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The Dollar, the Yen, or the RMB? A Survey Data Analysis of Invoicing Currencies among Japanese Overseas Subsidiaries[§]

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Abstract

The purpose of this study is to analyze the factors that promote the usage of local currencies in Japanese trade in Asia by utilizing a large-scale firm-level questionnaire survey in 2018 on Japanese overseas subsidiaries in Asia and to discover why the usage of Asian currencies has increased recently.

The major findings are as follows: first, with respect to the choice of invoicing currency, subsidiaries with large sales tended to choose the U.S. dollar while those with small sales tended to choose the yen or local currency; second, subsidiaries established for sales to the local market tended to choose the local currency; third, overseas subsidiaries tended to unify the transaction currency on both the import and export sides, a practice called the natural hedge; fourth, subsidiaries with large local currency borrowing, a high share of local procurement, and a joint venture with local firms who try to maximize their profits measured using local currency, tend to adopt local currency invoicing. These results suggest that the role of the U.S. dollar as the main invoice currency is in decline, as Japanese exporting firms move away from using Asian subsidiaries as a platform to export to the United States and increasingly use Asian subsidiaries as a local sales base in Asian countries and an export platform to China and back to Japan.

Keywords: exchange rate risk management, invoice currency, operational hedging, financial hedging, overseas production ratio

JEL classification: F31, F33, F2

[§] This study is conducted as a part of the Project "Exchange Rate and International Currency" undertaken at the Research Institute of Economy, Trade and Industry (RIETI). This study utilizes the questionnaire survey data of "Questionnaire Survey on the Choice of Invoice Currency by Japanese Overseas Subsidiaries" conducted in 2018 by RIETI. The author is grateful for helpful comments and suggestions by research members, and Discussion Paper seminar participants at RIETI.

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1. Introduction

Since the collapse of the Bretton Woods system in 1971, Japanese firms have faced volatile exchange rates. From the early 1970s to the mid-1990s, the yen appreciated steadily, especially after the Plaza Accord in 1985. Japanese exporting firms have coped with the yen appreciation trend and currency fluctuations by adopting various defensive measures. The use of financial instruments such as forward transactions proved to be effective only in the short run. Invoicing exports in yen should protect Japanese exporters' income, but importers may not agree to the arrangement. Trade conflicts incentivized exporters to set up assembler subsidiaries in foreign countries, and this proved to be an effective hedging operation against currency fluctuations. Japanese exporters have developed sophisticated currency risk management methods since the 2000s, when the overseas production ratio increased sharply, including carefully choosing the invoicing currency for intra-firm trade between head offices in Japan and overseas subsidiaries. In our earlier studies, we focused on the case of Japanese firms, showing that currency risk management depends on the size of the firm, sales destinations of subsidiaries, and the global market power of exporters (Ito, Koibuchi, Sato, and Shimizu, 2009, 2010, 2011, 2018).

The shift to overseas production by Japanese firms further accelerated during the period of record-high appreciation of the yen following the global financial crisis in 2008, and the share of overseas manufacturing by manufacturing firms (based on all Japanese firms) peaked in 2017 at a record 25.4%, according to the Basic Survey on Overseas Business Activity 2018 (Ministry of Economy, Trade and Industry). Although some manufacturing firms have returned to domestic production, owing to the depreciating yen, the overseas production ratio has been maintained at the 20% level. Looking at the percentage of Japanese companies expanding overseas by region, Asia has the highest ratio at 67.4% among other areas (2018). Trade transactions with Asian countries are extremely important for Japanese firms. Accordingly, the question of which currency overseas subsidiaries in Asia should use to conduct trade transactions is important for exporting firms.

The purpose of this study is to analyze the types of factors that promote the usage of local currencies in Japanese trade in Asia by focusing on the exchange rate risk management of Japanese overseas subsidiaries in Asia. With reference to the third Research Institute of Economy, Trade and Industry (RIETI) questionnaire survey of Japanese overseas subsidiaries conducted in 2018, we picked up the case of overseas subsidiaries in Asian countries and conducted an empirical analysis of the invoice currency share and various factors influencing the choice of invoice currency. The results showed the following: First, subsidiaries with large sales tended to choose the U.S. dollar or local currency invoicing, while subsidiaries with small sales tended to choose the yen or local currency invoicing. Second, sales subsidiaries also tended to choose local

currency invoicing. Third, the natural hedge was the most important incentive influencing the invoice currency decision, and this feature was common to all selected invoice currencies. In other words, overseas subsidiaries tended to unify the transaction currency on both the import and export sides. Fourth, local currency borrowing, a high share of local procurement, joint ventures with local firms, and profit management policies in the local currency also promoted local currency invoicing.

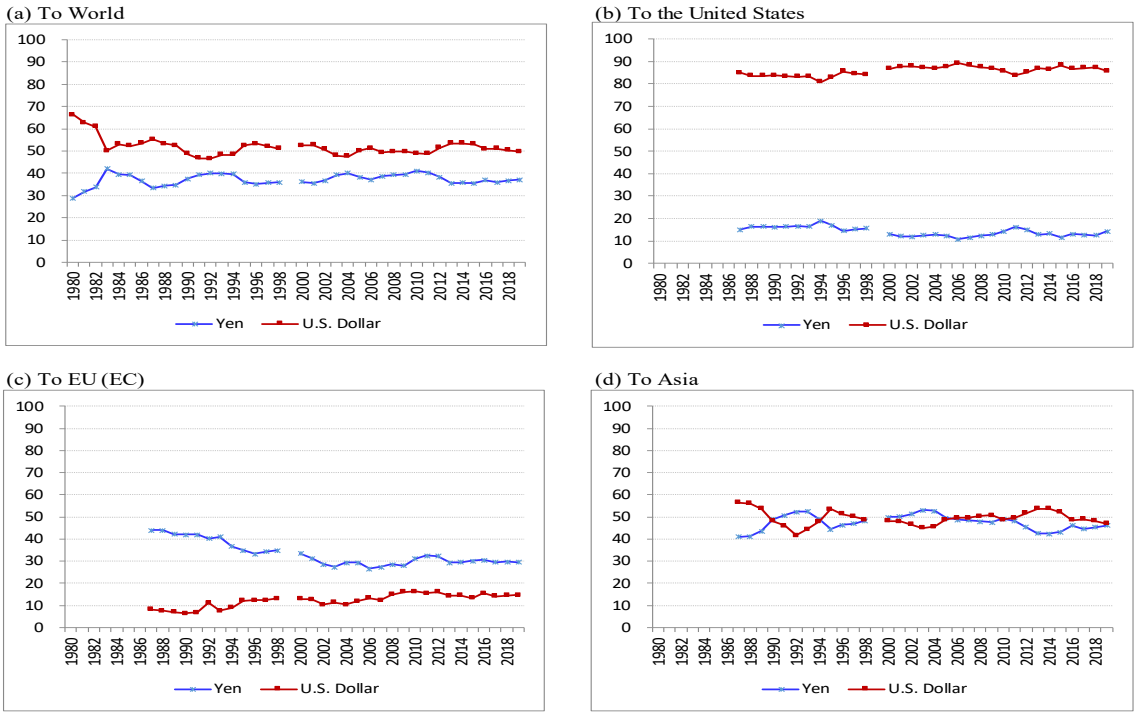
The structure of the rest of this paper is as follows. Section 2 summarizes the "stylized facts" established in the literature concerning the invoicing currency question. Section 3 explains the determinants of invoicing currency choice and methods of exchange rate risk management. It also considers the specialized foreign exchange risk characteristics of Asia. In Section 4, an overview is provided of Asian countries' results in the 2018 RIETI questionnaire survey. Section 5 conducts an empirical analysis, based on the 2018 RIETI questionnaire survey, to identify the factors that promote local currency invoicing in Asia. Section 6 summarizes the discussion of the empirical results and policy implications.

2. The stylized facts established in the literature

Regarding the determinants of invoicing currency choice, previous studies have presented the famous "stylized facts", a typical tendency to choose the invoice currency as follows. First, trade in manufactured goods between advanced countries tends to be invoiced in the exporter's currency (Grassman, 1973). Second, trade of manufactured goods between advanced and developing countries tends to be invoiced in the advanced country's currency (Grassman, 1973; Page, 1977). Third, differentiated goods tend to be invoiced in the exporter's currency, while homogeneous goods tend to be invoiced in an international currency such as U.S. dollars (McKinnon, 1979).

Japan, however, has been known to violate the above stylized facts (Tavlas and Ozeki, 1992; Fukuda and Ji, 1994; Kawai, 1996; and Sato, 1999). Figure 1 shows the change of invoice currency share in Japan's export to the world, the United States, EU and Asia since 1980, and it indicates two remarkable features as follows. First, Japanese exports to advanced countries tend to be invoiced in the importer's currency, which is the "first puzzle" of Japan's invoicing currency choice. Specifically, in Japanese exports to the United States, the share of yen never exceeded 20% and was just 14.2% as of 2019 (Figure 1(b)). Since 2000, 85% or more has been invoiced in U.S. dollars. Second, the yen is not the most used currency in Japanese exports to Asia (Figure 1(d)). Since 2011, the share of the yen has been lower than that of the U.S. dollar, which is the second puzzle of Japan's invoicing currency choice.

Figure 1. Choice of Invoicing Currency in Japan's Exports: 1980–2019 (%)



Note: Data for 1999 are not available. September data are used for 1992–1997, March data for 1998, and the second half of the year data for 2000–2018.
Source: Ito et al. (2018a), updated with data published by the Ministry of Finance, Japan.

To solve the above puzzles and to identify the factors that decide Japanese firms' choice of invoice currency, we conducted questionnaire surveys with Japanese firms.[1] The results produced by Ito et al. (2018a) based on questionnaire surveys with Japanese overseas subsidiaries conducted in 2010 and 2014 as well as two-time surveys with Japanese head offices conducted in 2009 and 2013 showed that the first puzzle can be explained by the pricing-to-market (hereinafter, PTM) behavior of Japanese firms. Specifically, Japanese manufacturing firms tended to choose the importer's currency in exports to advanced countries, especially when importers were their own local subsidiaries. As discussed in the literature on PTM, since local subsidiaries face stiff market competition in advanced countries, Japanese head offices do not pass on the exchange risk to their own subsidiaries by choosing invoicing in yen. Even in intra-firm trade, Japanese head offices tend to choose the U.S. dollar or local currency invoicing, which is a reasonable choice from the standpoint of their exchange rate risk management.

