The Asian Journal of Shipping and Logistics • Volume 31 Number 3 September 2015 pp. 405-427 •

Japanese Forwarders' Local Import Hub in Asia: 3PL Power and Environmental Improvement

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Contents

Abstract

The purpose of this paper is to demonstrate by an econometric method which countries or regions in Asia are superior import hubs for Japan based on two axes, the third party logistics (3PL) business power of Japanese local forwarders and the logistical environment catch-up speed of these countries. According to the estimated results, this simple model can explain the structural changes in China's logistics based on its WTO accession and can develop Japanese forwarders' stable import hub ranking by suggesting total optimization in the East Asian NIES (newly industrial economies) and the ASEAN (Association of Southeast Asian Countries) districts by Japanese forwarders.

Key Words : Forwarder, 3PL, Logistics Hub, Intermodal Transport, Japan Import, Transit Trade, China, East Asian NIES, ASEAN

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I. Problem Setting

Since 2007, the IBRD/World Bank research group has published four global Logistical Performance Indexes based on worldwide research in six key dimensions composed of customs, infrastructure, ease of arranging shipment, quality of logistics services, tracking and tracing, and time lines). Arvis et al. (2014) is the most recent of these indexes. This type of analysis is called a large-scale benchmark survey analysis, and it provides the global logistics rankings of 160 countries and regions in a specific year. In comparison with this survey, this paper attempts to analyze the small-sized public panel data on logistics related to Japanese import trade using an econometric method and to confirm its effectiveness so that other researchers can easily apply this method to their countries.

The purpose of this paper is to demonstrate how selected countries or regions in Asia are ranked as excellent import hubs for Japan. In this paper, the competitive axes are composed as follows. The first axis is the third party logistics (3PL) business power of Japanese local forwarders entering Asian countries and regions. The second axis is the logistical environment catch-up power of these countries and regions toward an advanced level. For logistics research in a specific geographical area, this is an essential perspective, as noted by the OECD (1996), Miyashita (2009), Karatas et al. (2013), Bowersox et al. (2013) and Banomyong et al. (2015). The four stages of transportation, physical distribution, logistics and SCM overlap and are continuously developing. Based on hard infrastructure, the soft institutional infrastructure is also continuously developing. Without two types of infrastructure, the superstructure of logistics and SCM cannot be developed. This viewpoint does not emerge from the narrow idea of grasping logistics based only on strategic aspects. For example, in China, we can find four different development stages of logistics and transient states that simultaneously involve different economic levels in accordance with the coastal regions, the central regions and the inland regions.

This is the evidence that a continuous and multi-layered development model of logistics can adapt to reality. Avoiding replacement investment and new investment in transportation infrastructure and the information base leads to a decline in the competitiveness of nations. This is an

essential point of view as a premise of logistics research in East Asia and Southeast Asia.

The discussion of the subject in this paper is limited to seven countries and regions, including China, the East Asian NIES of Hong Kong, Korea, Taiwan and Singapore and the ASEAN two countries, namely Thailand and Malaysia. The Philippines and Indonesia belong to so-called ASEAN four. However, except for Thailand and Malaysia, continuous logistics data related to Japanese forwarders' intermodal contracts over the 10 years cannot be found in the ASEAN district.

II. Conditions of Japan's Overseas Import Logistics Hubs

1. The Background of Measuring International Freight Forwarders' Logistics Activity

In this paper, we use Japanese forwarders' intermodal contracts as the important logistics data. In the logistics development process described above, forwarders created an innovative business type of logistics called 3PL as the logistics service provider, which ultimately led to a relative decline in carriers and a tremendous breakthrough of forwarders. The competition between carriers and forwarders can explain the dynamic process of this situation.

In the first stage of transportation, the leading transport activity was the role of carriers as the shipping company. The traditional business of carriers was to contract with large shippers, which endogenously prepared forwarders to serve the function of an in-house sector. Therefore, according to Mckinnon (1989), without depending on the forwarders, large shippers could arrange cargo by themselves by deploying the forward integration strategy. On the contrary, traditional forwarders were used to work within small- and medium-sized shippers to collect their cargo on a large scale. Thus, forwarders adopted a reverse integration strategy in contrast to that of carriers. However, at this stage, forwarder had to remain as a subcontractor of the carrier.

In the next physical distribution stage, multimodal transport made

progress in accordance with the development of container ships since the 1960s. The traditional relationship between carriers and forwarders changed completely during this stage. The US Shipping Act of 1984 gave the intermodal transport function to forwarders as NVOCCs (non-vessel operating common carriers). Consequently, forwarders achieved an equal rank to carriers. In practice, as NVOCCs, forwarders began to incorporate carriers as subcontractors of intermodal transport.

Since the emergence of NVOCCs, international physical distribution has reached the logistics of the next stage. In response to the growing orientation toward logistics, forwarders have expanded their traditional reverse integration capabilities by working with shippers and have created a logistics system to build support across the various functions of the procurement, production and sales of shippers. Forwarders have been able to quickly sublimate the existing business style and to adopt the new style of 3PL business. Although Kutlu (2007) stressed the importance of the 4PL function horizontally controlling multiple 3PLs in one business organization, 3PL can be considered an innovative and core business domain for all types of logistics industries, including forwarders.

