0	2.3	1.3
United States	76	1.0	86.8	8.0	0.0	2.7	1.5
Europe	75	4.9	40.7	46.5	0.0	5.8	2.0
Euro Area	40	2.4	48.7	45.0	0.0	3.3	0.7
United Kingdom	10	0.0	39.0	36.0	0.0	15.0	10.0

Table 4. Share of Invoice Currency in Manufacturing Subsidiaries' Sales and Exports by Location

4A. Sales in Local Market

Share of Invoice Currency in Local Market	Number of Respondents	(a) Yen (%)	(b) US Dollar (%)	(c) Euro (%)	(d) Renminbi (%)	(e) Local Currency (%)	(f) Others (%)
Asia	414	4.9	21.5	0.2	21.9	50.6	0.9
China	112	2.2	13.5	0.3	80.2	3.6	0.3
Thailand	96	7.5	7.3	0.1	0.0	83.1	2.1
Oceania	16	0.2	12.4	0.0	0.0	87.4	0.0
North America	175	1.2	94.3	1.0	0.0	3.1	0.3
United States	160	1.4	96.7	1.1	0.0	0.4	0.3
Europe	98	1.4	8.1	73.4	0.1	16.5	0.5
Euro Area	59	0.4	7.6	91.0	0.0	0.4	0.6
United Kingdom	13	2.3	1.9	50.6	0.0	45.2	0.0

4B. Exports to Japan

Share of Invoice Currency in Exports to Japan	Number of Respondents	(a) Yen (%)	(b) US Dollar (%)	(c) Euro (%)	(d) Renminbi (%)	(e) Local Currency (%)	(f) Others (%)
Asia	313	46.0	48.0	0.2	0.2	5.6	0.0
China	93	47.8	50.8	0.7	0.8	0.0	0.0
Thailand	71	54.6	27.4	0.0	0.0	18.0	0.0
Oceania	11	9.5	53.2	0.0	0.0	37.3	0.0
North America	56	13.1	86.0	0.0	0.0	0.9	0.0
United States	52	12.2	86.9	0.0	0.0	1.0	0.0
Europe	31	17.0	14.5	61.7	0.0	6.8	0.0
Euro Area	22	11.2	17.7	71.1	0.0	0.0	0.0
United Kingdom	3	0.0	0.0	60.0	0.0	40.0	0.0

4C. Exports to Other Countries (excluding Japan)

Share of Invoice Currency in Exports to Others	Number of Respondents	(a) Yen (%)	(b) US Dollar (%)	(c) Euro (%)	(d) Renminbi (%)	(e) Local Currency (%)	(f) Others (%)
Asia	323	8.6	77.5	3.2	0.7	6.6	3.4
China	68	8.4	76.5	4.6	2.3	1.4	6.8
Thailand	81	7.7	73.3	5.0	0.0	12.0	2.0
Oceania	15	0.0	47.8	2.7	0.0	40.7	8.9
North America	100	0.2	90.6	5.4	0.0	1.4	2.5
United States	89	0.2	90.5	6.1	0.0	0.4	2.8
Europe	75	2.8	20.6	68.6	0.1	5.7	2.2
Euro Area	43	2.4	26.9	68.8	0.0	0.0	2.0
United Kingdom	11	2.7	11.4	66.8	0.0	19.1	0.0

Table 5. Share of Invoice Currency in Manufacturing Subsidiary's Imports of Intermediate Inputs from Japan: Type of Trade and Partner