In 2017, we conducted the third questionnaire survey with Japanese head offices, revealing new evidence that the share of local currency invoicing had markedly increased in Japanese exports to Asia. The share of importer's currency invoicing increased significantly from 2009 to

[1] The questionnaire surveys were financially supported by the Research Institute of Economy, Trade and Industry (RIETI).

2017, especially in exports to China and Thailand, where the shares of renminbi and baht invoicing were 12.3% and 14.1%, respectively, in 2017. On the other hand, the share of U.S. dollar invoicing declined considerably from 2013 to 2017 in all three countries. What caused such a rapid increase in local currency invoicing and decline in U.S. dollar invoicing? To answer this question, this study investigated large-scale firm-level questionnaire surveys concluded in 2018 on Japanese overseas subsidiaries in Asia about their choice of invoice currency.

Table 1. Share of Invoicing Currency Choice by Japanese Firms (%)

Export to China	JPY Invoicing Share (%)			USD Invoicing Share (%)			Importer's Currency Invoicing Share (%)		
	2009	2013	2017	2009	2013	2017	2009	2013	2017
Total respondent firms	55.4	44.6	47.6	43.7	47.1	39.2	1.3	8.2	12.3
Large (upper 1/3)	45.3	29.1	35.0	52.4	64.3	48.9	3.2	6.5	14.9
Middle (middle 1/3)	60.5	46.3	49.5	40.9	41.0	37.8	0.0	12.4	12.4
Small (lower 1/3)	63.4	61.1	58.1	34.2	33.0	30.9	0.0	5.8	9.5
Export to Korea	JPY Invoicing Share (%)			USD Invoicing Share (%)			Importer's Currency Invoicing Share (%)		
	2009	2013	2017	2009	2013	2017	2009	2013	2017
Total respondent firms	69.0	58.4	65.1	25.5	36.1	25.8	4.5	5.4	8.6
Large (upper 1/3)	62.5	38.8	52.4	32.8	51.4	37.1	4.2	9.8	9.3
Middle (middle 1/3)	68.9	61.4	68.0	25.8	35.7	21.4	4.2	2.8	10.3
Small (lower 1/3)	78.9	77.7	74.2	13.8	19.5	20.0	5.4	2.9	5.8
Export to Thailand	JPY Invoicing Share (%)			USD Invoicing Share (%)			Importer's Currency Invoicing Share (%)		
	2009	2013	2017	2009	2013	2017	2009	2013	2017
Total respondent firms	60.1	54.6	52.3	30.4	36.3	33.7	9.4	7.8	14.1
Large (upper 1/3)	54.7	41.4	32.9	35.4	49.6	48.2	9.5	8.1	18.9
Middle (middle 1/3)	57.3	41.6	58.0	32.5	30.3	30.7	10.1	9.0	11.4
Small (lower 1/3)	75.5	68.6	71.0	16.7	21.9	17.5	7.8	5.8	11.6

Note: All figures are based on the RIETI Questionnaire Survey on Choice of Invoice Currency of Japanese Firms conducted in 2009, 2013, and 2017. We divide the respondent firms into three size categories (large, medium, and small) based on their consolidated sales amounts.
Source: Ito et al. (2018b).

3. Choice of invoice currency and exchange rate risk management in Asia

Many determinants of currency invoicing have been suggested in the literature. Previous studies have typically used data concerning the share of currency invoicing at a country level and correlated them with suspected macroeconomic factors. A micro-analysis at the firm level is needed to test the factors' relevance. A typical example of and useful approach to the use of detailed firm-level data is provided by Friberg and Wilander (2008), who conducted a questionnaire survey analysis with Swedish exporting firms for empirical tests on determinants of currency invoicing. Following Friberg and Wilander (2008), Ito et al. (2010) began to conduct interview surveys of leading Japanese exporters.[2] As these interview surveys covered firm-level information related to exchange rate risk management, a destination breakdown with respect to

[2] Ito et al. (2010) interviewed treasurers of 23 Japanese companies from four major export industries (automotive, electrical machinery, general machinery, and electronic components) over a one-year period from autumn 2007 to autumn 2008.

the choice of invoice currency became possible. Moreover, one question aimed to determine whether trade was an intra-firm or arms-length transaction— a clear advantage over macro data. Ito et al. (2010, 2011) claimed to have found evidence of a wider set of invoice currency determinants for Japanese exporters: (1) intra-firm trade, inter-firm trade, or trade via a trading company; (2) transaction cost of the currency; (3) intensity of competition in the export destination markets and degree of product differentiation; and (4) structure of the production and distribution network, in which, for example, goods are produced in Japanese exporters' subsidiaries in Asia and shipped to the United States as the final destination.

For overseas manufacturing subsidiaries in Asia, particularly, intra-firm trade is an important factor in deciding the invoice currency. For example, Asian subsidiaries typically import semi-finished goods from Japanese parent firms and export finished products to the rest of the world. In this case, U.S. dollar invoicing tends to be chosen, even in exports from Japanese headquarters to production subsidiaries in Asia, indicating that their choice of U.S. dollar invoicing is a rational part of their strategy of global exchange rate risk management. In addition, small firms, with insufficient resources to run treasury departments of their own, usually ask a general trading company to manage their foreign exchange trade business. In this case, they tend to use yen invoicing in their transactions with a trading company, and the trading company, which does both imports and exports, takes over exchange rate risks. Accordingly, Japanese firms' choice of invoice currency is rather complicated but should be considered along with other risk management methods and their trading structure.

Adding to the hedging instruments mentioned in Döhring (2008), we assumed that Japanese firms have four methods for managing exchange rate risk: (1) choice of invoice currency, (2) operational hedging, (3) financial hedging, and (4) pricing (pass-through) policy. Figure 2 shows our conceptual diagram of exchange rate risk management, based on which we constructed questions in our RIETI questionnaire survey. We briefly explain each of the four methods related to the Asian overseas subsidiaries as follows.

Figure 2. Concept of Exchange Rate Risk Management

<table>
<tr><td>Hedging Instruments</td><td colspan="2">Financial Hedges</td><td>Operational Hedges</td><td></td><td>Choice of Invoice currency</td><td></td><td>Pricing Policy (Pass through)</td></tr>
<tr><td>Classification in Financial Statements</td><td>Derivative Hedges</td><td colspan="2">Natural Hedges</td><td rowspan="2">+</td><td rowspan="2">Home currency or US dollar</td><td rowspan="2">+</td><td rowspan="2">Yes / No</td></tr>
<tr><td>Examples</td><td>Forward
Options
Others</td><td>Foreign Currency Debt</td><td>Overseas Diversification
Operational matching of revenues and expenditure (marry/netting)</td></tr>
</table>

Note: The "Operational hedges" and "Financial Hedges" parts are from Döhring (2008)

- *Choice of invoicing currency*

As mentioned above, Japanese overseas subsidiaries in Asia tend to use the U.S. dollar as their invoice currency, rather than the yen or home currency. The reasons for this are as follows. First, their regional production network, where the final consumer is the United States, and the export of goods made from materials imported from Japan to the United States uses dollars in the trade structure in both exports and imports, which can offset their foreign exchange risk exposure. Second, their home currency is an emerging market currency, and the existence of capital and foreign exchange trading regulations make their home currency's transaction costs high. Third, most Asian currencies had long ago adopted the de facto U.S. dollar peg system, and the volatility of exchange rates between the U.S. dollar and their local currencies was the least among other currencies. For Japanese firms that have a policy of taking over the foreign exchange risk of their overseas subsidiaries, using the dollar is the second-best choice if the local currency cannot be used.

Recently, Asian countries have achieved steady economic growth and gradually attempted to remove controls on financial and capital transactions. With this deregulation of financial and capital markets in Asia, Japanese head offices have started to use local currencies in their exports to Asia-based subsidiaries. In addition, Asian countries, especially China, have become more important consumer markets for Japan. As long as Asia is the final destination market, Asian local currencies can be chosen as the invoicing currency along Asian production and value chains.

- *Operational hedge (natural hedge)*

In the wake of the sharp yen appreciation in 1995, Japanese exporting firms accelerated the transfer and expansion of production facilities overseas and increased the proportion of imported components from overseas. Such offshoring is typical of operational hedging. Exporting firms' increase in import components is also a means of operational hedging. For firms with a higher U.S. dollar invoicing share, "marry and netting" presumably works effectively to reduce their currency exposure. However, not all firms can use this technique. Firms that make goods using Japanese materials only and export them abroad cannot carry out marry and netting because they have no payable foreign currency. As for overseas subsidiaries, local procurement of intermediate goods also reduces their currency risk if they have a high share of local selling. Natural hedges are also an alternative way of reducing exchange rate exposure. As explained in Figure 2, holding foreign currency debt (borrowing) by subsidiaries can reduce their currency risk of foreign currency revenue in future.

- *Financial hedge*

Most typical hedging instrument to hedge financial risk is using the financial market

installments, such as forward contracts and options. It is expected that the higher the U.S. dollar invoicing share, the greater the financial hedge usage to manage exchange rate exposure. In our RIETI questionnaire surveys with head offices conducted since 2009, more than 70% of firms were found to use some kind of hedging instrument through the foreign exchange market. Moreover, Japanese firms with larger size and larger exposure are more likely to use financial hedging. In our RIETI questionnaire surveys of overseas subsidiaries, however, their usage of financial hedging was not as high, and they tended to use spot transactions, because most currency risks were held by their head offices and they did not need to use forward transactions themselves. Another reason why financial hedging is not often used in Asian countries is because Asian financial market is not mature enough to deal with forward contracts and options.

- *Pricing policy (exchange rate pass-through)*

Even when Japanese firms invoice their exports in U.S. dollars and suffer shrinking profit margins from yen appreciation, they may be able to recover profit margin by raising the dollar-denominated export prices. Our questionnaire surveys suggested that such a price change cannot be done too often, but an annual revision of export price changes seems to occur. When new models are marketed, prices may reflect new exchange rate levels. Whether foreign overseas subsidiaries can make their price revisions in response to foreign exchange fluctuations (i.e., when foreign exchange "pass-through" occurs) depends on how discretionary they are in managing currency risk.

According to the Basic Survey on Overseas Business Activity 2018, the local and regional sales ratio of local manufacturing firms in Asia was 79.6%, which was lower than that of North America (93.9%) and Europe (82.2%). The sales ratio to Japan from Asian subsidiaries was 15.3%, which was higher than that of Europe (4.1%) and North America (1.8%). In addition, the local manufacturing sales share had increased in all regions. Looking at the local/regional procurement ratio by region, Asia was 74.5%, Europe was 71.4%, and North America was 66.9%. The procurement ratio from Japan was 23.4% in Asia, 25.9% in North America, and 20.5% in Europe. These results suggest that Japanese overseas subsidiaries in Asia have various options for their local sales, local procurement, import, and export; therefore, their choice of invoice currency largely depends on their own trade structure.

