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## Protecting Subsidiaries from Exchange Rate Risk: The Role of Ownership Ratios in Invoice Currency Decisions

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# Introduction

## Introduction:

- Exchange rates greatly impact macroeconomics, notably with the current yen depreciation.
- In considering exchange rates and financial policies, the choice of invoicing currency is a primary concern.

## Currency Invoicing:

- Invoice Currency Choice  $\Rightarrow$  Impact of Exchange Rate on Price  $\Rightarrow$  Macroeconomic Conditions  
Ex. Amiti et al. 2022
- **PCP** (Producer Currency Pricing), **LCP** (Local Currency Pricing), and **VCP** (Vehicle Currency Pricing, or Dominant Currency) are the three main invoicing themes.  
Ex. Obstfeld and Rogoff 2000, Devereux and Shi 2013
- PCP suggests that the exporting side absorbs exchange rate fluctuations with minimal impact on constant export volume.

# Introduction

## Supply Chain and Invoice Currency:

- In an era of heightened economic volatility, the influence of exchange rate fluctuations—particularly through the choice of invoice currency—has a considerable impact on the structure and functioning of global supply chains.

## Key Takeaway:

- **The ownership structure of trading partners** significantly affects invoice currency choice.
  - ⇒ The share of yen-invoiced exports is 85.2% for Japanese arm's-length exports to Thailand.
  - ⇒ When ownership ratio exceeds 50%, the U.S. dollar-invoiced share increases significantly.
- **Parent companies** and **domestic subsidiaries** adopt distinct invoice currency strategies, even in intra-firm exports.

# Previous Research

## Invoice Currency with Highly Disaggregated Data:

### ➤ Goldberg and Tille 2016

1. Vehicle currencies prevalent
2. Transaction size matters
3. Exchange rate (volatility/regime/volume)
4. Exporting country market share confirmed

### ➤ Devereux et al. 2017

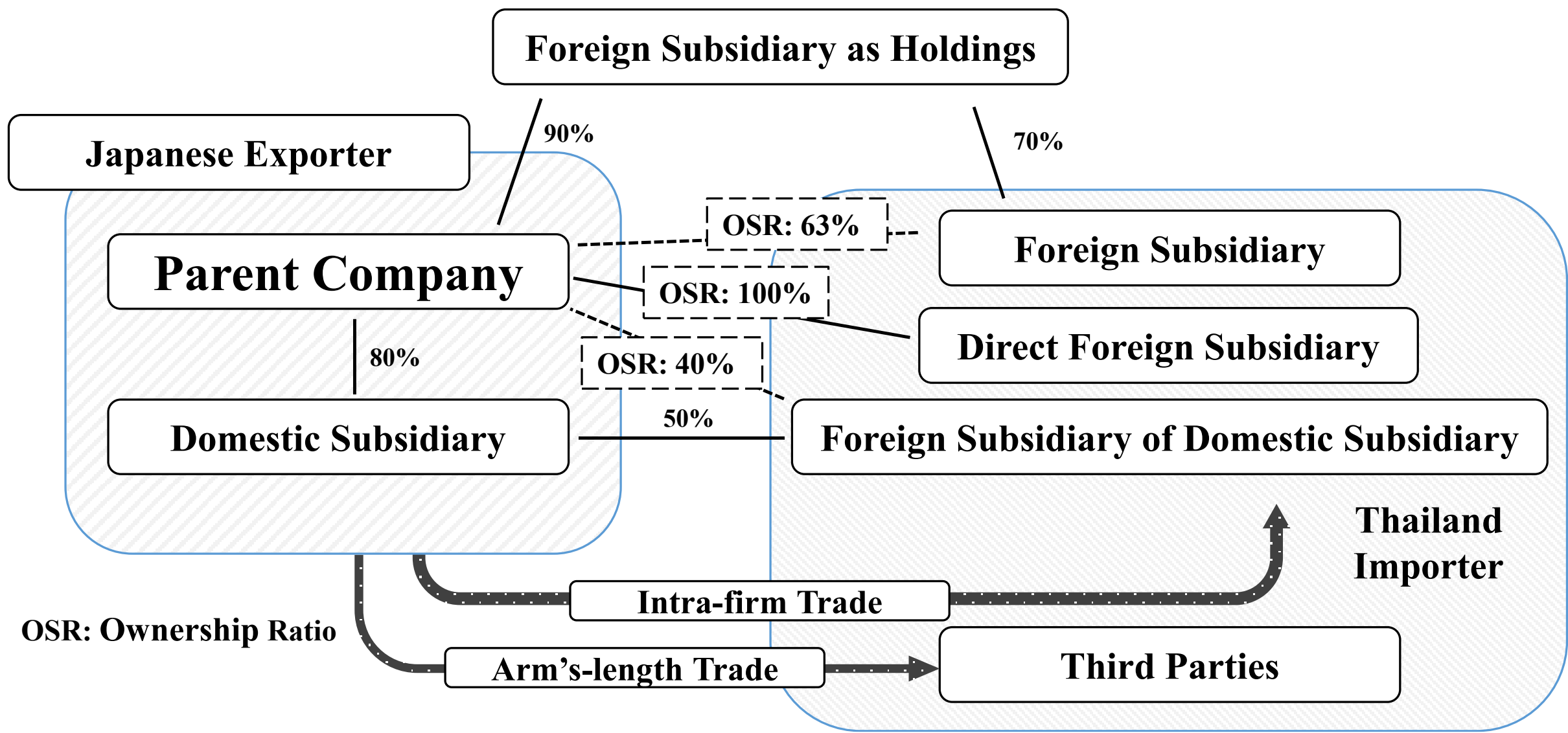
Market share impacts invoicing: Pass-through and currency choice depend on importer and exporter size in international trade.