	Subsidiaries in:					Subsidiaries in:					
	Asia	China	Thailand	United States	Euro Area	Asia	China	Thailand	United States	Euro Area	
1a. Japanese Head Office (Share: %)						1b. Japanese Head Office (Number of firms)					
1. JPY	58.8	53.0	65.3	20.9	50.7	293	70	66	33	36	
2. USD	38.0	45.5	23.8	79.1	8.5	189	60	24	125	6	
3. Euro	0.4	0.0	2.0	0.0	39.4	2	0	2	0	28	
4. Renminbi	0.2	0.8	0.0	0.0	0.0	1	1	0	0	0	
5. Local	2.2	0.0	8.9	0.0	0.0	11	0	9	0	0	
6. Others	0.4	0.8	0.0	0.0	1.4	2	1	0	0	1	
TOTAL	100.0	100.0	100.0	100.0	100.0	498	132	101	158	71	
2a. Group Company (Share: %)						2b. Group Company (Number of firms)					
1. JPY	51.9	36.1	71.4	20.4	56.3	67	13	15	10	9	
2. USD	46.5	58.3	28.6	77.6	18.8	60	21	6	38	3	
3. Euro	0.0	0.0	0.0	2.0	25.0	0	0	0	1	4	
4. Renminbi	0.8	2.8	0.0	0.0	0.0	1	1	0	0	0	
5. Local	0.8	2.8	0.0	0.0	0.0	1	1	0	0	0	
6. Others	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	
TOTAL	100.0	100.0	100.0	100.0	100.0	129	36	21	49	16	
3a. Japanese <i>Sogo Shosha</i> (Share: %)						3b. Japanese <i>Sogo Shosha</i> (Number of firms)					
1. JPY	56.9	41.5	69.6	29.4	60.0	78	17	32	5	3	
2. USD	38.7	53.7	23.9	70.6	0.0	53	22	11	12	0	
3. Euro	0.0	0.0	0.0	0.0	40.0	0	0	0	0	2	
4. Renminbi	1.5	4.9	0.0	0.0	0.0	2	2	0	0	0	
5. Local	2.9	0.0	6.5	0.0	0.0	4	0	3	0	0	
6. Others	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	
TOTAL	100.0	100.0	100.0	100.0	100.0	137	41	46	17	5	
4a. Other Company (Share: %)						4b. Other Company (Number of firms)					
1. JPY	53.4	44.4	44.4	47.1	33.3	31	4	4	8	3	
2. USD	32.8	33.3	33.3	47.1	0.0	19	3	3	8	0	
3. Euro	0.0	0.0	0.0	0.0	33.3	0	0	0	0	3	
4. Renminbi	3.4	22.2	0.0	0.0	0.0	2	2	0	0	0	
5. Local	6.9	0.0	22.2	0.0	0.0	4	0	2	0	0	
6. Others	3.4	0.0	0.0	5.9	33.3	2	0	0	1	3	
TOTAL	100.0	100.0	100.0	100.0	100.0	58	9	9	17	9	

Table 6. Share of Invoice Currency in Manufacturing Subsidiary's Exports to Japan:
Type of Trade and Partner

	Subsidiaries in:					Subsidiaries in:					
	Asia	China	Thailand	United States	Euro Area	Asia	China	Thailand	United States	Euro Area	
1a. To Japanese Head Office (Share: %)						1b. To Japanese Head Office (Number of firms)					
1. JPY	46.3	51.8	50.0	8.3	6.3	171	58	41	3	1	
2. USD	45.8	46.4	24.4	91.7	6.3	169	52	20	33	1	
3. Euro	0.3	0.0	0.0	0.0	87.5	1	0	0	0	14	
4. Renminbi	0.5	1.8	0.0	0.0	0.0	2	2	0	0	0	
5. Local	6.8	0.0	25.6	0.0	0.0	25	0	21	0	0	
6. Others	0.3	0.0	0.0	0.0	0.0	1	0	0	0	0	
TOTAL	100.0	100.0	100.0	100.0	100.0	369	112	82	36	16	
2a. To Group Company (Share: %)						2b. To Group Company (Number of firms)					
1. JPY	50.8	45.5	69.2	13.3	0.0	32	5	9	2	0	
2. USD	46.0	54.5	23.1	86.7	14.3	29	6	3	13	1	
3. Euro	0.0	0.0	0.0	0.0	85.7	0	0	0	0	6	
4. Renminbi	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	
5. Local	1.6	0.0	7.7	0.0	0.0	1	0	1	0	0	
6. Others	1.6	0.0	0.0	0.0	0.0	1	0	0	0	0	
TOTAL	100.0	100.0	100.0	100.0	100.0	63	11	13	15	7	
3a. To Japanese <i>Sogo Shosha</i> (Share: %)						3b. To Japanese <i>Sogo Shosha</i> (Number of firms)					
1. JPY	8.3	33.3	0.0	0.0	0.0	1	1	0	0	0	
2. USD	91.7	66.7	100.0	0.0	0.0	11	2	4	0	0	
3. Euro	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	
4. Renminbi	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	
5. Local	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	
6. Others	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	
TOTAL	100.0	100.0	100.0	—	—	12	3	4	0	0	
4a. To Other Company (Share: %)						4b. To Other Company (Number of firms)					
1. JPY	42.1	40.0	57.1	12.5	50.0	8	2	4	1	2	
2. USD	42.1	60.0	28.6	87.5	25.0	8	3	2	7	1	
3. Euro	0.0	0.0	0.0	0.0	25.0	0	0	0	0	1	
4. Renminbi	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	
5. Local	5.3	0.0	14.3	0.0	0.0	1	0	1	0	0	
6. Others	10.5	0.0	0.0	0.0	0.0	2	0	0	0	0	
TOTAL	100.0	100.0	100.0	100.0	100.0	19	5	7	8	4	