4. Asian countries' 2018 RIETI Questionnaire Survey results

This section overviews the Asian countries' 2018 RIETI Questionnaire Survey results, conducted with 21,801 Japanese overseas subsidiaries from January 2019 to the end of February

2019. In total, 2,051 responses were obtained and this response rate was 9.4% Our main findings were as follows: First, almost 60% of Japanese overseas subsidiaries chose the invoice currency and methods of managing currency risk based on their own discretion. Second, the usage of Asian local currencies as the invoice currency had increased. For example, 20% of the sampled firms used RMB for some invoicing. Third, the RMB and other Asian local currencies are used for trade both with Japan and with other countries, and such usage has increased significantly over the past two surveys. Fourth, U.S. dollar-denominated transactions decreased with the increase in the usage of Asian local currencies. Fifth, yen invoicing accounted for the largest share of the intermediate goods import from Japan, while the share of U.S. dollar invoicing exceeded that of yen invoicing in exports to Japan.

Table 2. Production Bases in Asia: Share of Invoice Currency in Local Sales and Export
(average of share data, %)

Invoice Currency Share (%) in Local Sales							
	# of responded firms	Yen	USD	Euro	RMB	Local Currency	Other
2018	**328**	**3.9**	**18.0**	**0.1**	**26.9**	**53.8**	**1.3**
2014	299	3.2	23.2	0.6	23.8	47.2	2.0
2010	414	4.9	21.5	0.2	21.9	50.6	0.9
Invoice Currency Share (%) in Export to Japan							
	# of responded firms	Yen	USD	Euro	RMB	Local Currency	Other
2018	**307**	**31.2**	**43.9**	**0.2**	**11.2**	**15.8**	**2.5**
2014	209	37.8	52.2	0.0	4.7	4.8	0.4
2010	313	46.0	48.0	0.2	0.2	5.6	0.0
Invoice Currency Share (%) in Export to Other Countries (excluding Japan)							
	# of responded firms	Yen	USD	Euro	RMB	Local Currency	Other
2018	**272**	**9.9**	**68.3**	**1.3**	**4.8**	**15.9**	**2.6**
2014	220	6.0	80.7	2.9	1.7	5.4	3.3
2010	323	8.6	77.5	3.2	0.7	6.6	3.4

Note: All figures are based on the RIETI Questionnaire Survey on the Choice of Invoice Currency by Japanese Overseas Subsidiaries conducted in 2010, 2014, and 2018. We used the responses of Asian countries including China, Korea, Hong Kong, Taiwan, Singapore, Thailand, India, Indonesia, Malaysia, Philippines, and Vietnam.

As mentioned above, we conducted the RIETI Questionnaire Survey on the Choice of Invoice Currency by Japanese Overseas Subsidiaries in 2010, 2014, and 2018. Although the responding firms in the three surveys were not the same, we can compare the invoice currency share across three different points. Table 2 shows the share of invoicing currency of Japanese overseas subsidiaries (production bases) in Asia by transaction. Here, we can again confirm that local currency invoicing increased in all transactions in local sales, exports to Japan, and exports to other countries from 2010 to 2018. Particularly, the RMB invoicing share in exports to Japan increased significantly from 0.2% in 2010 to 11.2% in 2018. On the other hand, the U.S. dollar

invoicing share in all transactions declined in 2018, following a slight increase in 2014 from 2010. The more interesting and puzzling evidence is that the share of yen invoicing in exports to Japan decreased in 2018, but that of local sales and export to other countries increased in 2018 after a decline in 2014 from 2010.

Table 3-A. Trading Local Currency by Country (2018)

	India	Indonesia	Singapore	Thailand	Phillppines	Viestnam	Malaysia	South Korea	Hong Kong	Chinese Taipei	China
# of responded firms	27	90	61	116	26	23	63	21	52	72	239
Yes	19	61	39	81	16	13	43	9	37	46	225
	70.4	67.8	63.9	69.8	61.5	56.5	68.3	42.9	71.2	63.9	94.1
No	8	29	25	35	10	10	20	12	15	26	14
	29.6	32.2	41.0	30.2	38.5	43.5	31.7	57.1	28.8	36.1	5.9

Table 3-B. Transaction Types of Trading Local Currencies by Country (2018)

Local Currency Usage (Type of Transactions, Select all that apply)

	India	Indonesia	Singapore	Thailand	Phillppines	Viestnam	Malaysia	South Korea	Hong Kong	Chinese Taipei	China
# of responded firms	16	60	35	77	15	13	41	8	19	36	208
Receipts from the local market	14	50	23	66	7	7	31	8	13	29	198
	87.5	83.3	65.7	85.7	46.7	53.8	75.6	100.0	68.4	80.6	95.2
Payments made in the local market	12	43	21	60	14	12	31	7	15	32	184
	75.0	71.7	60.0	77.9	93.3	92.3	75.6	87.5	78.9	88.9	88.5
Payments for imports (from the headquarters)	3	7	8	15	1	1	2	2	3	8	45
	18.8	11.7	22.9	19.5	6.7	7.7	4.9	25.0	15.8	22.2	21.6
Payments for imports (excluding headquarters)	8	12	7	13	3	0	10	0	3	5	17
	50.0	20.0	20.0	16.9	20.0	0.0	24.4	0.0	15.8	13.9	8.2
Receipts for exports (to headquarters)	2	3	4	13	1	0	2	0	4	5	30
	12.5	5.0	11.4	16.9	6.7	0.0	4.9	0.0	21.1	13.9	14.4
Receipts for exports (excluding headquarters)	2	6	9	17	0	0	4	0	5	10	16
	12.5	10.0	25.7	22.1	0.0	0.0	9.8	0.0	26.3	27.8	7.7
Other(s)	0	3	3	0	1	0	1	0	2	1	6
	0.0	5.0	8.6	0.0	6.7	0.0	2.4	0.0	10.5	2.8	2.9

Note: All figures are based on the RIETI Questionnaire Survey on the Choice of Invoice Currency by Japanese Overseas Subsidiaries conducted in 2018.

Table 3-A summarizes each Asian country's response to the question of whether they were currently trading in Asian local currencies and shows that more than 60% of firms answered "yes," except for Vietnam and South Korea. The highest percentage was China at 94.1%, followed by Hong Kong at 71.2%, India at 70.4%, and Thailand at 69.8%. As for the type of transaction, Table 3-b indicates that "Receipts from the local market" represented the largest share in most countries, followed by "Payments made in the local market." In China, almost 90% of firms used RMB for local receipts and payments. However, 21.6% of firms used it for payments for imports from their headquarters, and 14.4% firms used it for receipts for exports to their headquarters. These ratios are larger than imports and exports with others, excluding headquarters.

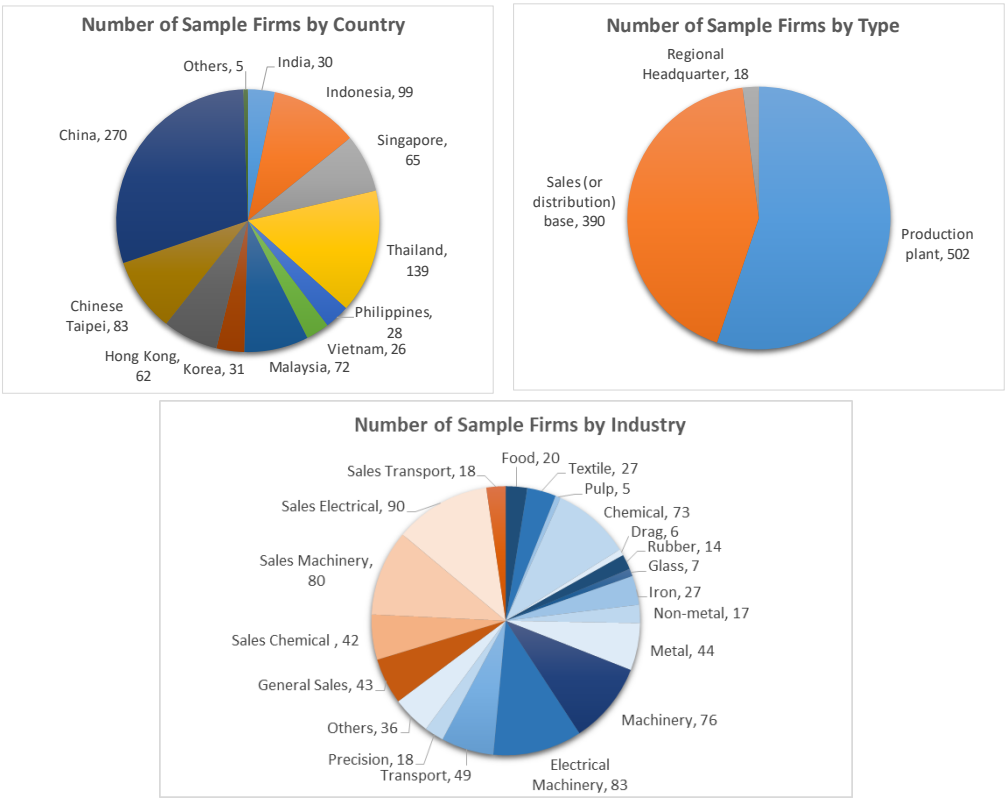
The above results suggest that Asian local currency usage in Asian subsidiaries has recently increased, not only in their local transactions, but also in their international transactions, while

the usage of the U.S. dollar has decreased. What caused this change in the invoicing currency? We attempted to analyze the determinants of the invoice currency of Japanese overseas subsidiaries in the next section.

5. The empirical analysis of the 2018 RIETI Questionnaire Survey of Japanese Overseas Subsidiaries in Asia

In this section, we present the empirical analysis to investigate the factors affecting the choice of invoice currency of Japanese overseas subsidiaries in Asia. We focus on the responses of Asian countries (China, Korea, Hong Kong, Taiwan, Singapore, Thailand, Indonesia, Malaysia, Philippines, and Vietnam). Figure 3 shows our sample firms' basic information. By country, China represented the largest sample number (270), followed by Thailand (139), Indonesia (99), and Chinese Taipei (83). By type, production plant represented the largest (502), followed by sales (or distribution) base (390). The sample firms were well diversified by industry. Electrical machinery was the largest (83) among production plants, followed by machinery (76), and chemical plants (73). In the sales base, sales of electrical machinery were the largest (90), followed by sales of machinery (80).