Forwarders that proactively enter intermodal transport have paved the way for 3PL types of business. Corresponding to the strategy building of shippers' logistics (defined as the intrafirm integrated distribution system) and SCM (defined as the interfirm integrated distribution system) (Bowersox, et al. (2013)), forwarders can have success in satisfying the conditions of the 3PL type of business. For example, competent forwarders have provided value-added services by operating distribution centers as outsourcing hubs of VMI (vendor-managed inventory). In this way, the initial intermodal transport by NVOCCs has gradually evolved into the essential requisite for 3PL through the contract logistics of forwarders.

Thus, we can conclude that intermodal transport data qualitatively reflect the developing stages of logistics, even though they quantitatively represent simply the transport activity. Needless to say, intermodal transport is the necessary condition of 3PL for NVOCC forwarders, but it is not a sufficient condition. This is an important hypothesis to discern the intermodal transport data concerned.

In contrast, shipping cartels have become the shackles of logistics support action by carriers. The United States Shipping ACT of 1984

recognized carriers' cartel-breaking as an independent action that allows the establishment of diverse customer-oriented freight rates, promotes deregulation and, in fact, realizes a contestable market presented by Baumol (1982) and Coursey et al. (1984). However, the microeconomic evaluation of this performance is merely the extent to which market failure is avoided. In contrast, the US Shipping Reform Act of 1998 supported carriers' full-scale challenge to logistics services by concealing information on the fare discount contract in the Service Contract for continuous contract shippers. Although the OECD (1999) and Miyashita (1999) recognized its epoch-making effects on market conduct, even the existing carrier-oriented large shippers strengthened 3PL contracts with forwarders. To most of the carriers that adhere to the traditional transport business domain, the 3PL type of business is equal to the new entrants into the new business domain. Many carriers cannot avoid the subcontracting of forwarders in this type of business, with some exceptions, such as Maersk Logistics and NYK Logistics, as analyzed by Greve et al. (2007). In contrast, forwarders' entry into the 3PL type of business means continuous sublimation behavior from the original business fields, and it is relatively easy for them.

Thus, the developing process of intermodal transport to the 3PL stage includes dual aspects representing forwarder initiative and carrier passivity. The sensitive signal of 3PL business can be obtained from changes in the data of the intermodal transport supported by both forwarders and carriers. The amount of 3PL business representing part of multimodal transport, unlike the traditional transport business area, does not have a close relationship with the change in the trade volume itself. Thus, the trade elasticity of intermodal transport by forwarders can provide some degree of meaningful judgment to measure whether the forwarders' business is oriented toward the 3PL type.

2. Hypothesis of International Freight Forwarders' Logistics Activity

The 3PL business position of Japanese forwarders in overseas countries is determined not only by their inherent innovative power toward new types of business, as described above, but also by the exogenous factor of

the local economic environment. Therefore, we will first analyze whether overseas Japanese forwarders correspond innovatively to the 3PL type of business in Asia. Second, we will question whether their activity has been consistent with the catch-up level of the local logistical environment in each Asian country and region.

The first task is related to the ability of Japanese overseas forwarders that respond to 3PL business innovation in Asian deployment. Their response to 3PL can be judged by whether their intermodal transport is created without conjunction with the amount of maritime cargo movement represented by trade volume. As described, changes in quantitative and qualitative business innovation behavior by the forwarder industry are condensed to the data of the intermodal transport contract. If forwarders' actions are not linked to the occurrence of the maritime cargo movement, the intermodal transport elasticity of trade volume will be smaller. In that case, the overseas ability of Japanese forwarders to respond to the local 3PL would be judged to be strong. On the contrary, the behavior of traditional forwarders will be sensitive to keep pace in the marine cargo movement. Hence, the intermodal transport elasticity of trade volume will be larger. In this case, the local ability of Japan's forwarders to respond to 3PL business in Asia can be said to be weak. In this way, the trade volume elasticity of intermodal transport suggests whether Japanese forwarders have an innovative 3PL business orientation or are more traditional.

The second task addresses the catch-up speed of the logistical environment toward Japan's level by Asian countries and regions. For example, the development level of the logistical environment in Asian countries and regions will depend on the different stages of economic development represented by the relative ratio of Japan's GDP to those countries and regions. Mature countries and regions that have already reached a high level of economic development will have an equipped logistics infrastructure. Thus, their catch-up speed will be slow. In this case, the elasticity of multimodal transport to the relative ratio change in the GDP of Japan to those countries and regions will be inelastic and nearly equal to zero.

Based on the first task, if Japan's overseas forwarders have succeeded in Asian local support with 3PL business, the trade volume elasticity of intermodal transport will be small. In the second task, if Asian countries

and regions have been promoting a logistical environment, the elasticity of multimodal transport to the relative ratio change in the GDP of Japan will be inelastic and nearly equal to zero. Thus, it is possible to lead the local response capabilities hypothesis of Japan's overseas forwarders and the logistical environment catch-up speed hypothesis of Asian countries and regions. In the next section, these two hypotheses are demonstrated in the phases of Japanese imports from Asian countries and regions in the 2000s.