Table 7. Share of Invoice Currency in Manufacturing Subsidiary's Exports to Other Countries: Type of Trade and Partner

	Subsidiaries in:					Subsidiaries in:					
	Asia	China	Thailand	United States	Euro Area	Asia	China	Thailand	United States	Euro Area	
1a. To Customer (Share: %)						1b. To Customer (Number of firms)					
1. JPY	7.3	20.0	3.6	4.1	0.0	14	6	2	3	0	
2. USD	82.9	70.0	85.5	90.5	23.8	160	21	47	67	5	
3. Euro	1.6	0.0	5.5	2.7	76.2	3	0	3	2	16	
4. Renminbi	1.6	6.7	0.0	0.0	0.0	3	2	0	0	0	
5. Local	4.7	0.0	3.6	1.4	0.0	9	0	2	1	0	
6. Others	2.1	3.3	1.8	1.4	0.0	4	1	1	1	0	
TOTAL	100.0	100.0	100.0	100.0	100.0	193	30	55	74	21	
2a. To Group Company (Share: %)						2b. To Group Company (Number of firms)					
1. JPY	6.0	3.5	2.2	0.0	0.0	14	2	1	0	0	
2. USD	77.2	78.9	69.6	76.5	18.8	179	45	32	26	6	
3. Euro	4.3	5.3	10.9	17.6	78.1	10	3	5	6	25	
4. Renminbi	1.3	5.3	0.0	0.0	0.0	3	3	0	0	0	
5. Local	7.3	3.5	15.2	2.9	3.1	17	2	7	1	1	
6. Others	3.9	3.5	2.2	2.9	0.0	9	2	1	1	0	
TOTAL	100.0	100.0	100.0	100.0	100.0	232	57	46	34	32	
3a. To Distributor (Share: %)						3b. To Distributor (Number of firms)					
1. JPY	0.0	0.0	0.0	0.0	20.0	0	0	0	0	1	
2. USD	88.4	91.7	87.5	100.0	40.0	38	11	7	14	2	
3. Euro	0.0	0.0	0.0	0.0	20.0	0	0	0	0	1	
4. Renminbi	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	
5. Local	9.3	0.0	12.5	0.0	20.0	4	0	1	0	1	
6. Others	2.3	8.3	0.0	0.0	0.0	1	1	0	0	0	
TOTAL	100.0	100.0	100.0	100.0	100.0	43	12	8	14	5	
4a. To Others (Share: %)						4b. To Others (Number of firms)					
1. JPY	11.8	0.0	16.7	0.0	0.0	2	0	1	0	0	
2. USD	64.7	0.0	83.3	100.0	16.7	11	0	5	3	1	
3. Euro	0.0	0.0	0.0	0.0	33.3	0	0	0	0	2	
4. Renminbi	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	
5. Local	0.0	0.0	0.0	0.0	0.0	0	0	0	0	0	
6. Others	23.5	0.0	0.0	0.0	50.0	4	0	0	0	3	
TOTAL	100.0	—	100.0	100.0	100.0	17	0	6	3	6	

Table 8. Results of Logit Estimation: Invoicing Decision in Subsidiary's Exports to Japan