Figure 3. Basic Information of Sample Firms

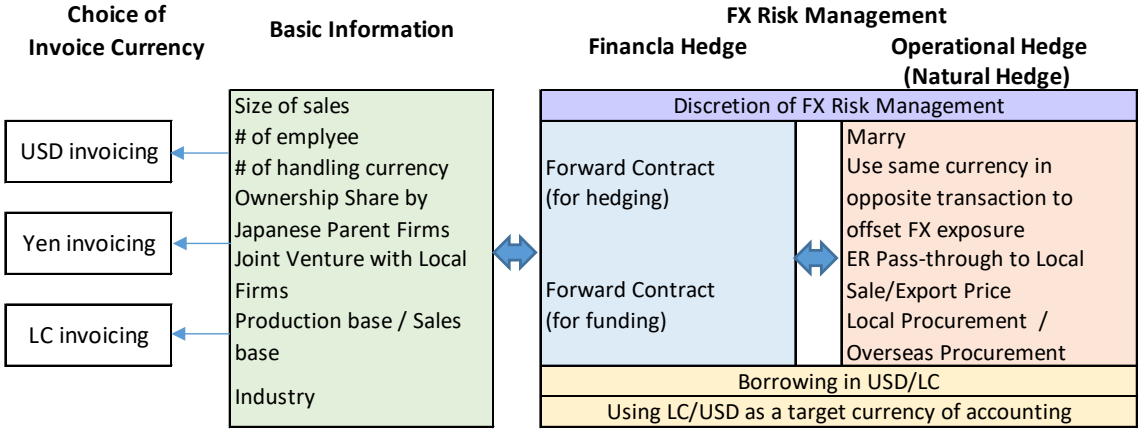


Note: All figures are based on the RIETI Questionnaire Survey of Japanese Overseas Subsidiaries conducted in 2018.

5-1. Determinants of choice of invoice currency for overseas subsidiaries in Asia

In this section, we investigate the relationship between the choice of invoice currency and the exchange rate risk management of Japanese overseas subsidiaries in Asia based on the questionnaire survey. The 2018 RIETI Questionnaire Survey covered rich information related not only to firms' general information, but also to foreign exchange rate risk management methods, including their choice of invoicing currency, usage of financial hedges, operational hedges, and price revision (pass-through) strategies. As shown in Figure 4 illustrating our research design for invoice currency determinants, we explain our empirical framework as follows.

Figure 4. Research Design for Invoice Currency Determinants

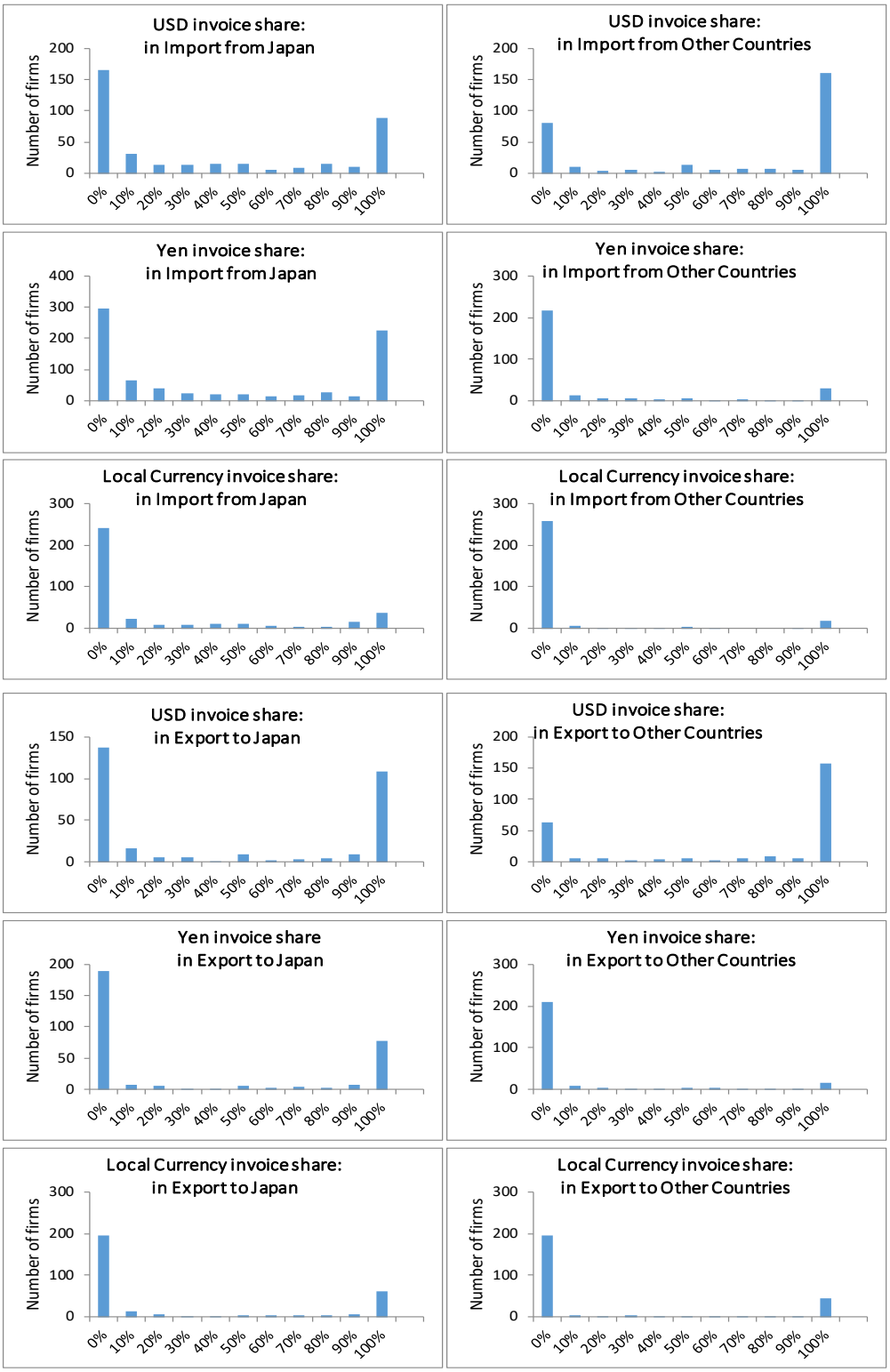


In our estimation model, the dependent variable is the share of invoice currency, e.g., U.S. dollar, Japanese yen, and Asian local currency. Because we asked firms about their invoice currency share in each export and import transaction with their Japanese headquarters and other countries' counterparties, for given firm *i*, we have its invoice currency share of *the U.S. dollar, the Japanese yen and Asian local currency* in trade *k, import and export,* with trade partner country *j, Japan or other countries*.

Figure 5 shows the distribution of firms in each share of invoice currency by each transaction. Basically, the number of firms that answered 0% and 100% is larger than the others between 0% and 100%, indicating that most firms tended to use one currency for their all transactions. As shown, the share of invoice currency is clearly censored at zero (i.e. left-censored). With this left-censored distribution, the Ordinary Least Squares (OLS) estimation cannot be used since, among other reasons, the assumption of normal distribution is not met. To accommodate the left-censored distribution, the Tobit model is often applied for estimating the effects of explanatory variables in previous studies[3].

[3] As many previous studies did, we conducted Probit Model for robustness check and confirmed that we got

Figure 5. Distribution of the Share of Invoice Currency



Note: All figures are based on the RIETI Questionnaire Survey of Japanese Overseas Subsidiaries conducted in 2018.

the similar results as well.

In order to examine the determinants of invoicing currency share y_i^* while accounting for many zero values, we set up the following latent regression model.

$$y_i^* = x_i'\beta + \varepsilon_i$$

The model supposes that there is a latent (i.e. unobservable) variable y_i^*. This variable linearly depends on a set of exogenous variables x_i via a vector β, which determines the relationship between exogenous variables x_i and the latent variable y_i^*. In reality, we observe the followings

$$y_i = \begin{cases} y_i^* & if \;\; y_i^* > 0 \\ 0 & if \;\; y_i^* \leq 0 \end{cases}$$

when the threshold value being 0 in this analysis. We could estimate the above model using the *Tobit* model specification of the following equation to test the firm-level determinants of invoice currency: [4]

$$\text{Share of Invoice Currency}_{i,j,k} = \alpha_0 + \alpha_1 Firms_i + \alpha_2 Risk\;\; Management_i + \alpha_3 Financial\;\; Hedge_{i,j,k} + \alpha_4 Operational\;\; Hedge_{i,j,k} + \varepsilon_{i,j,k} \quad (1)$$

The explanatory variables on the right-hand side were categorized into four groups of variables, such as *Firms' basic information, Risk management, Financial hedge, and Operational hedge*, and an error term.

- *Firms (Basic Information)*

Firms is a vector of variables to capture firms' specific characteristics. First, the natural log of sales is used to control for firm size, the data of which is taken from their answer about annual sales in 2018, or fiscal year in 2017. The second variable is the number of currencies they used for local and international transactions. Because the sample firms are Japanese overseas subsidiaries, some used many currencies, including the U.S. dollar, Japanese yen, and Asian local currencies as well as the currency of their home country. Third, we used their ownership shareholding ratio by Japanese parent firms as a proxy to capture the strength of their relationship with the head office. Based on our previous research, the higher the ownership shareholding ratio, the more likely it is that headquarters take over the exchange rate risk of their overseas subsidiaries. For local currency invoicing, we used the dummy variable of joint ventures of local firms, instead of the ownership shareholding ratio. Fourth, we used a dummy variable for production subsidiaries, to show a possible difference in currency invoicing decisions between intra-firm (production base) and arms-length exports (sales base). Lastly, we included main manufacturing

[4] Because the dependent variables are the share of invoice currency, their distribution is between 0 and 1. Therefore, we set the lower limit to 0 and the upper limit to 1 when using the Tobit Model.

industry dummies, e.g., “electrical machinery,” “transport equipment,” and “general machinery.”