III. Model Building and Estimated Results

1. Model Building

Based on the two hypotheses described above, we build the basic model of equation (1.1).

(1.1) Japanese forwarders' intermodal transport volume = f (Japan maritime container import trade volume; import partner GDP / Japan GDP).

In the estimation, to avoid the outlier generated by the economic scale difference, we divide the pool data of 7 countries into China and others (Hong Kong, Taiwan, Korea, Singapore, Thailand and Malaysia).

Because the estimation of China is made independently, equation (1.1) is specified in logarithmic form and is converted into China mode, as in equation (1.2).

(1.2) $\ln (CFV) = a_0 + (a_1 + a_2 DWT) \ln (CIV) + (a_3 + a_4 DWT) \ln (CDP / JDP)$, where

CFV: Intermodal transport volume from China to Japan by Japanese forwarders (mil. R/T; JIFFA (Japan International Freight Forwarders Association Inc.) Statistics),

CIV: Import volume of Japan from China by containership (mil. dollars; MOF, *Trade Statistics of Japan*),

CDP: GDP of China (mil. dollars; government statistics),

JDP: GDP of Japan (mil. dollars; government statistics), and

DWT: Dummy variables representing accession to the WTO (2001.2H-2011.2H=1.0, otherwise 0).

In equation (1.2), a_1 is Japanese forwarders' 3PL local business response

capabilities in China, which indicates the import trade volume elasticity of intermodal transport volume. Furthermore, a_3 is the Chinese logistical environment improvement catch-up speed, which denotes the GDP ratio elasticity of the intermodal transport volume.

The sign condition is basically $a_1, a_3 > 0$, but it may also be $a_1 < 0$, which suggests that local Japanese forwarders in China have adopted strong enough innovative action to reverse the traditional behavior. Because the coefficient a_1 takes a smaller value close to zero, even if its sign is negative, Japanese forwarders' local 3PL business becomes increasingly innovative, indicating that most of the intermodal transport contract by forwarders is not directly linked to the import volume. In other words, forwarder business has already reached the logistics and SCM stages in the form of 3PL.

As mentioned, the sign of coefficient a_3 indicates that the catch-up speed of the logistical environment improvement is positive because the GDP ratio of Japan to Asian countries and regions creates the difference in catch-up speed. If the GDP difference does not affect this speed, the GDP ratio elasticity of intermodal transport volume will be nearly zero. The countries concerned are already in the mature stage and have been prepared with an excellent logistical environment. In contrast, China is located in another position because it belongs to a growing country. In the case of China, the catch-up speed will be high and the GDP ratio elasticity will be large. When the logistical environment is in a poor state, the catch-up speed is increased.

The coefficients a_2 and a_4 represent, respectively, the effects of China's accession to the WTO in the import volume of Japan from China and the GDP ratio of Japan to China. The signs of these coefficients are negative because accession to the WTO caused the preferred structural change in China's logistics world, disrupting the era between extensive production and intensive production.

Why is the dummy variable representing the Lehman Shock not introduced in equation (1.2)? The reason is that the huge scale of the Chinese economy has converted the effect of this shock into growing energy.

On the contrary, as shown in equation (1.3), Japanese local forwarders' intermodal transport function of imports from the other six countries and

regions can be specified in logarithmic form, and the coefficient dummy variables of each country and region are introduced as additional variables.

(1.3) $(SFV_i) = b_0 + (b_1+b_{2j}DMN_j) \ln (SIV_i) + (b_3+b_{4j}DMN_j) \ln (SDP_i / JDP) + (b_4+b_{5j}DMN_j) (DLS_i) \cdot \ln (SIV_i) + (b_6+b_{7j}DMN_j) \cdot (DLS_i) \cdot \ln (SDP_i / JDP)$, where

SFV_i: the intermodal import transport volume by Japanese forwarders from each country or region, where i represents its number (i=1-6; that is, 1=Hong Kong, 2=Taiwan, 3=Korea, 4=Singapore, 5=Thailand, 6=Malaysia), (mil. R/T; JIFFA statistics),

SIV_i: the import volume of Japan from each country or region by containership (mil. dollars; MOF, *Trade Statistics of Japan*)

SDP_i: GDP of each country or region (mil. dollars),

JDP: GDP of Japan (mil. dollars),

DMN_j: the coefficient dummy variable representing each country or region (j=2-6, 2=Taiwan, 3=Korea, 4=Singapore, 5=Thailand, 6=Malaysia), and

DLS_i: the dummy variables representing the Lehman Shock in each country and region (2009/1H-2011/2H =1.0, otherwise 0).

The sign condition of b_1 in equation (1.3) is basically the same as in equation (1.2). Hence, b_1 is positive. Equation (1.3) introduces the coefficient dummy variables as the additional variables. Under this application, the sign of (b_1+b_{2j}) may be either positive or negative. The coefficient b_1 denotes the Hong Kong/Japan import trade volume elasticity of intermodal transport volume. The Taiwan/Japan import trade volume elasticity of intermodal transport volume equals (b_1+b_{22}) if b_{22} is statistically significant. If so, we can say that Japanese forwarders' 3PL business local response capabilities in Hong Kong are structurally different from their 3PL capabilities in Taiwan. Thus, by introducing the coefficient dummy variables, we can judge the structural differences of Japanese forwarders' 3PL business local response capabilities among six countries and regions.

