

International Market Penetration by Japanese Affiliates via exporting from ASEAN4 and China

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Abstract. Bayesian analysis is used to perform the probability estimation to examine the Japanese affiliates' market penetration by exporting from ASEAN4 (i.e. Indonesia, Malaysia, Philippines and Thailand) and China. The estimation is conducted for 13 manufacturing sub-sectors in 2001-2005 and 2006-2010. This study found that Japanese affiliates not only benefited from low cost production and low trade barriers but also seized the advantage of internalized global production network within ASEAN4 and China to export their goods. Production networking could have both favorable and adverse effects on exports of Japanese affiliates.

Keywords: Foreign direct investment, Exports, Fragmentation, Outsourcing, Bayesian.

1. Introduction

Japan has deeply committed herself to ASEAN4 (i.e. Indonesia, Malaysia, Philippines and Thailand) and China in foreign direct investment (FDI), trade and economic cooperation. The statistics from the Ministry of Economy, Trade and Industry (METI) reported that the amount of Japanese affiliates' acquisition of tangible assets (excluding land) has grown from 330 billion yen in 2001 to 440 billion yen in 2005, then dropped to 372 billion yen in 2009 for ASEAN4. However, this amount has increased by 1.28% from 2001 to 2005 and amounted to 392 billion yen in 2009 for China. The share of exports sales to total sales of Japanese affiliates in ASEAN4 and China for manufacturing industry has decreased from 36.5% in 2001 to 27.48% in 2009 for ASEAN4, and from 30.87% in 2001 to 15.48% in 2009 for China.

The rise of China has attracted the Japanese affiliates to shift their production base from ASEAN4 to China. This led to the purpose of this study, which is the analysis of manufacturing exports of Japanese affiliates in ASEAN4 and China from 2001 to 2010. Ultimately, this study examines the international market penetration of Japanese affiliates using ASEAN4 and China as export platforms. This paper performs the probabilistic estimations based on a modified ratio of export sales to investment for 13 manufacturing sub-sectors using Bayesian Network (BN) analysis. The estimation incorporates the effects of unobserved factors on exports and can be used to gauge the Japanese affiliates' degree of international market penetration by exporting from ASEAN4 and China to the rest of the world (except Japan) and shed some light on Japanese production networks. The diagnostic results in the form of probability values can be used directly for short-term planning and decision making.

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Section 2 presents the conceptual framework and methodology. Section 3 provides the evaluation framework based on the estimated probability. Results are discussed in Section 4 followed by concluding remarks in Section 5.

2. Conceptual Framework and Methodology

Due to the lack of disaggregated data, it is not feasible to employ regression models for this study. Therefore, this study performs a probabilistic estimation based on the modified ratio of exports to investment.

As the share of investment varies across sub-sectors, it is important to normalize the ratio of exports to investments as follows:

$$r_j = (x_j/i_j) / (X/I), \quad j = \text{number of manufacturing sub-sectors} \quad (1)$$

where r_j is the ratio of Japanese affiliates' exports on investment for the respective manufacturing sub-sector to Japanese affiliates' total exports on investment of manufacturing industry. r_j exceeding unity indicates positive induced increment resulting from the initial investment, positive direction of acceleration effects and low substitution for exported goods, and vice versa.

The Bayes theorem of joint probability distribution for the Japanese affiliates' export for each industry is expressed as follows:

$$p(x_j | r_j, e) = [p(r_j | x_j, e) p(x_j, e)] / p(r_j, e) \quad (2)$$

The $p(x_j | r_j, e)$ denotes the posterior probability of x_j resulted from r_j , given unobserved e . The $p(r_j | x_j, e)$ denotes the likelihood of r_j given the true value of x_j and e ; $p(x_j, e)$ denotes the prior probability of x_j , given e which accommodate for the effects of unobserved parameters; $p(r_j, e)$ denotes the expected evidence of r_j given e . This study estimates Eq. (2) for the above average exports given r_j is greater than unity

Japanese FDI is commonly in the form of mergers and acquisition, and joint venture [1],[2]. Mergers and acquisition is the most important FDI strategy for Japan in global competition arena (Park, 2003). Therefore, the investment variable in Eq. (1) denotes the Japanese affiliate's acquisition of tangible asset (excluding land). The analysis is conducted for 2001-2005 and 2006-2010 based on the quarterly data collected from METI.

3. Evaluation Framework

Production network has been an important segment of international trade literature. Table 1 presents the framework to evaluate the degree of market penetration by taking into account production networks.