Dependent Variable:	Choice of Invoice Currency							
	JPY (1)	JPY (2)	JPY (3)	JPY (4)	USD (5)	USD (6)	USD (7)	USD (8)
Exr Volatility	-0.3549 [-2.56]**	-0.3488 [-2.52]**	-0.3376 [-2.46]**	-0.3319 [-2.42]**	-0.1124 [-0.87]	-0.1067 [-0.83]	-0.1365 [-1.04]	-0.1309 [-1.01]
D_Finish EX	-0.1466 [-2.65]***		-0.1463 [-2.64]***		0.0278 [0.41]		0.0223 [0.33]	
D_Parts EX		0.0984 [1.82]*		0.0946 [1.75]*		0.0584 [0.91]		0.0642 [1.00]
D_Intra-Firm EX	0.1638 [2.36]**	0.1472 [2.03]**	0.1777 [2.67]***	0.1603 [2.30]**	-0.2073 [-2.60]***	-0.1989 [-2.50]**	-0.2276 [-2.87]***	-0.2208 [-2.79]***
D_Rauch Index	0.199 [3.28]***	0.1468 [2.29]**	0.1997 [3.31]***	0.1485 [2.32]**	-0.2387 [-3.25]***	-0.2504 [-3.37]***	-0.2398 [-3.27]***	-0.2548 [-3.43]***
Foreign Sales	-0.0013 [-1.18]	-0.0011 [-1.01]			0.0008 [0.62]	0.0007 [0.54]		
US Dependence			-0.0033 [-2.04]**	-0.0031 [-1.89]*			0.0036 [2.00]**	0.0036 [2.03]**
Intra-Firm IM	0.0025 [3.09]***	0.0026 [3.18]***	0.0026 [3.17]***	0.0027 [3.26]***	-0.0018 [-1.96]**	-0.0019 [-2.04]**	-0.0019 [-2.05]**	-0.002 [-2.14]**
JPY Invoice IM	0.008 [9.66]***	0.008 [9.73]***	0.0079 [9.62]***	0.0079 [9.68]***				
USD Invoice IM					0.0096 [11.15]***	0.0097 [11.22]***	0.0094 [10.99]***	0.0095 [11.05]***
D_Netting	0.157 [2.44]**	0.1538 [2.39]**	0.1666 [2.59]***	0.163 [2.53]**	-0.1929 [-2.86]***	-0.1924 [-2.86]***	-0.1987 [-2.97]***	-0.1991 [-2.98]***
D_Reinvoice	-0.176 [-2.88]***	-0.1818 [-3.02]***	-0.1845 [-3.14]***	-0.1891 [-3.24]***	0.211 [2.60]***	0.2115 [2.60]***	0.2214 [2.75]***	0.2208 [2.74]***
Constant	-1.3473 [-1.86]*	-1.6545 [-2.21]**	-1.4677 [-2.05]**	-1.7423 [-2.34]**	-0.0454 [-0.07]	-0.2525 [-0.37]	0.0734 [0.11]	-0.1524 [-0.22]
Industry Dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
NOBS	582	582	582	582	584	584	584	584
Pseudo R2	0.2839	0.28	0.2875	0.2832	0.3408	0.3416	0.3452	0.3463
Log Likelihood	-278.7187	-280.2574	-277.323	-278.9759	-266.7933	-266.4643	-265.0073	-264.561

Note: Results of Logit estimation are reported (benchmark: exports of either intermediate goods (parts) or finished goods in arm's length exports of the chemical industry). Estimation includes industry dummies. Marginal effects are reported. Figures in square bracket are z -statistic (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

Table 9. Results of Logit Estimation: Invoicing Decision in Subsidiary's Exports to Foreign Countries (excluding Japan)

Dependent Variable: Major currency (US dollar, Euro, UK pound, etc.)					
	Asian Subsidiaries			All Subsidiaries	
	(1)	(2)	(3)	(4)	(5)
Exr Volatility	0.1306 [2.22]**	0.1327 [2.32]**	0.1308 [2.21]**	0.0626 [1.77]*	0.0629 [1.82]*
D_Finish EX	0.032 [0.64]	0.0219 [0.42]	0.0306 [0.61]	0.0123 [0.39]	0.0019 [0.06]
D_Parts EX	0.0445 [1.11]	0.049 [1.24]	0.0426 [1.07]	0.0235 [0.96]	0.0253 [1.04]
D_Rauch Index	0.0703 [0.84]	0.0773 [0.92]	0.0757 [0.89]	0.008 [0.23]	0.0171 [0.47]
Consolidated Sales	-0.0061 [-0.58]			-0.0083 [-1.22]	
Foreign Sales		-0.0013 [-1.46]			-0.001 [-1.61]
US Dependence			-0.0004 [-0.35]		
Intra-Firm IM	-0.0014 [-2.41]**	-0.0012 [-2.26]**	-0.0013 [-2.34]**	-0.0008 [-2.17]**	-0.0006 [-1.89]*
Major Invoice IM	0.0024 [4.40]***	0.0024 [4.46]***	0.0024 [4.39]***	0.0016 [5.25]***	0.0016 [5.23]***
D_Netling	0.0608 [1.74]*	0.0527 [1.48]	0.0616 [1.78]*	0.0282 [1.13]	0.0234 [0.92]
Constant	1.7459 [1.12]	1.4214 [2.03]**	0.9758 [1.55]	2.6823 [1.97]**	1.6574 [2.65]***
Industry Dummy	Yes	Yes	Yes	Yes	Yes
NOBS	262	262	262	431	431
Pseudo R2	0.1864	0.1942	0.1855	0.1639	0.1673
Log Likelihood	-93.8311	-92.9243	-93.9359	-131.0175	-130.4805

Note: Results of Logit estimation are reported (benchmark: exports of either intermediate goods (parts) or finished goods in arm's length exports of the chemical industry). Estimation includes industry dummies. Marginal effects are reported. Figures in square bracket are z -statistic (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).