In addition, as the coefficient (b_1+b_{2j}) approaches zero, the local 3PL business of Japanese forwarders in a particular country or region becomes increasingly innovative in ASEAN and NIES. However, in the major transit countries and regions that absorb the intermodal transport beyond

their own trade, the Japanese import trade elasticity of intermodal transport will increase in contrast to the general trend. In such a specific case, the value of (b_1+b_{2j}) will deviate largely from zero. Therefore, we need to identify the estimated results of each country or region.

As mentioned, (b_1+b_{2j}) may be negative, suggesting that local Japanese forwarders in NIES and ASEAN have adopted logistic innovation actions that are strong enough to reverse the traditional behavior. This negative sign suggests that local Japanese logistics will reach a higher stage than the positive sign of nearly zero.

In equation (1.3), the coefficient (b_3+b_{4j}) denotes the GDP ratio elasticity of intermodal transport volume, indicating the relative catch-up speed of logistical environment improvement in a specific country or region. As in equation (1.2), the sign condition of (b_3+b_{4j}) in equation (1.3) is normally positive.

In this normal case, if the coefficient b_{4j} is statistically significant, we can understand that the catch-up speeds of each country or region are structurally different from each other. Thus, the GDP ratio of Japan to Asian countries and regions leads to a difference in the catch-up speed. If the GDP ratio does not generate this speed difference, the GDP ratio elasticity of intermodal transport volume will be nearly zero. Hence, the coefficient (b_3+b_{4j}) with a positive sign may be nearly equal to zero. In this case, the countries concerned have already prepared for a mature and excellent logistical environment. The slower the catch-up speed is, the better the current logistical environment improvement in the specific country or region will be.

Even in the particular case related to major transit trade, the sign condition of (b_3+b_{4j}) may be positive. However, the GDP ratio elasticity of intermodal transport volume will increase largely apart from zero because the intermodal transport tends to exceed the growth rate of the GDP ratio.

The effects of the Lehman Shock on the main determinant factors described above are captured by their coefficient dummy variables under the different conditions of each country or region. Hence, the sign conditions of b_4, b_{5j}, b_6 and b_{7j} are indefinite.

2. Estimated Results

1) Intermodal Import Transport Function from China by Japanese Forwarders: The Backwardness of Japan's Local Logistics Behavior in China

By inputting the semiannual data in equation (1.2) and adopting the least squares method, we can obtain the estimated result of Table 1. All of the data except for the dummy variables are smoothed to remove their trends. The estimated period is 1998/1H-2011/2H. In the following estimated results, the figures in parentheses are t-statistics, and ***, ** and * show statistical significance at the 1%, 5% and 10% levels, respectively. RB2 denotes the coefficient of determination adjusted by the degree of freedom, SE denotes the standard error of the estimate, DW denotes Durbin-Watson statistics, and N denotes the sample size.

The estimated result shown in Table 1 satisfies the positive sign condition of a_1 and a_3. On the contrary, two types of coefficient dummy variables of China's accession to the WTO have negative signs in common. In addition, all coefficients are statistically significant. Hence, the Japanese forwarders' 3PL business local response capabilities in China and the Chinese logistical environment improvement catch-up speed are under a preferable structural change through accession to the WTO. As described, the reason is that in our model, the decrease in the coefficient value representing the elasticity is the signal that indicates how Japanese forwarders' 3PL business local response capabilities and the Chinese logistical environment improvement have been strengthened.

<Table 1> Estimated result of intermodal import transport function from China by Japan local forwarders

Periods and effect of the WTO / Determinant factors	Coefficients before the accession to the WTO		Additional value of the coefficient adjusted by the accession to the WTO		Coefficients after the accession to the WTO	
Japan forwarders' 3PL business local response capabilities in China: (CIV)	a_1	1.021 (12.47)***	a_2	-0.701 (-7.37)***	a_1+a_2	0.320
Chinese logistical environment improvement catch-up speed: (CDP/JDP)	a_3	1.337 (15.48)***	a_4	-0.673 (-13.34)***	a_3+a_4	0.664
Constant	8.138					
Statistics	RB2=0.996, SE=0.04749, DW=1.03, N=28					

In the period after accession to the WTO, the elasticity of Japanese forwarders' 3PL business capabilities is 0.32, one-third of the former level. On the contrary, the elasticity of the Chinese logistical environment improvement catch-up speed is 0.664, which is half the existing level. These findings suggest that the Chinese average stage of logistics development concerned with local Japanese forwarders is currently approaching the logistics level, although Japanese forwarders' 3PL business capabilities are evaluated as higher than Chinese logistical environment improvement power. This finding does not deny the current situation in which the Chinese coastal area's logistics stage is already between the logistics and supply chain stages.

Finally, it should be noted that all coefficient values in Table 1 are related only to China. Therefore, it is impossible to compare them precisely with other coefficients estimated in the cases of NIES and ASEAN in Table 2, described below.