Table 1: Evaluation Framework

Item	Range of estimated probability value	
	0 to 0.495	0.5 to 1.0
Indication	←	→
	Decrease significantly	Increase significantly
Degree of market penetration	Decreasing	Increasing
Gain from low cost production, low trade barriers. Difference in factors of endowments	Decreasing	Increasing
Managerial controllability by the Japanese on fragmentation production and the agglomeration effects	Decreasing	Increasing
Cost of service link	Increasing	Decreasing
Technology gap	Decreasing	Increasing
Value added products	Decreasing	Increasing
Intra-industry trade (IIT)	Increasing in horizontal	Increasing in outsourcing
		Increasing vertical IIT

Product fragmentation	IIT activities Reducing horizontal IIT in Intermediate Goods	Increasing in fragmentation activities.
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Notes : Theoretical and recent empirical supports as per [3], [4], [5],[6], [7], [8].

4. Results and Discussion

Japan has historically invested in ASEAN4. The increase of Japanese affiliates' acquisition in China is to balance up Japanese investment in East Asia. To facilitate analysis, we have grouped the manufacturing sub-sectors in accordance to their probability value and the change of values over time in line with the evaluation framework in Table 1. The four identified groupings (Table 2) based on the probability analysis results in Table 3 to and their characteristics are as discussed below:

Table 2: Industry Groupings for Japanese Affiliates in ASEAN4 and China

High Penetration Fragmented Industry	ASEAN4	Lumber, pulp, paper and paper products, Iron and steel, Non-ferrous metals, Electrical machinery.
	China	Lumber, pulp, paper and paper products, Iron and steel, General-purpose, production and business oriented machinery, Electrical machinery.
Competitive Industry	ASEAN4	Food & tobacco, Chemicals, Ceramic, stone and clay products.
	China	Non-ferrous metals.
Low Value Added Fragmented Industry	ASEAN4	Nil.
	China	Miscellaneous manufacturing industries
Low Penetration Industry	ASEAN4	Transportation equipment, Fabricated metal products, Textiles, General-purpose, production and business oriented machinery, Miscellaneous manufacturing industries
	China	Transportation equipment, Fabricated metal products, Textiles, Food & tobacco, Chemicals, Ceramic, stone and clay products.

4.1 High Penetration Fragmented Industry

This group of industries will have increasing estimated probability value within the range of 0.5 to 1.0. The results for this grouping indicate that Japanese affiliates have high degree of market penetration by exporting from ASEAN4 and China. Besides comparative advantage, product fragmentation, reducing service link cost, managerial control and high value added products are important factors to strengthen Japanese affiliates' market penetration [3], [9], [1]. This also reflects Japan as a global player and technology leader. It is significant to note the presence of the electrical machinery industry under this grouping for China and ASEAN and the absence of general-purpose, production and business oriented machinery in ASEAN4.

4.2 Competitive Industry

The estimated probability values of these industries are increasing from 0.0-0.499 to 0.5-1.0. Japanese affiliates' exported goods are more competing with the domestic exported goods for these industries in ASEAN4. The degree of market penetration through exports by Japanese affiliates remains rather high due to the efficiency in resource utilization.

4.3 Low Value Added Fragmented Industry

This group of industries has decreasing estimated probability value from 0.5-1.0 to 0.0-0.499. These industries are relatively exposed to external demand shock [10] resulted from the 2007 global crises. This reveals that product fragmentation with limited value added products, relative high local content requirement and the failure of technology commercialization in local markets have adversely affected exports from Japanese affiliates. The industries identified in this grouping are mainly industries more suited for domestic consumption.

4.4 Low Penetration Industry

Industries with estimated probability value within the range of 0.00 to 0.499 from 2001-2005 to 2006-2010. These industries have low degree of market penetration via exporting from both ASEAN4 and China.

The traded goods could be for outsourcing purpose where comparative advantage, technology, managerial control and value added influences are minimal [6], [8].

This is not surprising as these industries have not much specialized or proprietary technology is involved. With the availability of specialized equipment, design software and specialized skills, this industry will slowly fade out of Japanese hands into domestic producers.