- *Risk Management*

Exchange rate risk management approaches differ among foreign subsidiaries. Some subsidiaries had no discretion over their risk management, and all decisions were made by their head office in Japan. Others were given some discretion to decide their risk management. According to the 2018 REITI Questionnaire Survey, the ratio of discretional risk management, including partial discretion, in the case of Asian countries, was almost 70% and higher than that of North American countries (52%). This is because some regulations and restrictions remain in the Asian foreign exchange market, and it continues to be difficult to manage local currencies from Japan. Sato and Shimizu (2018), who analyzed the RMB usage of Japanese overseas subsidiaries in China based on RIETI questionnaire surveys in 2010 and 2014, found that subsidiaries who discretionally managed their exchange rate risk tended to use RMB for their trade transactions, suggesting that discretionary decisions on risk management are important when using RMB as a trade transaction currency in China. In the current analysis, we attempted to use the same variable to analyze the determinants of Asian local currencies’ usage. Concerning discretionary management of exchange rate risk, we set the dummy of discretional risk management to take 1 if foreign exchange risk management was subject to the discretionary decisions of local subsidiaries, and 0 otherwise. By using these dummies, we tested whether the sample firm’s capacity to manage currency risk affected the choice of invoice currency.

- *Financial Hedge*

We constructed dummy variables related to financial hedges. For forward contracts, there are two different purposes. One is for hedging the future foreign currency receivable or payment. The other is for foreign currency funding. In this analysis, we set two different types of dummy variable for using forward contract for hedging (or funding) takes 1 if a firm uses forward contract for hedging (or funding) and 0 if not. Basically, overseas subsidiaries do not need to use forward contracts for hedging if they use home currency invoicing. Accordingly, we supposed the usage of forward contracts for hedging to be related to U.S. dollar or Japanese yen invoicing. On the other hand, forward contract for funding is one of the strategies to hedge their foreign currency exposure for a certain period, which are related to the operational hedge.

- *Operational Hedge*

In the questionnaire survey, we asked firms whether they used marry (matching) and netting as a currency risk management technique. Based on the responses to this question, we made a dummy variable of marry, which took 1 if firms used marry (matching) and netting, and 0 if not. In addition to this variable, we set more specific explanatory variables utilizing the responses to the survey.

Because most sample firms do intra-firm trade with their Japanese headquarters, we supposed that the operational hedge would be the most important determinant in deciding the invoice currency. Particularly, if they were production-based, they conducted various international transactions, such as the import of intermediate goods from their Japanese headquarters and the export of final goods to other international markets as well as to their headquarters; or, some other cases, for example, they used more local procurement than imports from Japan and sold more in local markets than in international markets. Because we used each transaction's share of invoice currency as a dependent variable, we were able to use the share of invoice currency in the opposite transaction as an explanatory variable. This enabled us to test whether they tried to use the same currency in both transactions to offset the receivables and payables. Moreover, local and international procurement shares were also used.

Regarding the pricing policy (exchange rate pass-through), we set two different types of pass-through dummy variable. We used a dummy for pass-through to local sales price for analyzing the share of invoice currency in import as a dependent variable, and we used a dummy for pass-through to exporting price for analyzing the share of invoice currency in export as a dependent variable. Both dummy variables took 1 if a firm had a rule reflecting foreign exchange rate fluctuations in its local market selling (or exporting) prices and 0 otherwise. As for the natural hedge methodology by utilizing financial market, we applied the response to the question of whether they used "Borrowing in the local currency" or "Borrowing in U.S. dollars" as their exchange rate risk management approach. We made dummy variables that took 1 if a firm borrowed in the local currency (or U.S. dollars) and 0 otherwise.

Lastly, from the standpoint of accounting, we made a new dummy to explain foreign subsidiaries' attitudes to evaluating their profits. In our survey, we asked the firms to indicate the currency around which they built their management plan and set the profit target. Dummy variable for using U.S. dollar (or local currency) as a target currency of their risk management from the above answer.

5-2. Results of the Tobit Analysis

- *Determinants of U.S. dollar invoicing*

In Table 4-1, we present the results using the share of U.S. dollar invoicing in imports from Japan as a dependent variable. Let us first look at the estimated coefficients of the explanatory variables included in the firms' basic information. The coefficient of the natural log of consolidated sales is positive and significant in (5) specification in Table 4-1, and the coefficient of the number of currency is negative and significant in (1), (4), and (5). These results show that large sales subsidiaries tended to use U.S. dollar invoicing and that subsidiaries who used U.S.

dollar invoicing tended not to use other currencies but the U.S. dollar. Among explanatory variables in financial hedges, the coefficient of the dummy of forward (hedging) is positive and significant. This result is reasonable, as subsidiaries who use U.S. dollar invoicing need to hedge their foreign exchange exposure by utilizing forward contracts in foreign exchange markets. Among explanatory variables in operational hedges, the coefficient of their U.S. dollar invoice share in exports to Japan is positive and strongly significant in (2) (3), whose Pseudo R-square is higher (0.194 and 0.197) than the other specification. This means that subsidiaries who used U.S. dollar invoicing in their exports to Japan tended to use the U.S. dollar in their imports from Japan as well. The share of overseas procurement is also positive and significant, suggesting that subsidiaries that imported intermediate goods not only from Japan but from other countries tended to use U.S. dollar invoicing. As for natural hedges, the share of dummy of borrowing in the U.S. dollar is positive and significant. The coefficient of the dummy of using the U.S. dollar as a target currency of management is also positive and significant. Regarding the industry dummy, the coefficient of the dummy of transport equipment is negative and significant.

In Table 4-2, we present the results using the share of U.S. dollar invoicing in imports from other countries excluding Japan as a dependent variable. In these results, the coefficient of the ownership share by Japanese parent firms is positive and significant in (1), (2), (3) and (4). This indicates that subsidiaries with a high ownership share by their parent firms tended to use U.S. dollar invoicing in imports from Japan. This result is consistent with our previous research results based on RIETI questionnaire surveys of Japanese headquarters which confirmed that they tended to use U.S. dollar invoicing in their intra-firm trade. Among explanatory variables in operational hedges, the coefficient of their U.S. dollar invoice share in exports to other countries is positive and strongly significant in (2) (3). This means that subsidiaries that used U.S. dollar invoicing in their exports to other countries tended to use the U.S. dollar in their imports from Japan. Similar to the case of imports from Japan, the coefficients of the share of overseas procurement and the dummy of using the U.S. dollar as a target currency of management are also positive and significant. Regarding the industry dummy, the coefficient of the dummy of transport equipment is negative and significant.

In Table 4-3, we present the results using the share of U.S. dollar invoicing in exports to Japan as a dependent variable. In these results, the coefficient of the dummy of discretionary risk management is negative and significant in (1), (2) and (4). This indicates that subsidiaries with a high ownership share by their parent firms tended to use U.S. dollar invoicing in imports from Japan. This result is also consistent with our previous research results. Among the explanatory variables in operational hedges, the coefficient of their U.S. dollar invoice share in imports from Japan is positive and strongly significant in (2) and (3). Similar to the case of imports from Japan, the coefficients of the dummy of borrowing in the U.S. dollar, the share of overseas procurement,

and the dummy of using the U.S. dollar as a target currency of management are all positive and significant. Regarding the industry dummy, the coefficient of the dummy of general machinery is positive and significant.

In Table 4-4, we present the results using the share of U.S. dollar invoicing in exports to other countries excluding Japan as a dependent variable. Regarding the firms' basic information, the coefficient of the natural log of consolidated sales is positive and significant in (1), and the coefficient of the number of currency is negative and significant in all the models. Among the explanatory variables in operational hedges, the coefficient of their U.S. dollar invoice share in imports from other counties is positive and strongly significant in (2) and (3). Similar to the case of imports from Japan, the coefficients of the dummy of borrowing in the U.S. dollar and the dummy of using the U.S. dollar as a target currency of management are positive and significant.

- *Determinants of Japanese Yen Invoicing*

In Table 4-5, we present the results using the share of Japanese yen invoicing in imports from Japan as a dependent variable. Let us first look at the estimated coefficients of the explanatory variables included in the firms' basic information. Contrary to the case of U.S. dollar invoicing, the coefficient of the natural log of consolidated sales is negative and significant in (1), and the coefficient of the number of currency is positive and significant in all the models. These results show that small sales subsidiaries tended to use yen invoicing and that such subsidiaries used many currencies in their local and international transactions. Interestingly, the coefficient of the dummy of discretionary risk management is positive and significant in (1), (2), (3) and (4). This means that subsidiaries who used yen invoicing required their own discretion for exchange rate risk management. Among the explanatory variables in financial hedges, none of the coefficients are significant. Among the explanatory variables in operational hedges, the coefficient of their yen invoice share in exports to Japan is positive and strongly significant in (2) and (3), whose Pseudo R-square is higher (0.236 and 0.242) than the other models. Similar to the case of U.S. dollar invoicing, the subsidiaries tried to use the same currency in both import and export transactions. The share of overseas procurement from Japan is also positive and significant, which suggests that subsidiaries with a high share of importing intermediate goods from Japan tended to use yen invoicing. Regarding the industry dummy, the coefficient of the dummy of transport equipment is positive and significant.

In Table 4-6, we present the results using the share of yen invoicing in imports from other countries excluding Japan as a dependent variable. Similar to the case of imports from Japan, the coefficient of the natural log of consolidated sales is negative and significant in (1), (2), (4) and (5). Among the explanatory variables in operational hedges, the coefficient of their yen invoice share in exports to other countries is positive and strongly significant in (2) and (3). The high

share of importing intermediate goods from Japan is also positive and significant.

In Table 4-7, we present the results using the share of yen invoicing in exports to Japan as a dependent variable. Similar to the case of imports, the coefficient of the natural log of consolidated sales is negative and significant in (1), and the coefficient of the number of currency is positive and significant in (6). Among the explanatory variables in operational hedges, the coefficient of their yen invoice share in exports to other countries is positive and strongly significant in (2) and (3). The share of importing intermediate goods from Japan is also positive and significant. Regarding the industry dummy, the coefficient of the dummy of transport equipment is positive and significant.

In Table 4-8, we present the results using the share of yen invoicing in exports to other countries excluding Japan as a dependent variable. The results are almost the same as in the previous cases. The coefficient of the natural log of consolidated sales is negative and significant in all models. Among the explanatory variables in operational hedges, the coefficient of their yen invoice share in imports from other counties is positive and strongly significant in (2) and (3). Regarding the industry dummy, the coefficient of the dummy of transport equipment is positive and significant.