2) Estimated Results of Intermodal Import Transport Function from Six Asian Countries and Regions by Japan Local Forwarders—the Variety of Logistic Structures

As shown in Table 2, we can obtain the estimated results of the intermodal import transport function from six Asian countries and regions by Japanese forwarders by inputting their panel data into equation (1.3) and adopting the least squares method. The estimated period is from 2001/1H to 2011/2H; hence, the sample size is 144. All data except the dummy variables are smoothed in the same way as in the analysis of imports from China. All coefficients in Table 2 are statistically significant

at either the 1% or 5% levels, and the sign conditions are satisfied.

<Table 2> Estimated result of intermodal import transport function from six Asian countries and regions by local Japanese forwarders

Determinant factors	Country or region : coefficients		Elasticity of normal condition: b_i+b_{ij}	Elasticity under the Lehman shock
Japan forwarders' 3PL business local response capabilities: (SIV_i)	Hong Kong : b_1	1.361 (9.73)***	1.361	same as on the left
	Taiwan: b_{22}	-1.471 (-13.15)***	-0.110	ditto
	Korea: b_{23}	-1.368 (-7.99)***	-0.007	0.044
	Singapore: b_{24}	-1.686 (-22.54)***	-0.325	-0.386
	Thailand: b_{25}	-1.134 (-11.23)***	0.227	0.188
	Malaysia: b_{26}	-1.467(-16.29)***	-0.106	-0.157
Logistical environment improvement catch-up speed: (SDP_i / JDP)	Hong Kong: b_3	1.850(9.41)***	1.850	same as on the left
	Taiwan: b_{42}	-1.110(-3.61)***	0.740	ditto
	Korea: b_{43}	-1.481(-3.86)***	0.369	ditto
	Singapore: b_{44}	-1.439(-5.38)***	0.411	ditto
	Thailand: b_{45}	-0.760(-2.83)***	1.090	ditto
	Malaysia: b_{46}	-1.041(-3.86)***	1.041	ditto
Coefficient dummy variable representing the Lehman Shock: (DLS_i)・(SIV_i)	Korea: b_{53}	0.051(3.51)***	-	-
	Singapore: b_{54}	-0.061(-2.02)**	-	-
	Thailand : b_{55}	-0.039(-2.36)**	-	-
	Malaysia : b_{56}	-0.051(2.39)**	-	-
Constant		5.948		
Statistics		RB2=0.980, SE=0.1201, N=144		

From the viewpoint of Japanese forwarders' 3PL local business response capabilities, Hong Kong is judged to be the base of the typical transit trade of re-exports from China because Japan's import trade elasticity of intermodal transport from Hong Kong is 1.361, and it is the only elastic response in Table 2. Why is it elastic? First, it is based on the data problem in trade practice. The re-exports generated from China via Hong Kong to Japan are counted as Chinese exports and are excluded from Hong Kong exports to Japan. This re-export volume destined for Japan is estimated to exceed ten times that of the Hong Kong original export, as shown in Figure 1. On the contrary, all of the intermodal transport volume, including the re-exportation from Hong Kong to Japan, is counted directly as Japanese forwarders' handling volume. This results in a statistical inconsistency between trade and transport in the transit trade region. Second, the re-exportation activity by local Japanese 3PL forwarders in China should link to the shipping transport in Hong Kong port without wasted time. Because this condition is entirely satisfied, Japanese forwarders prefer to use Hong Kong as the transit region. Thus,

almost the entire value of the elasticity of the Japanese forwarders' 3PL business local response capabilities in Hong Kong reflects the Chinese re-exportation activity. This is discussed in Table 5.

With the exception of Thailand, in Table 2, Japanese forwarders' 3PL behaviors are commonly identified as being at the innovative level in Taiwan, Korea, Singapore and Malaysia. The reason is that the local Japanese 3PL forwarders act according to the inelastic value with a negative sign for Japan imports. According to the hypothesis of international freight forwarders' logistics activity noted in the previous section, the innovative grade is inversely proportional to the value of the elasticity. Hence, if we measure the innovative ranking of local Japanese forwarders based on their 3PL elasticity, we obtain the order of Singapore (-0.325), Taiwan (-0.11), Malaysia (-0.106) and Korea (-0.007). Here, the elasticity is represented by the numerical value in parentheses. In these countries and regions, Japan local forwarders are considered to have strengthened their 3PL business local response capabilities in innovative level. On the contrary, in Thailand, local Japanese forwarders' 3PL elasticity is 0.227, which is inferior to that of other countries and regions. Local Japanese forwarders' 3PL ranking in Thailand is fifth.

Next, we pay attention to the estimated result of the logistical environment improvement catch-up speed. The special feature of Hong Kong as the typical transit trade region of China is also confirmed by the abnormally elastic level of the GDP ratio of Hong Kong to Japan. Hong Kong has reacted excessively to the GDP ratio to accept many re-exports of China. This is consistent with the estimated result of Japan's local 3PL analysis mentioned above. On the other hand, the effect of Lehman shock was perfectly neutral with regard to the logistical environment improvement catch-up speed of 6 countries and regions. This demonstrates the buffer function concerned with them against economic crisis to be effective.