## Intra-firm Trade and Invoice Currency Choice:

### ➤ Yoshimi et al. 2024

- Target: Exports from Japanese complete vehicle manufacturer to France
- Using customs data and fully matching whether each transaction is intra-company trade or not, it is clear that the more intra-firm trade is, the more likely they are to choose Local Currency (EUR).

# Ownership Structure and Trade Relationship



# Data: Export Transaction Data from Japan Customs

## Utilization of Administrative Data:

- From 2022, The Ministry of Finance has launched a joint research using administrative data (import/export declaration data)
- Data Range: 2014-2019
- Constructed database detailing ownership and capital ties between exporters and importers, enabling precise measurement of capital relationships in Japanese automobile exports to Thailand.

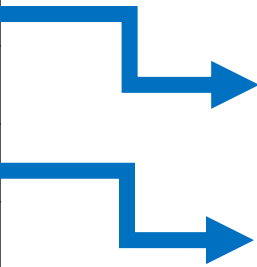
# How to Identify Intra-firm Trade

## Custom Data

Exporter	Importer	Importer's address
A社	A France社	XXX Montreuil
A社	C社	〇〇〇
A社	A Sales社	XXX Paris
B社	D社	〇〇〇

## Overseas Subsidiary Data

Parents	Subsidiary	Subsid. address
A社	A Holdings社	△△△ Paris
A社	A France社	XXX Montreuil
A社	Paris A Tradings社	〇〇〇
A Holdings社	A Sales社	XXX Paris



### 【Procedure】

1. Machine Matching in Python
2. Manual Matching of all target transactions

### 【Reasons why Manual Matching】

The method of describing the name of the supplier, etc. is not consistent, and there are fluctuations.(e.g.) Abbreviated names of overseas subsidiaries are used instead of official names.