- *Determinants of Local Currency Invoicing*

In Table 4-9, we present the results using the share of local currency invoicing in imports from Japan as a dependent variable. Similar to the case of the Japanese yen, the coefficient of the natural log of consolidated sales is negative and significant in (5), which suggests that small sales subsidiaries tended to use local currency invoicing. The dummy of joint venture with local firms is positive and significant in all, excluding (5)[5]. This means that Japanese overseas subsidiaries who were jointly and partially owned by local firms tended to use local currency invoicing. Contrary to the case of Japanese yen invoicing, the coefficient of the dummy of discretionary risk management is negative and significant in (1), (2), (3) and (5). This means that subsidiaries who use local currency invoicing did not have any discretion in exchange rate risk management. In other words, they did not need to conduct any exchange rate risk management because they did not have any foreign currency exposure. Among the explanatory variables in financial hedges, no coefficients are significant. The coefficient of the dummy of manufacturing base is negative and significant in (5). This suggests that subsidiaries with production plants tended to not use local currency invoicing. Among the explanatory variables in financial hedges, the coefficient of the dummy of forward (hedging) is negative and significant, which is contrary to the case of U.S. dollar invoicing. Among the explanatory variables in operational hedges, the coefficient of their

[5] In the case that we used the ownership share by Japanese parent firms instead of the dummy of joint venture with local firms, it was negative and significant.

local currency invoice share in exports to Japan is positive and strongly significant in (2) and (3), whose Pseudo R-square is higher (0.145 and 0.154) than the other specifications. Similar to the case of U.S. dollar and Japanese yen invoicing, the subsidiaries tried to use the same currency in both import and export transactions. The coefficient of the share of local procurement is also positive and significant, which suggests that subsidiaries with a high share of local procurement tended to use local currency invoicing. The coefficient of the dummy of borrowing in local currency is also positive and significant. Regarding the industry dummy, the coefficient of the dummy of electric machinery is positive and significant.

In Table 4-10, we present the results using the share of local currency invoicing in imports from other countries excluding Japan as a dependent variable. Similar to the case of imports from Japan, the coefficient of the natural log of consolidated sales is negative and significant in all. The dummy of joint venture with local firms is positive and significant in (1) and (4). Among the explanatory variables in operational hedges, the coefficient of their local currency invoice share in exports to other countries is positive and strongly significant in (2) and (3). The coefficient of the share of local procurement and the dummy of borrowing in local currency are also positive and significant.

In Table 4-11, we present the results using the share of local currency invoicing in exports to Japan as a dependent variable. Similar to the case of imports, the coefficient of the natural log of consolidated sales is negative and significant in (2), (3), and (5). Among the explanatory variables in operational hedges, the coefficient of their local currency invoice share in exports to other countries is positive and strongly significant in (2) and (3). The coefficient of the dummy of borrowing in local currency and the dummy of using local currency as a target currency of management is positive and significant.

In Table 4-12, we present the results using the share of local currency invoicing in exports to other countries excluding Japan as a dependent variable. In this case, the coefficient of the natural log of consolidated sales is negative and significant, and the coefficient of the dummy of the manufacturing base is negative and significant in all models. In addition, the coefficient of the number of currency is positive and significant in all models excluding (5). Among the explanatory variables in operational hedges, the coefficient of their yen invoice share in imports from other counties is positive and strongly significant in (2) and (3).

6. Conclusion

Asian local currencies are being used more than before in Japanese overseas subsidiaries as Japan becomes more involved in Asian value chains. Why has the use of local currencies increased in transactions with Japanese overseas subsidiaries in Asia? Our previous research

indicated that Japanese export firms often adopt a strategy of centralizing exchange risk management in headquarters (Japan) to avoid exposing their overseas subsidiaries to exchange risks and have tended to choose the U.S. dollar in their transactions in Asia. In recent years, however, Chinese and other Asian markets have become more important as final consumption destinations. Moreover, Asian production bases engaged in manufacturing not only import intermediary goods from Japan but have also started local procurement. In addition, intra-regional trade transactions in Asia have been expanding recently. These seem to be the reasons for the increased use of local currencies.

In this study, we attempted to analyze whether the above changes could be confirmed in Japanese overseas subsidiaries in Asia. Based on our empirical analysis with the detailed firm-level information from questionnaire survey, we can confirm that their invoicing currency choice was strongly influenced by their incentive to use the same currency not only in import and export, but also in local sales, local procurement, and borrowing; this feature was common to all their selected invoice currencies, not only the U.S. dollar, but also the Japanese yen, and their home currencies. We were first able to recognize, in our interviews and questionnaire survey of Japanese headquarters so far, that Japanese manufacturing exporters try to use the same currency for their all transactions to manage their foreign exchange exposure. We were then able to confirm nearly the same tendency in the current analysis by utilizing overseas subsidiaries data.

In Asian subsidiaries, we confirmed that the U.S. dollar as an invoicing currency is still widely used. It is because Japanese head offices tend to choose the U.S. dollar invoicing to manage exchange rate risk in their intra-firm transactions. However, this analysis also suggested the small signs that differ from such a traditional choice of invoice currency. In our Asian sample, we count the number of firms who answered the invoice currency share in their multiple transactions, for example import from Japanese head office and export to them, and compare the number of firms whose share of local currency invoicing are higher than other currencies. Table 5 summarizes the results. The second column shows the number of firms whose share of local currency invoicing in multiple transaction are above 50%. Among the sample countries, China has the largest number of firms who meet this criterion, 31 and followed by Thailand, 23. If we look at the share of the number of these firms against the number of firms who answered the invoice currency share in multiple transactions, Thailand is the highest share, 43.4% followed by Singapore, 30.8%. The third column shows the number of firms whose share of local currency invoicing in multiple transaction are above 90%. In this case, China has the largest number of firms, 23 and the highest share, 21.5%. It means that more than 20% of overseas subsidiaries in China use the RMB for their almost all transactions due to our questionnaire surveys. These results indicated that some of subsidiaries, particularly in China have already started to choose their own currencies for their multiple trade transactions to manage exchange rate risk in the same way as

the U.S. dollar.

Table 5. Number of firms who answered the LC invoicing share in multiple transactions

	# of firms who answered the invoice currency share in multiple transactions	# of firms whose share of LC invoicing in multiple transaction are above 50%		# of firms whose share of LC invoicing in multiple transaction are above 90%	
India	13	2	15.4%	1	7.7%
Indonesia	52	4	7.7%	3	5.8%
Singapore	13	4	30.8%	1	7.7%
Thailand	53	23	43.4%	9	17.0%
Malaysia	40	5	12.5%	2	5.0%
Hong Kong	13	2	15.4%	1	7.7%
Taiwan	33	8	24.2%	4	12.1%
China	107	31	29.0%	23	21.5%
Total	324	79	24.4%	44	13.6%

Note: All figures are based on the RIETI Questionnaire Survey on the Choice of Invoice Currency by Japanese Overseas Subsidiaries conducted in 2018. In this questionnaire survey, overseas subsidiaries responded about their invoice currencies in each transaction of export, import, local sales, and local procurement. There are no applicable sample in Korea, Philippines and Vietnam.

In addition, the growing and deepening regional production network in Asia is likely to promote local currency transactions, especially if subsidiaries are jointly owned by local firms, have a large share of local procurement, or hold local currency borrowing. Regarding the usage of the Japanese yen, a large share of intermediate goods importing from Japan tended to use yen invoicing. These results suggest that the role of the U.S. dollar will be diminished if Asian countries advance their local production abilities and financial and capital liberalization much further. To avoid a decline in the role of the yen in Asia, Japan should increase its imports with Asia through intra-firm trade and become a more important consumer market for Asian exporters.

The use of local Asian currencies has recently become more helpful, in terms of exchange risk management for Asian overseas subsidiaries. This trend has also been enhanced by institutional movements: regulations on exchange transactions in the RMB and other local Asian currencies have been eased, and the exchange rate system has shifted to a flexible managed float regime that focuses more on markets. Furthermore, the stability of the exchange rates of Asian currencies

against the Japanese yen has helped. In this analysis, however, we mainly focused on the factors related to operational and natural hedges than financial hedges; therefore, we did not include any information on the transaction costs of each exchange rate between the U.S. dollar, Japanese yen, and Asian local currencies. Such information also plays an important role as a determinant of invoice currency. Moreover, we do not consider any information on features of trading goods, whether differentiated or not. These are left for our future analysis.

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Table 4-1. Determinants of U.S. dollar Invoicing: Import from Japan

Dependent variable:	Share of U.S. dollar Invoicing : Import from Japan				
	(1)	(2)	(3)	(4)	(5)
Log(Sales)	0.0271	-0.0199	-0.0187	0.0211	0.0303**
	(0.016)	(0.018)	(0.018)	(0.017)	(0.015)
Ownership Share by Japanese Parent Firms	0.0203	0.161	0.173	0.0429	-0.129
	(0.219)	(0.221)	(0.221)	(0.215)	(0.208)
Dummy of Discretionary Risk Management	0.00416	0.0105	0.0288	0.0186	0.0934
	(0.115)	(0.114)	(0.116)	(0.115)	(0.108)
# of Currenncy	-0.0952**	-0.0592	-0.0654	-0.102**	-0.160***
	(0.045)	(0.043)	(0.043)	(0.045)	(0.045)
Dummy of Manufacturing base	0.0309	-0.107	-0.101	0.0288	0.0164
	(0.139)	(0.143)	(0.149)	(0.136)	(0.137)
USD invoice share in export to Japan		1.276***	1.248***		
		(0.142)	(0.143)		
USD invoice share in export to other countries					
Dummy of Marry				0.103	
				(0.152)	
Dummy of Forward (hedging)				0.288**	
				(0.132)	
Dummy of Forward (funding)				0.287	
				(0.175)	
Pass-through in local sales price				-0.131	
				(0.127)	
Dummy of Borrowing in USD					0.563***
					(0.205)
Share of Overseas Procurement					0.520**
					(0.220)
Dummy of Using USD as a target currency of management					0.714***
					(0.149)
Dummy of Electric Machinery			0.119		0.146
			(0.164)		(0.162)
Dummy of Transport Equipment			-0.157		-0.563***
			(0.240)		(0.211)
Dummy of General Machinery			-0.127		0.00973
			(0.180)		(0.178)
Observations	374	266	266	363	351
Pseudo R-squared	0.0156	0.194	0.197	0.0286	0.094

Authors' calculation. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4-2. Determinants of U.S. dollar Invoicing: Import from Other Countries