Arranging the GDP ratio elasticity in numerical order in other countries and regions, we obtain the order of Korea (0.369), Singapore (0.411), Taiwan (0.74), Malaysia (1.041) and Thailand (1.09). This reflects an excellent grade ranking of the logistical environment improvement. The grade is also inversely proportional to the value of elasticity based on the logistical environment hypothesis. As the stage of economic development

in a specific country approaches a mature level, its catch-up speed will be slower.

Finally, what type of disturbing effects did the Lehman Shock have on Japanese forwarders' action? According to the estimated results in Table 2, the effect can be confirmed in Japanese local forwarders' 3PL action in Korea, Singapore, Thailand and Malaysia. The negative sign of this coefficient dummy variable concerning the latter three ASEAN countries suggests that Japanese local forwarders were able to level up their 3PL power against such a global financial crisis.

Each ranking of Japanese forwarders' local 3PL response capability and the local logistical environment improvement stage of the 6 countries and regions is summarized in Table 3. The numerical value in parentheses is the elasticity of intermodal transport represented by the coefficient of the estimated result. The ranking is inversely proportional to the value of elasticity. Hong Kong is outside of the ranking as the transit trade region. Here the transit trade is defined as all trade transiting through third countries.

<Table 3> Logistics ranking of Japanese local forwarders' business in 6 countries and regions based on the estimated results in Table 2

Ranking	1	2	3	4	5	Transit trade region
Japan forwarders' 3PL business local response capabilities	Singapore (-0.325)	Taiwan (-0.110)	Malaysia (-0.106)	Korea (-0.007)	Thailand (0.227)	Hong Kong (1.361)
Logistics environmental matured stage of six countries and regions	Korea (0.369)	Singapore (0.411)	Taiwan (0.740)	Malaysia (1.041)	Thailand (1.090)	Hong Kong (1.850)

According to Arvis et al. (2014), the order of the overall logistics performance index score of these six countries and regions is Singapore (5; 4.0), Hong Kong (15; 3.83), Taiwan (20; 3.72), Korea (22; 3.67), Malaysia (25; 3.59) and Thailand (36; 3.43). The figures in parentheses are in order the global ranking and scores of Logistics Performance Index of the World Bank.

Although our rankings in Table 3 are separately captured by two items, we can argue that their overview does not appear to be far from the overall ranking order mentioned above, with the exception of Hong Kong.

<Table 4 > Test of the relative stability of the estimated results

Determinant factors	Country or region	Case 1: 5 countries and regions	Case 2: 4 countries and regions	Case 3: 3 countries and regions	Case 4: 2 countries and regions
Japan Forwarders' 3PL business local response capabilities: (SIV_i)	Hong Kong: b_1	1.408 (9.53)***	1.363 (9.75)***	1.318 (8.08)***	0.799(8.13)***
	Taiwan: b_{22}	-1.490 (-12.85)***	-1.472 (-13.42)***	-1.453(-11.61)***	-1.29(-17.98)***
	Korea: b_{23}	-1.384 (-7.84)***	-1.369 (-8.20)***	-1.353 (-7.15)***	-
	Singapore: b_{24}	-1.695 (-21.92)***	-1. 687 (-23.09)***	-	-
	Thailand: b_{25}	-1.163 (-10.99)***	-	-	-
Logistical environment improvement catch-up speed: (SDP_i / JDP)	Hong Kong: b_3	1.921 (9.23)***	1.853 (9.39)***	1.786 (7.72)***	0.973(7.08)***
	Taiwan: b_{42}	-1.199 (-3.71)***	-1.114 (-3.64)***	-1.030 (-2.91)***	-0.17(-0.81)
	Korea: b_{43}	-1.575 (-3.94)***	-1.485 (-3.92)***	-1.397 (-3.21)***	-
	Singapore: b_{44}	-1.532 (-5.42)***	-1.443 (-5.39)***	-	-
	Thailand: b_{45}	-0.850 (-3.00)***	-	-	-
Coefficient dummy variable representing the Lehman Shock: (DLS_i)•(SIV_i)	Korea: b_{53}	0.051 (3.38)***	0.051 (3.61)***	0.052 (3.22)***	-
	Singapore: b_{54}	-0.059 (-1.96)*	-0.061 (-2.08)**	-	-
	Thailand : b_{55}	-0.038 (-2.26)**	-	-	-
Constant		5.875	5.945	6.014	6.855
Statistics		RB2=0.979, SE=0.1238, N=120	RB2=0.984, SE=0.1169, N=96	RB2=0.959, SE=0.1323, N=72	RB2=0.991, SE=0.06993, N=48

In addition, as shown in Table 4, the estimated result of Table 2 is relatively stable from Cases 1 to 3, even if we decrease the sample number of countries or regions in order. In particular, the ranking is fixed as in Table 3 despite the variety of country and region combinations. This demonstrates that Japanese forwarders' 3PL business local response capabilities in the NIES and ASEAN districts have been developed in accordance with the pace of their logistical environment improvement catch-up speed to attain total optimization, as if they were the distribution community. Generally speaking, the suitability of our theoretical hypothesis with real world logistics appears to be relatively robust.