## Example of Constructed Data

Exporter	Importer	Importer's address	Intra-firm Identification	Intra-firm 1	Intra-firm 2	Intra-firm 3	Intra-firm 4
A社	A France社	XXX Montreuil	Sub-1 Firm	Yes	Yes	Yes	Yes
A社	A Sales社	XXX Paris	Sub-2 Firm	Yes	Yes	Yes	Yes
A社	E社	〇〇〇	Arm's-length Trade	No	No	No	No

# Japanese Exports to Thailand and Invoice Currency

## Exports to Thailand and Invoice Currency:

➤ The yen-invoiced exports account for 41.6% of Japanese total exports. (Shimizu et al. 2024)

➤ Japanese exports of complete car manufacturers by 74 companies, the yen-invoiced share declines to 27.1%

	Transaction		
	JPY	USD	THB
<u>Exports by 74 firms</u>	<b>27.1%</b>	<b>57.3%</b>	<b>15.6%</b>
<u>Intra-firm Export</u>	<b>26.2%</b>	<b>58.1%</b>	<b>15.7%</b>
OSR: 0-25%	-	-	-
OSR: 25-50%	<b>67.0%</b>	<b>0.5%</b>	<b>32.5%</b>
OSR: 50-75%	<b>18.8%</b>	<b>78.8%</b>	<b>2.4%</b>
OSR: 75-100%	<b>20.1%</b>	<b>65.0%</b>	<b>14.9%</b>
<u>Arm's-length Export</u>	<b>85.2%</b>	<b>6.0%</b>	<b>8.6%</b>
JPN Affl.	<b>90.8%</b>	<b>5.6%</b>	<b>3.6%</b>
THA Affl.	<b>94.0%</b>	<b>4.9%</b>	<b>0.9%</b>

# Trade Channel and Invoice Currency

## Trade Structure and Invoice Currency:

- **Parent companies:** **59.1%** of intra-firm exports are invoiced in the **U.S. dollars**, while **95.9%** of arm's-length exports are **invoiced in yen**.
- **Domestic subsidiaries:** **49.8%** of intra-firm exports are **invoiced in yen**, while the yen-invoiced share is **68.8%** in arm's-length exports

	Transaction		
	JPY	USD	THB
parent-intra	24.2%	59.1%	16.7%
parent-arms	95.9%	1.3%	2.5%
subsid-intra	49.8%	46.2%	4.0%
subsid-arms	68.8%	13.2%	17.9%

The OSR significantly affects the choice of invoice currency in intra-firm trade.

# Methodology

$$y_{i,p,k} = a + bOSR_{i,p} + e_i + e_p + e_s + e_t + \varepsilon_{i,p,k}$$

## Fixed Effect Model:

$i$ : firm,  $p$ : product group(HS6),  $k$ : transaction

$y_{i,p,k}$  : the invoice currency dummy a value of one for transactions invoiced in the Japanese yen or the U.S. dollar and zero otherwise.

$OSR_{i,p}$  : the ownership ratio given as a time-invariant value to each company and its trade partner.

$e_i, e_p, e_s, e_t$ : firm, partner firm, product (HS six-digit) and year FEs,

## Expected Result:

Yen-Invoice	U.S. Dollar-Invoice
$b$ : negative	$b$ : positive

# Explanatory Variables

- ***IIS*** : Share of Invoice Currency in Imports
- ***MS***: Market Share
- ***Partner Import Amounts (Transaction)***: the value and numbers of imports from trading partner firms
- ***Unit Price***: the gross weight unit value
- ***Core Product Ratio***: the ratio of the firm *i*'s exports of product *s* (numerator) to its total exports (denominator)
- ***Volatility & Nominal ER***: the annual average nominal exchange rate levels for JPY/USD and JPY/THB to represent exchange rate levels, and their volatilities.