Dependent variable:	Share of U.S. dollar Invoicing : Import from other countries				
	(1)	(2)	(3)	(4)	(5)
Log(Sales)	0.0381	-0.0396	-0.0376	0.026	0.0234
	(0.027)	(0.034)	(0.034)	(0.028)	(0.026)
Ownership Share by Japanese Parent Firms	0.627*	0.817**	0.821**	0.644*	0.457
	(0.351)	(0.393)	(0.392)	(0.353)	(0.347)
Dummy of Discretionary Risk Management	-0.0622	0.058	0.0411	-0.0676	0.0233
	(0.186)	(0.187)	(0.189)	(0.187)	(0.178)
# of Currenncy	-0.039	-0.000474	0.00516	-0.0443	-0.0899
	(0.073)	(0.075)	(0.075)	(0.072)	(0.073)
Dummy of Manufacturing base	-0.032	-0.293	-0.152	-0.0143	0.0832
	(0.229)	(0.252)	(0.265)	(0.229)	(0.233)
USD invoice share in export to Japan					
USD invoice share in export to other countries		1.446***	1.370***		
		(0.255)	(0.256)		
Dummy of Marry				0.227	
				(0.254)	
Dummy of Forward (hedging)				0.273	
				(0.216)	
Dummy of Forward (funding)				0.208	
				(0.306)	
Pass-through in local sales price				0.0533	
				(0.205)	
Dummy of Borrowing in USD					0.0728
					(0.339)
Share of Overseas Procurement					1.300***
					(0.358)
Dummy of Using USD as a target currency of management					0.903***
					(0.265)
Dummy of Electric Machinery			-0.23		-0.215
			(0.263)		(0.268)
Dummy of Transport Equipment			-0.357		-0.500*
			(0.347)		(0.298)
Dummy of General Machinery			-0.376		-0.152
			(0.338)		(0.295)
Observations	295	197	197	287	280
Pseudo R-squared	0.117	0.206	0.211	0.119	0.169

Authors' calculation. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4-3. Determinants of U.S. dollar Invoicing: Export to Japan

Dependent variable:	Share of U.S. dollar Invoicing : Export to Japan				
	(1)	(2)	(3)	(4)	(5)
Log(Sales)	0.0567	0.0006	0.0024	0.0464	0.0553
	(0.039)	(0.033)	(0.033)	(0.040)	(0.037)
Ownership Share by Japanese Parent Firms	0.251	-0.431	-0.426	0.211	-0.118
	(0.485)	(0.411)	(0.413)	(0.489)	(0.473)
Dummy of Discretionary Risk Management	-0.523**	-0.379*	-0.354	-0.569**	-0.355
	(0.263)	(0.219)	(0.224)	(0.267)	(0.247)
# of Currenncy	-0.106	0.0083	-0.00361	-0.116	-0.211**
	(0.102)	(0.083)	(0.083)	(0.102)	(0.102)
Dummy of Manufacturing base	-0.313	-0.19	-0.319	-0.231	-0.523
	(0.320)	(0.269)	(0.285)	(0.327)	(0.322)
USD invoice share in import from Japan		2.708***	2.695***		
		(0.379)	(0.382)		
Dummy of Marry				0.511	
				(0.348)	
Dummy of Forward (hedging)				0.287	
				(0.303)	
Dummy of Forward (funding)				-0.307	
				(0.412)	
Pass-through in exporting price				0.316	
				(0.317)	
Dummy of Borrowing in USD					1.249**
					(0.505)
Share of Overseas Procurement					1.370**
					(0.546)
Dummy of Using USD as a target currency of management					1.626***
					(0.375)
Dummy of Electric Machinery			0.345		0.332
			(0.322)		(0.354)
Dummy of Transport Equipment			-0.0103		-0.574
			(0.442)		(0.502)
Dummy of General Machinery			0.451		0.623*
			(0.350)		(0.375)
Observations	295	266	266	281	268
Pseudo R-squared	0.020	0.207	0.212	0.030	0.109

Authors' calculation. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4-4. Determinants of U.S. dollar Invoicing: Export to Other Countries

Dependent variable:	Share of U.S. dollar Invoicing : Export to other countries				
	(1)	(2)	(3)	(4)	(5)
Log(Sales)	0.0676*	0.0654	0.0594	0.0625	0.0521
	(0.041)	(0.041)	(0.040)	(0.042)	(0.042)
Ownership Share by Japanese Parent Firms	0.411	-0.6	-0.473	0.297	0.285
	(0.510)	(0.492)	(0.486)	(0.504)	(0.543)
Dummy of Discretionary Risk Management	0.184	-0.0386	-0.00667	0.158	0.208
	(0.264)	(0.245)	(0.244)	(0.265)	(0.273)
# of Currenncy	-0.223**	-0.261**	-0.247**	-0.235**	-0.237**
	(0.108)	(0.102)	(0.100)	(0.109)	(0.118)
Dummy of Manufacturing base	0.716**	0.651**	0.817**	0.718**	0.845**
	(0.343)	(0.319)	(0.337)	(0.345)	(0.374)
USD invoice share in import from other countries		1.817***	1.684***		
		(0.346)	(0.336)		
Dummy of Marry				0.459	
				(0.351)	
Dummy of Forward (hedging)				0.134	
				(0.304)	
Dummy of Forward (funding)				0.179	
				(0.430)	
Pass-through in exporting price				0.194	
				(0.331)	
Dummy of Borrowing in USD					1.433*
					(0.743)
Share of Overseas Procurement					0.553
					(0.577)
Dummy of Using USD as a target currency of management					1.256***
					(0.433)
Dummy of Electric Machinery			-0.108		-0.0282
			(0.358)		(0.417)
Dummy of Transport Equipment			-0.671		-0.8
			(0.442)		(0.489)
Dummy of General Machinery			-0.634		-0.571
			(0.429)		(0.466)
Observations	260	197	197	249	234
Pseudo R-squared	0.159	0.267	0.276	0.158	0.205

Authors' calculation. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

*** p<0.01, ** p<0.05, * p<0.1

Table 4-5. Determinants of Yen Invoicing: Import from Japan

Dependent variable:	Share of Yen Invoicing : Import from Japan				
	(1)	(2)	(3)	(4)	(5)
Log(Sales)	-0.0440**	-0.0317	-0.0307	-0.023	-0.0361
	(0.021)	(0.025)	(0.025)	(0.024)	(0.024)
Ownership Share by Japanese Parent Firms	0.371	-0.207	-0.231	0.203	0.132
	(0.267)	(0.278)	(0.274)	(0.278)	(0.283)
Dummy of Discretionary Risk Management	0.278**	0.281**	0.238*	0.262*	0.214
	(0.141)	(0.139)	(0.139)	(0.142)	(0.144)
# of Currenncy	0.198***	0.133**	0.145***	0.177***	0.186***
	(0.058)	(0.055)	(0.055)	(0.058)	(0.061)
Dummy of Manufacturing base	0.100	0.051	0.113	0.840	0.661
	(0.171)	(0.562)	(0.567)	(0.585)	(0.612)
Yen invoice share in Export to Japan		1.705***	1.663***		
		(0.196)	(0.193)		
Dummy of Marry				0.00454	
				(0.188)	
Dummy of Forward (hedging)				-0.198	
				(0.163)	
Dummy of Forward (funding)				-0.175	
				(0.222)	
Pass-through in local selling price				0.0472	
				(0.154)	
Share of Overseas Procurement from Japan					0.412*
					(0.233)
Dummy of Electric Machinery			-0.301		-0.324
			(0.208)		(0.223)
Dummy of Transport Equipment			0.199		0.600**
			(0.276)		(0.264)
Dummy of General Machinery			0.0904		0.187
			(0.211)		(0.231)
Observations	375	266	266	362	357
Pseudo R-squared	0.0557	0.236	0.242	0.062	0.0689

Authors' calculation. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4-6. Determinants of Yen Invoicing: Import from Other Countries

Dependent variable:	Share of Yen Invoicing : Import from Other Countries				
	(1)	(2)	(3)	(4)	(5)
Log(Sales)	-0.0950***	-0.0667*	-0.0616	-0.0732*	-0.0819**
	(0.036)	(0.037)	(0.037)	(0.038)	(0.038)
Ownership Share by Japanese Parent Firms	0.374	-0.294	-0.336	0.218	0.00504
	(0.413)	(0.406)	(0.408)	(0.426)	(0.422)
Dummy of Discretionary Risk Management	0.136	-0.0372	-0.0196	0.103	0.0458
	(0.214)	(0.201)	(0.202)	(0.217)	(0.219)
# of Currenncy	0.0243	0.0988	0.0867	0.0284	-0.0021
	(0.087)	(0.081)	(0.081)	(0.084)	(0.090)
Dummy of Manufacturing base	0.0855	1.198	1.336	1.153	1.068
	(0.268)	(1.255)	(1.292)	(1.068)	(1.083)
Yen invoice share in Export to other countries		1.658***	1.626***		
		(0.370)	(0.376)		
Dummy of Marry				-0.154	
				(0.295)	
Dummy of Forward (hedging)				0.257	
				(0.239)	
Dummy of Forward (funding)				-0.0754	
				(0.359)	
Pass-through in local selling price				-0.307	
				(0.238)	
Share of Overseas Procurement from Japan					0.701**
					(0.355)
Dummy of Electric Machinery			0.27		0.0991
			(0.296)		(0.326)
Dummy of Transport Equipment			0.142		0.582
			(0.360)		(0.353)
Dummy of General Machinery			0.332		0.408
			(0.329)		(0.342)
Observations	284	191	191	276	272
Pseudo R-squared	0.153	0.228	0.233	0.158	0.174

Authors' calculation. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4-7. Determinants of Yen Invoicing: Export to Japan

Dependent variable:	Share of Yen Invoicing : Export to Japan				
	(1)	(2)	(3)	(4)	(5)
Log(Sales)	-0.191***	-0.201***	-0.208***	-0.196***	-0.234***
	(0.064)	(0.058)	(0.059)	(0.067)	(0.073)
Ownership Share by Japanese Parent Firms	1.220*	0.615	0.676	0.962	1.15
	(0.718)	(0.593)	(0.599)	(0.736)	(0.783)
Dummy of Discretionary Risk Management	0.274	-0.084	-0.0218	0.436	0.275
	(0.358)	(0.294)	(0.298)	(0.376)	(0.389)
# of Currenncy	0.202	-0.001	-0.009	0.204	0.268*
	(0.144)	(0.114)	(0.115)	(0.150)	(0.158)
Dummy of Manufacturing base	0.410	0.279	0.188	0.551	0.379
	(0.458)	(0.382)	(0.402)	(0.491)	(0.517)
Yen invoice share in Import from Japan		3.292***	3.332***		
		(0.540)	(0.551)		
Yen invoice share in Import from other countries					
Dummy of Marry				0.314	
				(0.507)	
Dummy of Forward (hedging)				-0.266	
				(0.448)	
Dummy of Forward (funding)				0.303	
				(0.608)	
Pass-through in exporting price				0.265	
				(0.453)	
Share of Overseas Procurement from Japan					1.311**
					(0.627)
Dummy of Electric Machinery			0.398		-0.305
			(0.490)		(0.590)
Dummy of Transport Equipment			0.931*		1.104
			(0.555)		(0.767)
Dummy of General Machinery			-0.187		-0.0213
			(0.470)		(0.595)
Observations	297	266	266	280	273
Pseudo R-squared	0.0443	0.258	0.265	0.0509	0.0612