However, in Case 4, which is composed of Hong Kong and Taiwan, the stability of the estimated result is lost by excluding Korea from Case 3. Almost all values of the coefficients change structurally compared with other cases, but Taiwan's catch-up speed is statistically insignificant, which indicates that the stronger linkage of Japan local forwarders is more valid in Hong Kong, Taiwan and Korea than in other areas. Further research is needed on the Hong Kong functions as the major transit region of re-export.

3) Reevaluation of Hong Kong Transit Trade Region

In the estimation in Table 2, we use the Japanese imports data from Hong Kong by container ships, excluding re-exports to Japan from Hong Kong, as the determining factor of Japanese local forwarders' 3PL business capabilities. In accordance with this, the determinant of the logistical environment improvement of Hong Kong is captured by the GDP ratio of Hong Kong to Japan. The two types of independent variables work rationally in common as Hong Kong's original determining factor. On the contrary, the dependent variable of intermodal transport by container ships is related to the Japanese total import data, including re-exports from Hong Kong. As described earlier, this is the main reason why the estimated results of Table 2 depict Hong Kong's special feature of a transit trade hub by highlighting the response to both Japanese local 3PL forwarders' business capabilities and Hong Kong's logistical environment improvement.

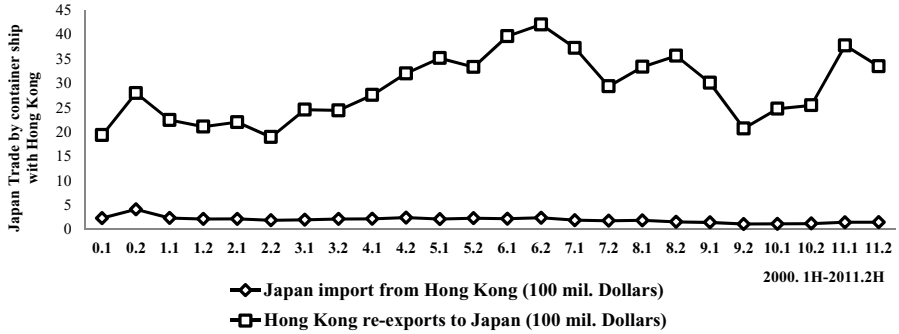
Nevertheless, NIIES and ASEAN involve Singapore and Korea as the global transit trade region. Why does only Hong Kong show an abnormal elasticity value? Hence, the final problem is to reevaluate the logistical power of Hong Kong's re-exports based on the linkage with Taiwan and Korea.

To do this, first, we calculate the volume of Hong Kong's re-exports to Japan by container shipping trade. According to Japanese trade statistics, Japanese import data from Hong Kong contain only Hong Kong's origin goods and exclude China's origin re-export goods, which are included in the data on Japanese imports from China. On the contrary, based on Chinese trade statistics, China's export data to Japan exclude the volume of Hong Kong re-exports to Japan. Hence, Japanese import data from China are larger than Chinese export data to Japan. Their difference equals Hong Kong re-exports to Japan. Multiplying this re-exportation volume by the international modal split ratio of Japanese import from Hong Kong, we can divide it into container mode and air mode, which makes it possible to obtain approximate data on Hong Kong re-exports by container ships to Japan based on the above data processing, as shown in Figure 1.

Based on Figure 1, Hong Kong re-exports to Japan by container ships are, on average, approximately 14.8 times larger than Japanese imports

from Hong Kong by the same mode. If we add the re-exports of Hong Kong to Japanese imports from Hong Kong, we obtain the total Japanese imports from Hong Kong by container ships. Hong Kong's re-export ratio concerned with Japan trade from 2000-2011 is very high, an average of 93.6%. In Hong Kong's total export trade, this ratio is higher, approximately 98%.

<Figure 1> Comparison of Japan imports from Hong Kong with Hong Kong re-exports to Japan by container ship



Source : MOF, Trade Statistics of Japan. JETRO, Global Trade Atlas. National Bureau of Statistics of China, China Statistical Yearbook.

Needless to say, Singapore and Pusan are worldwide transit regions. In Singapore's worldwide export trade, its re-export ratio was approximately 45% from 2007-2011, and its re-export origins and destinations are widely scattered. But the Singapore's re-export ratio to Japan is below this average and constitutes approximately 23% of the total Japanese imports.

In the case of Korea, we are compelled to use the transship rate instead of the re-export ratio based on the lack of data available. The average ratio of import transship containers from Korea to total import container TEU volume from Korea is 52% based on 2000-2011 SPDI data. Because a part of the transship cargo is related only to the re-export trade, the re-export ratio is lower than the transship rate.

Therefore, Hong Kong's re-export position is judged to be predominantly high. Although both Singapore and Korea also play an important role in re-exportation, we cannot detect a significant difference

in the estimated results of Table 2 in this re-export ratio level. This is also why the estimated result of Cases 1-3 in Table 4 demonstrates the statistical stability of our basic analytical framework.

However, as described in Case 4 of Table 4, it is clear that the absence of Korea will have a definite effect on the local linkage with Hong Kong and Taiwan. Hence, it will be necessary to estimate the intermodal import linkage in these areas to depict Hong Kong's special position.

The estimated results are shown in Table 5, where we apply the theoretical model of equation (1.3) to the restricted zone. Here, the data related to Hong Kong are changed as follows.