# Baseline Result

Dep.	(1) JPY	(2) JPY	(3) JPY	(4) JPY	(5) JPY	(6) JPY	(7) JPY	(8) JPY
<i>Ownership</i>	-0.552** (0.090)	-0.287* (0.123)	-0.283* (0.123)	-0.264* (0.122)	-0.735* (0.294)	-0.285* (0.122)	-0.247# (0.130)	-0.238# (0.132)
<i>Import Invoice Share</i>		-0.195** (0.009)	-0.191** (0.008)	-0.190** (0.008)	-0.218** (0.010)	-0.208** (0.009)	-0.008 (0.007)	0.077** (0.007)
<i>Market Share</i>		-0.004** (0.000)	-0.004** (0.000)	-0.004** (0.000)	0.002** (0.000)	-0.044** (0.001)	-0.002** (0.000)	-0.002** (0.000)
<i>Partner Import Amount</i>			0.005** (0.001)					
<i>Partner Import Transaction</i>				0.034** (0.001)				
<i>Unit Value</i>					0.011** (0.000)			
<i>Core Product Ratio</i>						0.041** (0.001)		
<i>Volatility</i>							0.029** (0.000)	
<i>JPY/USD</i>								-0.086** (0.006)
Observations	966,948	925,134	925,134	925,134	852,400	925,134	925,134	925,134
R-squared	0.675	0.680	0.680	0.680	0.684	0.680	0.668	0.667
HS6FE	YES	YES	YES	YES	YES	YES	YES	YES
YearFE	YES	YES	YES	YES	YES	YES	NO	NO
FirmFE	YES	YES	YES	YES	YES	YES	YES	YES
PartnerFE	YES	YES	YES	YES	YES	YES	YES	YES

## OSR and JPY Invoice Currency:

### ➤ *Ownership Ratio*

Negative and significant

The higher the ownership ratio, the more likely avoid yen-denominated transactions ⇒ parent companies prioritize **protecting their subsidiaries from foreign exchange risk**

### ➤ *IIS (Import Invoice Share)*

Negative and significant

Methods such as currency hedging and netting, which reduce the cost of exporting in dollars.

### ➤ *MS (Market Share)*

Negative and significant

likely as a strategy to maintain the market share

# Baseline Result

Dep.	(9) USD	(10) USD	(11) USD	(12) USD	(13) USD	(14) USD	(15) USD	(16) USD
<i>Ownership</i>	1.029** (0.076)	1.040** (0.110)	1.041** (0.110)	1.036** (0.110)	0.777* (0.334)	1.040** (0.110)	1.039** (0.110)	1.038** (0.110)
<i>Import Invoice Share</i>		0.004 (0.004)	0.006 (0.004)	0.003 (0.004)	0.016** (0.003)	0.005 (0.004)	0.004 (0.003)	-0.003 (0.003)
<i>Market Share</i>		0.002** (0.000)	0.002** (0.000)	0.002** (0.000)	-0.003** (0.000)	0.003** (0.001)	0.002** (0.000)	0.002** (0.000)
<i>Partner Import Amount</i>			0.002** (0.000)					
<i>Partner Import Transaction</i>				-0.006** (0.000)				
<i>Unit Value</i>					-0.008** (0.000)			
<i>Core Product Ratio</i>						-0.002* (0.001)		
<i>Volatility</i>							0.000 (0.000)	
<i>JPY/USD</i>								0.026** (0.003)
Observations	966,948	925,134	925,134	925,134	852,400	925,134	925,134	925,134
R-squared	0.942	0.955	0.955	0.955	0.971	0.955	0.955	0.955
HS6FE	YES	YES	YES	YES	YES	YES	YES	YES
YearFE	YES	YES	YES	YES	YES	YES	NO	NO
FirmFE	YES	YES	YES	YES	YES	YES	YES	YES
PartnerFE	YES	YES	YES	YES	YES	YES	YES	YES

## OSR and USD Invoice Currency:

### ➤ *Ownership Ratio*

**Positive and significant**

The higher the ownership ratio, the more likely select USD-denominated transactions

⇒ parent companies prioritize **protecting their subsidiaries from foreign exchange risk**

### ➤ *IIS (Import Invoice Share)*

**Positive and not significant**

### ➤ *MS (Market Share)*

**Positive and significant (almost)**

a tendency to favor dollar-denominated trade and maintain local prices as a strategy to preserve market share

# Empirical Result -Parent vs Subsidiaries-

## Trade structure and Invoice Currency

==Japanese Yen Invoicing==

### 【Parent Companies】

#### ➤ *Ownership Ratio*

Negative and significant

⇒ parent companies prioritize **protecting their subsidiaries from foreign exchange risk**