Table 3: Results of Probability Analysis for 2001-2005 to 2006-2010

Industry	Mean	Standard Deviation	MC Error	2.5% quantiles of posterior distribution	Median	97.5% quantiles of posterior distribution
Food & tobacco	0.066	0.063	0.0019	0.0016	0.049	0.243
	0.598	0.148	0.0049	0.303	0.606	0.812
	<i>0.113</i>	<i>0.103</i>	<i>0.003</i>	<i>0.003</i>	<i>0.083</i>	<i>0.374</i>
Textiles	0.173	0.105	0.0035	0.026	0.155	0.424
	0.380	0.125	0.0037	0.156	0.380	0.634
	<i>0.087</i>	<i>0.079</i>	<i>0.003</i>	<i>0.002</i>	<i>0.063</i>	<i>0.291</i>
Lumber, pulp, paper and paper products	NA	NA	NA	NA	NA	NA
	0.631	0.160	0.004	0.305	0.645	0.895
	<i>NA</i>	<i>NA</i>	<i>NA</i>	<i>NA</i>	<i>NA</i>	<i>NA</i>
Chemicals	0.448	0.162	0.0051	0.160	0.449	0.752
	0.914	0.079	0.0021	0.715	0.937	0.997
	<i>0.116</i>	<i>0.101</i>	<i>0.004</i>	<i>0.003</i>	<i>0.087</i>	<i>0.356</i>
Ceramic, stone and clay products	0.693	0.122	0.004	0.435	0.701	0.896
	0.336	0.134	0.003	0.109	0.322	0.620
	<i>0.303</i>	<i>0.143</i>	<i>0.004</i>	<i>0.080</i>	<i>0.289</i>	<i>0.612</i>
Iron and steel	NA	NA	NA	NA	NA	NA
	0.663	0.136	0.005	0.390	0.670	0.895
	<i>NA</i>	<i>NA</i>	<i>NA</i>	<i>NA</i>	<i>NA</i>	<i>NA</i>
Non-ferrous metals	0.699	0.134	0.005	0.42	0.710	0.923
	0.922	0.074	0.003	0.743	0.944	0.998
	<i>0.399</i>	<i>0.147</i>	<i>0.005</i>	<i>0.144</i>	<i>0.395</i>	<i>0.718</i>
Fabricated metal products	0.218	0.130	0.004	0.035	0.194	0.535
	0.071	0.069	0.002	0.001	0.053	0.264
	<i>0.112</i>	<i>0.101</i>	<i>0.003</i>	<i>0.003</i>	<i>0.081</i>	<i>0.369</i>
General-purpose, production and business oriented machinery	0.234	0.120	0.004	0.056	0.221	0.526
	0.109	0.094	0.003	0.003	0.085	0.347
	<i>0.908</i>	<i>0.082</i>	<i>0.002</i>	<i>0.690</i>	<i>0.928</i>	<i>0.998</i>
Electrical machinery	0.913	0.080	0.002	0.699	0.935	0.997
	0.910	0.079	0.002	0.708	0.932	0.998
	<i>0.898</i>	<i>0.092</i>	<i>0.003</i>	<i>0.665</i>	<i>0.923</i>	<i>0.998</i>
Transportation equipment	0.113	0.096	0.003	0.004	0.089	0.369
	0.414	0.137	0.005	0.165	0.414	0.688
	<i>0.078</i>	<i>0.067</i>	<i>0.002</i>	<i>0.003</i>	<i>0.062</i>	<i>0.249</i>
Miscellaneous manufacturing industries	0.163	0.137	0.004	0.005	0.130	0.515
	0.215	0.104	0.003	0.053	0.201	0.451

	<i>0.750</i>	<i>0.121</i>	<i>0.003</i>	<i>0.471</i>	<i>0.763</i>	<i>0.937</i>
	0.165	0.100	0.003	0.026	0.145	0.410

Notes: Estimations for 2006-2010 are in bold. NA denotes unavailability of data. Estimation results for Japanese affiliates export penetration via China are in italics.

Overall, ASEAN4 and China could serve as important export platforms for Japanese affiliates to penetrate the international market. The estimated probability which greater than 0.5 shows that Japanese affiliates have benefited from the comparative advantage and low trade barriers in ASEAN4 and China to penetrate international market by exports. The results show that the expansion of Japanese affiliates' acquisition in China has not affected the Japanese affiliates' exports in ASEAN4 as the increased estimated probability on one side has not offset on the other side (refer Tables 3). However, direct exports could be the alternative market penetration strategy for the third and fourth group of the above mentioned industries.

5. Conclusions

ASEAN4 and China are important destinations for Japanese FDI and exports, particularly for the first and second group of industries. Although product fragmentation gives advantage in promoting the Japanese affiliates' exports for these industries, it has also adversely affected the Japanese exported goods for the third group of industry. The adverse effect could be due to relatively high local content and limited value added products of the exported goods. Japanese affiliates should constantly refine the market demand in ASEAN4 and China to increase their exports. Japanese affiliates should focus on industries that are more dynamic and lucrative and where both domestic producers of China and ASEAN4 do not comparative advantage in.

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