<Table 5> Estimated results of intermodal transport function in the zones of Hong Kong, Taiwan and Korea

Determinant factors	Country or region	Zones of Hong Kong, Taiwan and Korea	Elasticity of normal condition: b_i+b_{ij}	Elasticity under Lehman Shock
Japan forwarder's 3PL business local response capabilities: (SIV_i)	Hong Kong: b_1	1.008 (16.89)***	1.008	same as on the left
	Taiwan: b_{22}	-0.528 (-9.82)***	0.480	ditto
	Korea: b_{23}	-0.360 (-3.34)***	0.648	0.689
Logistics environmental improvement catch-up speed in countries and regions : (SDP_i / JDP)	Hong Kong: b_3	-0.202 (-5.88)***	-0.202	same as on the left
	Taiwan: b_{42}	0.567(3.98)***	0.365	ditto
	Korea: b_{43}	0.086 (0.41)	-0.202	ditto
Coefficient dummy variables of the the Lehman Shock: (DLS_i)・(SIV_i)	Korea: b_{53}	0.041 (4.09)***		
Constant		4.395		
Statistics		RB2=0.984, SE=0.0827, N=72		

Note : Hong Kong's (SLVi) data are replaced by the total Japanese imports from Hong Kong via container ships, which are the sum of the Japanese imports from Hong Kong and the re-exports of Hong Kong. Furthermore, Hong Kong's (SDPi) data are switched with China's GDP. All of the other data concerned with Taiwan and Hong Kong do not change. In addition, the t-statistics of the coefficient b53 is insignificant even at the 40% level. Hence b43 is statistically zero. This is the reason why (b3 + b43) equals b3, -0.202, in this Table.

First, we use Japan's total imports from Hong Kong by container ships as the 3PL determinant to clarify Hong Kong's position compared with Taiwan and Korea. This exchange of import data as a determinant corresponds rationally to the intermodal transport volume from Hong Kong, representing the dependent variable. Next, for the GDP ratio of

Hong Kong to Japan, which is another determinant, we use the GDP of China as its numerator. The numerator of the GDP ratio should theoretically be the sum of both Hong Kong's GDP and the part of China's GDP related only to Hong Kong's re-exports. However, we have no other option based on the lack of data availability, so the Hong Kong GDP ratio to Japan tends to be overestimated.

The estimated results in Table 5 demonstrate the following important points.

1. In this limited zone, the ranking of Japanese forwarders' 3PL business local response capabilities is fixed and stable—that is, Taiwan, Korea and Hong Kong, in order. Even under the effect of the Lehman Shock, there is no change in the ranking. This result matches the results shown in Tables 2 and 3.

2. The import trade volume elasticity of the intermodal transport volume in Hong Kong is 1.008. This finding demonstrates that Hong Kong is almost a perfect transit trade region and suggests that re-exported goods originally exported from China are instantaneously transshipped to a container ship in Hong Kong. Although almost all Japanese forwarders' local 3PL business appears to be completed in China, the logistics linkage between China and Hong Kong is judged as functioning perfectly.

3. Concerning the logistical environment improvement's catch-up speed, the sign of the GDP ratio elasticity of intermodal transport is negative in Hong Kong and Korea. Although we did not assume that its sign would be negative in our hypothesis, this finding is rational in the estimated result limited to the East Asia zone because the cargo collection competition between Hong Kong and Korea appears to accelerate improvement in the logistics environment.

4. Their GDP ratio elasticity value is the same, - 0.202. Because Korea's ranking of logistics environment improvement catch-up speed is at the top in Table 3, we can evaluate Hong Kong's position as the same as Korea's ranking.

5. The estimated result of Table 4 is fundamentally consistent with and complementary to the information given in Table 2.

IV. Concluding Remarks

In this paper, we attempted to demonstrate the hypothetical model of Japanese forwarders' local 3PL business response capabilities and Asian counties and regions' catch-up speed of the logistical environment improvement with an econometric method. The estimated results of the competitive positions among the six Asian countries and regions were shown to be statistically stable. Their logistics rankings were also tested and confirmed by the limited zone analysis.

On the contrary, the Chinese position was analyzed separately from the others to avoid the influence of the logistics volume gap on the panel analysis. Its estimated result could capture the structural changes in the 3PL business response capabilities and the accelerated catch-up speed of the logistical environment improvement induced by China's accession to the WTO.

The simple model and method adopted in this paper are useful for nations and firms to analyze the comparative position of the overseas local logistics hub and its environment. Based on this study, nations and firms can revise their logistics policies and strategies flexibly, which will bring them the excellent economic performances. Also applying this kind of research method to the specific country, academicians can easily deepen their insight about its current logistics position

Finally, the first problem left unfinished for this study is to combine two kinds of elasticities of infrastructure and management according to each weight. Also the second one is to evaluate Japan's position from the viewpoints of Asian 7 countries and regions analyzed in this research. ∗

Acknowledgement

I would like to express my hearty gratitude to Professor Oh Yongsik, National Korea Maritime and Ocean University, and Professor Koo Kyung-mo, Dong-eui University, for their helpful comments and assistance with the collection and processing of data.

∗ Date of Contribution ; March 20, 2015
Date of Acceptance ; August 1, 2015

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