### 【Domestic subsidiaries】

#### ➤ *Ownership Ratio*

Positive and significant

⇒ **lack the capacity to hedge against foreign exchange risk effectively**

VARIABLES	(1) JPY	(2) JPY	(3) JPY	(4) JPY	(5) USD	(6) USD	(7) USD	(8) USD
<i>Ownership</i>	-0.279# (0.161)	-0.308# (0.185)	0.854* (0.427)	1.257** (0.051)	1.289** (0.113)	1.353** (0.118)	-0.462 (0.410)	-1.319** (0.046)
<i>Import Invoice Share</i>		-0.568** (0.015)		0.027** (0.009)		0.033** (0.003)		-0.026** (0.007)
<i>Market Share</i>		0.003** (0.000)		-0.013** (0.001)		-0.005** (0.000)		0.009** (0.001)
Observations	886,699	854,386	80,062	70,582	886,699	854,386	80,062	70,582
R-squared	0.644	0.649	0.901	0.940	0.946	0.957	0.924	0.955
HS6FE	YES	YES	YES	YES	YES	YES	YES	YES
YearFE	YES	YES	YES	YES	YES	YES	YES	YES
FirmFE	YES	YES	YES	YES	YES	YES	YES	YES
PartnerFE	YES	YES	YES	YES	YES	YES	YES	YES
Sub Sample	Parent	Parent	Subsid.	Subsid.	Parent	Parent	Subsid.	Subsid.

# Main Findings and Contribution

## Main Findings:

### ➤ **OSR is Pivotal in Shaping Invoice Currency Strategies**

Higher OSR leads exporters to favor dollar invoicing over yen when ownership ties with importers are strong.

⇒ Manage exchange rate risks effectively

### ➤ **Invoicing Strategies between Parent Companies and their Domestic Subsidiaries**

[Parent Companies]OSR: Negative and Significant

Parent companies, having **more resources and centralized risk management capabilities**, tend to use foreign currency invoicing to protect their overseas subsidiaries from the impacts of exchange rate volatility.

[Domestic Subsidiaries]OSR: Positive and Significant

Domestic subsidiaries, constrained by **their limited capacity to tolerate exchange rate risks**, exhibit a pronounced preference for invoicing in producer currency, the Japanese yen.

# References

- Amiti, Mary, Oleg Itskhoki, and Jozef Konings, 2022. “Dominant Currencies: How Firms Choose Currency Invoicing and Why It Matters” *Quarterly Journal of Economics*, 137(3), 1435–1493.
- Devereux, M. B., & Shi, S. 2013. “VEHICLE CURRENCY” *International Economic Review*, 54(1), 97–133.
- Devereux, Michael B., Wei Dong, and Ben Tomlin, 2017. “Importers and Exporters in Exchange Rate Pass-Through and Currency Invoicing,” *Journal of International Economics*, 105, pp.187–204.
- Goldberg, Linda S., and Cedric Tille, 2016. “Micro, Macro, and Strategic Forces in International Trade Invoicing: Synthesis and Novel Patterns,” *Journal of International Economics*, 102, 173–187.
- Obstfeld, Maurice, and Kenneth Rogoff, 2000. “New Directions for Stochastic Open Economy Models” *Journal of International Economics*, 50(1), 117–153.
- Shimizu, Junko, Kiyotaka Sato, Takatoshi Ito, Yushi Yoshida, Taiyo Yoshimi, Uraku Yoshimoto, 2024. “Invoice Currency Choice and its Determinants in Japanese Trade: New Evidence from Japanese Customs Data ,” PRI Discussion Paper Series (No.24A-02)
- Yoshimi, Taiyo, Uraku Yoshimoto, Kiyotaka Sato, Takatoshi Ito, Junko Shimizu, Yushi Yoshida, 2024. “Invoice Currency Choice in Intra-Firm Trade: A Transaction-Level Analysis of Japanese Automobile Exports,” NBER Working Paper 32142.