Authors' calculation. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4-8. Determinants of Yen Invoicing: Export to Other Countries

Dependent variable:	Share of Yen Invoicing : Export to other countries				
	(1)	(2)	(3)	(4)	(5)
Log(Sales)	-0.104**	-0.115**	-0.109**	-0.111**	-0.0985**
	(0.051)	(0.055)	(0.054)	-0.0517	-0.0496
Ownership Share by Japanese Parent Firms	0.33	0.561	0.536	0.338	-0.00925
	(0.562)	(0.591)	(0.599)	(0.561)	(0.549)
Dummy of Discretionary Risk Management	0.383	0.389	0.427	0.413	0.341
	(0.294)	(0.274)	(0.280)	(0.298)	(0.292)
# of Currenncy	-0.0302	-0.129	-0.15	-0.0563	0.00423
	(0.124)	(0.120)	(0.120)	(0.126)	(0.125)
Dummy of Manufacturing base	-0.39	-0.138	-0.377	-0.232	-0.519
	(0.357)	(0.341)	(0.367)	(0.367)	(0.379)
Yen invoice share in Import from Japan					
Yen invoice share in Import from other countries		1.663***	1.606***		
		(0.422)	(0.415)		
Dummy of Marry				-0.12	
				(0.391)	
Dummy of Forward (hedging)				0.0748	
				(0.332)	
Dummy of Forward (funding)				0.0422	
				(0.503)	
Pass-through in exporting price				0.338	
				(0.351)	
Share of Overseas Procurement from Japan					0.698
					(0.470)
Dummy of Electric Machinery			0.368		-0.212
			(0.413)		(0.468)
Dummy of Transport Equipment			0.834*		0.824*
			(0.442)		(0.495)
Dummy of General Machinery			0.503		0.498
			(0.433)		(0.478)
Observations	247	191	191	238	229
Pseudo R-squared	0.313	0.424	0.439	0.303	0.319

Authors' calculation. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4-9. Determinants of Local Currency Invoicing: Import from Japan

Dependent variable:	Share of Local Currency Invoicing : Import from Japan				
	(1)	(2)	(3)	(4)	(5)
Log(Sales)	-0.00991	-0.0141	-0.0149	-0.00709	-0.0307**
	(0.0129)	(0.0152)	(0.0152)	(0.0130)	(0.0146)
Dummy of Joint Venture with Local Firms	0.285*	0.352**	0.353**	0.312**	0.138
	(0.157)	(0.177)	(0.176)	(0.155)	(0.160)
Dummy of Discretionary Risk Management	-0.282**	-0.366**	-0.302**	-0.221*	-0.266**
	(0.131)	(0.150)	(0.150)	(0.131)	(0.132)
# of Currenncy	-0.00639	-0.0242	-0.0339	-0.0108	0.0211
	(0.0496)	(0.0542)	(0.0546)	(0.0494)	(0.0513)
Dummy of Manufacturing base	-0.196	-0.295	-0.347*	-0.199	-0.375**
	(0.152)	(0.182)	(0.191)	(0.152)	(0.165)
LC invoice share in Export to Japan		0.920***	0.930***		
		(0.176)	(0.176)		
Dummy of Marry				0.230	
				(0.174)	
Dummy of Forward (hedging)				-0.270*	
				(0.153)	
Dummy of Forward (funding)				0.226	
				(0.194)	
Pass-through in Local Sales Price				-0.144	
				(0.144)	
Dummy of Borrowing in LC					0.493***
					(0.178)
Share of Local Procurement					0.672***
					(0.206)
Dummy of Using LC as a target currency of management					0.0657
					(0.131)
Dummy of Electric Machinery			0.384*		0.255
			(0.201)		(0.189)
Dummy of Transport Equipment			0.127		0.0574
			(0.287)		(0.232)
Dummy of General Machinery			-0.116		-0.236
			(0.231)		(0.218)
Observations	362	260	260	350	343
Pseudo R-squared	0.0649	0.150	0.160	0.0746	0.0977

Authors' calculation. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4-10. Determinants of Local Currency Invoicing: Import from Other Countries

Dependent variable:	Share of Local Currency Invoicing : Import from other countries				
	(1)	(2)	(3)	(4)	(5)
Log(Sales)	-0.0967**	-0.0846*	-0.0834*	-0.0680*	-0.129***
	(0.0376)	(0.0455)	(0.0457)	(0.0365)	(0.0431)
Dummy of Joint Venture with Local Firms	0.713*	0.415	0.530	0.750*	0.376
	(0.392)	(0.482)	(0.496)	(0.388)	(0.402)
Dummy of Discretionary Risk Management	-0.275	-0.658*	-0.636	-0.111	-0.234
	(0.322)	(0.391)	(0.397)	(0.316)	(0.330)
# of Currenncy	0.0837	-0.0418	-0.0619	0.0566	0.107
	(0.124)	(0.142)	(0.143)	(0.122)	(0.133)
Dummy of Manufacturing base	-0.238	-0.110	-0.291	-0.314	-0.561
	(0.397)	(0.479)	(0.517)	(0.395)	(0.442)
LC invoice share in Export to other countries		1.712***	1.738***		
		(0.521)	(0.527)		
Dummy of Marry				0.314	
				(0.433)	
Dummy of Forward (hedging)				-1.106**	
				(0.428)	
Dummy of Forward (funding)				0.615	
				(0.489)	
Pass-through in Local Sales Price				-0.508	
				(0.362)	
Dummy of Borrowing in LC					0.978**
					(0.467)
Share of Local Procurement					0.987*
					(0.520)
Dummy of Using LC as a target currency of management					0.223
					(0.334)
Dummy of Electric Machinery			0.596		0.224
			(0.526)		(0.473)
Dummy of Transport Equipment			-0.0121		0.371
			(0.702)		(0.514)
Dummy of General Machinery			0.501		-0.263
			(0.634)		(0.583)
Observations	289	192	192	281	276
Pseudo R-squared	0.160	0.236	0.241	0.173	0.183

Authors' calculation. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4-11. Determinants of Local Currency Invoicing: Export to Japan

Dependent variable:	Share of Local Currency Invoicing : Export to Japan				
	(1)	(2)	(3)	(4)	(5)
Log(Sales)	-0.0652*	-0.0944***	-0.0965***	-0.0728*	-0.132***
	(0.0352)	(0.0361)	(0.0361)	(0.0388)	(0.0434)
Dummy of Joint Venture with Local Firms	0.600	0.101	0.0758	0.620	0.328
	(0.384)	(0.375)	(0.374)	(0.407)	(0.398)
Dummy of Discretionary Risk Management	0.156	0.351	0.292	0.184	-0.0722
	(0.306)	(0.293)	(0.299)	(0.328)	(0.319)
# of Currenncy	-0.0354	0.0142	0.0322	-5.91e-05	0.0168
	(0.116)	(0.108)	(0.107)	(0.122)	(0.120)
Dummy of Manufacturing base	-0.0487	-0.213	-0.0598	-0.0452	-0.131
	(0.396)	(0.378)	(0.395)	(0.429)	(0.421)
LC invoice share in Import from Japan		2.466***	2.500***		
		(0.508)	(0.510)		
Dummy of Marry				-0.533	
				(0.463)	
Dummy of Forward (hedging)				-0.0705	
				(0.387)	
Dummy of Forward (funding)				0.463	
				(0.514)	
Pass-through in exporting price				-0.174	
				(0.410)	
Dummy of Borrowing in LC					1.682***
					(0.492)
Share of Local Procurement					0.676
					(0.476)
Dummy of Using LC as a target currency of management					0.888**
					(0.349)
Dummy of Electric Machinery			-0.495		-0.324
			(0.455)		(0.473)
Dummy of Transport Equipment			0.107		0.560
			(0.597)		(0.639)
Dummy of General Machinery			-0.419		-0.326
			(0.469)		(0.474)
Observations	290	260	260	276	265
Pseudo R-squared	0.0753	0.162	0.166	0.0887	0.142

Authors' calculation. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 4-12. Determinants of Local Currency Invoicing: Export to Other Countries

Dependent variable:	Share of Local Currency Invoicing : Export to other countries				
	(1)	(2)	(3)	(4)	(5)
Log(Sales)	-0.174**	-0.200**	-0.197**	-0.138	-0.207**
	(0.0864)	(0.0903)	(0.0893)	(0.0906)	(0.0980)
Dummy of Joint Venture with Local Firms	-0.515	-0.376	-0.276	-0.537	-1.032
	(0.974)	(0.920)	(0.932)	(1.026)	(1.070)
Dummy of Discretionary Risk Management	-1.190	-0.372	-0.448	-1.277	-1.047
	(0.765)	(0.668)	(0.680)	(0.822)	(0.763)
# of Currenncy	0.553*	0.553*	0.548*	0.546*	0.470
	(0.298)	(0.282)	(0.279)	(0.312)	(0.301)
Dummy of Manufacturing base	-1.884*	-1.986**	-2.356**	-2.031*	-2.000*
	(0.962)	(0.924)	(1.032)	(1.037)	(1.030)
LC invoice share in Import from other countries		3.694***	3.636***		
		(1.223)	(1.210)		
Dummy of Marry				-1.816	
				(1.157)	
Dummy of Forward (hedging)				-0.542	
				(0.888)	
Dummy of Forward (funding)				-0.0943	
				(1.238)	
Pass-through in exporting price				0.106	
				(0.899)	
Dummy of Borrowing in LC					1.771
					(1.153)
Share of Local Procurement					0.902
					(1.167)
Dummy of Using LC as a target currency of management					0.228
					(0.762)
Dummy of Electric Machinery			0.264		-0.27
			(0.992)		(1.092)
Dummy of Transport Equipment			1.843		1.617
			(1.249)		(1.308)
Dummy of General Machinery			0.92		1.157
			(1.135)		(1.177)
Observations	249	192	192	240	229
Pseudo R-squared	0.224	0.278	0.287	0.227	0.245

Authors' calculation. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1