# Appendix Tables

VARIABLES	(1) JPY	(2) JPY	(3) JPY	(4) JPY	(5) JPY	(6) JPY	(7) JPY	(8) JPY	(9) JPY	(10) JPY	(11) JPY	(12) JPY
<i>Ownership</i>	-0.279# (0.161)	-0.308# (0.185)	-0.303 (0.185)	-0.289 (0.185)	-0.286 (0.195)	-0.280 (0.199)	0.854* (0.427)	1.257** (0.051)	1.221** (0.049)	1.253** (0.052)	1.253** (0.052)	1.253** (0.052)
<i>Import Invoice Share</i>		-0.568** (0.015)	-0.557** (0.015)	-0.553** (0.014)	-0.046** (0.010)	0.125** (0.011)		0.027** (0.009)	0.036** (0.009)	0.031** (0.009)	0.031** (0.009)	0.030** (0.009)
<i>Market Share</i>		0.003** (0.000)	0.003** (0.000)	0.002** (0.000)	0.005** (0.001)	0.005** (0.001)		-0.013** (0.001)	-0.012** (0.001)	-0.013** (0.001)	-0.013** (0.001)	-0.013** (0.001)
<i>Partner Import Amount</i>			0.006** (0.001)						-0.024** (0.003)			
<i>Partner Import Transaction</i>				0.039** (0.001)						-0.015** (0.004)		
<i>Volatility</i>					0.032** (0.001)						-0.000 (0.001)	
<i>JPY/USD</i>						-0.097** (0.007)						0.018 (0.012)
Observations	886,699	854,386	854,386	854,386	854,386	854,386	80,062	70,582	70,582	70,582	70,582	70,582
R-squared	0.644	0.649	0.649	0.649	0.634	0.632	0.901	0.940	0.940	0.940	0.940	0.940
HS6FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
YearFE	YES	YES	YES	YES	NO	NO	YES	YES	YES	YES	NO	NO
FirmFE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
PartnerFE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Target	Parent	Parent	Parent	Parent	Parent	Parent	Subsid.	Subsid.	Subsid.	Subsid.	Subsid.	Subsid.

# Appendix Tables

VARIABLES	(1) USD	(2) USD	(3) USD	(4) USD	(5) USD	(6) USD	(7) USD	(8) USD	(9) USD	(10) USD	(11) USD	(12) USD
<i>Ownership</i>	1.289** (0.113)	1.353** (0.118)	1.352** (0.118)	1.350** (0.118)	1.351** (0.118)	1.352** (0.118)	-0.462 (0.410)	-1.319** (0.046)	-1.282** (0.046)	-1.314** (0.046)	-1.315** (0.046)	-1.315** (0.046)
<i>Import Invoice Share</i>		0.033** (0.003)	0.031** (0.004)	0.031** (0.003)	0.021** (0.003)	0.010** (0.003)		-0.026** (0.007)	-0.036** (0.007)	-0.030** (0.007)	-0.030** (0.007)	-0.030** (0.007)
<i>Market Share</i>		-0.005** (0.000)	-0.005** (0.000)	-0.005** (0.000)	-0.005** (0.000)	-0.005** (0.000)		0.009** (0.001)	0.009** (0.001)	0.009** (0.001)	0.009** (0.001)	0.009** (0.001)
<i>Partner Import Amount</i>			-0.001** (0.000)						0.024** (0.002)			
<i>Partner Import Transaction</i>				-0.006** (0.000)						0.016** (0.003)		
<i>Volatility</i>					-0.000 (0.000)						0.001 (0.001)	
<i>JPY/USD</i>						0.026** (0.003)						-0.022* (0.010)
Observations	886,699	854,386	854,386	854,386	854,386	854,386	80,062	70,582	70,582	70,582	70,582	70,582
R-squared	0.946	0.957	0.957	0.957	0.957	0.957	0.924	0.955	0.956	0.956	0.955	0.955
HS6FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
YearFE	YES	YES	YES	YES	NO	NO	YES	YES	YES	YES	NO	NO
FirmFE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
PartnerFE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Target	Parent	Parent	Parent	Parent	Parent	Parent	Subsid.	Subsid.	Subsid.	Subsid.	Subsid.	Subsid.

# Appendix Tables

	All			Parent Firms			Subsidiary Firms			Arm's-length trade			0 <OSR <=50			50 <OSR <=100		
	Obs	Mean	S.D.	Obs	Mean	S.D.	Obs	Mean	S.D.	Obs	Mean	S.D.	Obs	Mean	S.D.	Obs	Mean	S.D.
<i>JPY invoice</i>	1,092,193	0.267	0.443	1,001,976	0.246	0.430	90,217	0.511	0.500	16,711	0.857	0.351	145,066	0.677	0.468	930,416	0.193	0.395
<i>USD invoice</i>	1,092,193	0.569	0.495	1,001,976	0.581	0.493	90,217	0.437	0.496	16,711	0.057	0.232	145,066	0.005	0.071	930,416	0.666	0.472
<i>THB invoice</i>	1,092,193	0.163	0.370	1,001,976	0.173	0.379	90,217	0.052	0.222	16,711	0.087	0.281	145,066	0.318	0.466	930,416	0.141	0.348
<i>Ownership</i>	1,092,193	0.595	0.126	1,001,976	0.601	0.117	90,217	0.528	0.187	16,711	0.000	0.000	145,066	0.378	0.046	930,416	0.640	0.050
<i>Import Invoice Share (USD)</i>	1,092,193	-0.741	0.419	1,001,976	-0.728	0.327	90,217	-0.891	0.959	16,711	-0.935	1.075	145,066	-0.749	0.220	930,416	-0.737	0.421
<i>Import Invoice Share (THB)</i>	1,092,193	-6.656	3.147	1,001,976	-6.853	3.134	90,217	-4.470	2.368	16,711	-3.313	2.805	145,066	-3.689	2.755	930,416	-7.179	2.907
<i>Market Share</i>	1,092,193	-1.918	1.417	1,001,976	-1.847	1.224	90,217	-2.697	2.647	16,711	-2.667	2.661	145,066	-2.360	1.546	930,416	-1.835	1.345
<i>Partner Import Amount</i>	1,092,193	23.716	1.657	1,001,976	23.943	1.418	90,217	21.202	2.012	16,711	18.102	2.424	145,066	23.139	1.584	930,416	23.907	1.440
<i>Partner Import Transaction</i>	1,092,193	8.962	1.326	1,001,976	9.177	1.073	90,217	6.568	1.496	16,711	4.257	1.678	145,066	8.480	1.123	930,416	9.121	1.165
<i>Unit Value</i>	1,092,193	3.439	2.103	1,001,976	3.465	2.031	90,217	3.146	2.764	16,711	2.416	3.179	145,066	3.296	2.255	930,416	3.479	2.048
<i>Core Product Ratio</i>	1,092,193	-5.503	2.196	1,001,976	-5.617	2.117	90,217	-4.226	2.618	16,711	-3.888	3.164	145,066	-5.654	2.303	930,416	-5.508	2.146
<i>Volatility (USD)</i>	1,092,193	0.915	0.575	1,001,976	0.915	0.575	90,217	0.925	0.577	16,711	0.921	0.577	145,066	0.922	0.598	930,416	0.914	0.572
<i>Volatility (THB)</i>	1,092,193	0.028	0.014	1,001,976	0.028	0.014	90,217	0.028	0.015	16,711	0.028	0.015	145,066	0.028	0.015	930,416	0.028	0.014
<i>JPY/USD</i>	1,092,193	4.706	0.041	1,001,976	4.706	0.041	90,217	4.706	0.042	16,711	4.709	0.045	145,066	4.704	0.037	930,416	4.706	0.042
<i>JPY/THB</i>	1,092,193	1.211	0.045	1,001,976	1.211	0.045	90,217	1.211	0.045	16,711	1.213	0.045	145,066	1.212	0.045	930,416	1.211	0.045