Regional connectivity in continental ASEAN

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IV. Regional Connectivity in Continental ASEAN

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This chapter discusses the issue on the regional connectivity in continental ASEAN, in the context of developing the international production networks (hereafter IPNs). We herein focus on Mekong economies (Cambodia, Lao PDR, Myanmar, Thailand, and Vietnam) as continental ASEAN. The chapter III showed that the IPNs have been evolved in Mekong region, but mainly in the bilateral area between Thailand and Vietnam. In this sense, the IPNs in Mekong region still stay at the beginning stage of development, and thus there is the serious need to enhance the regional connectivity in this area. When we think about the regional connectivity in the context of continental area, the national land-borders are critical areas, which can at the same time be the gateways for the IPN penetration across the countries. This chapter first examines Mekong region's connectivity through the analysis of the gravity trade model and its modified fragmentation model. And it also discusses the strategy for the development of border areas as the gateways of the IPNs.

1. Connectivity in Mekong Region: Analysis of Gravity Trade Model

When we recall the "fragmentation theory" described in the chapter III, the larger differences in location advantages and the lower the service-link costs encourage firms to facilitate the fragmentation. As far as we see the differences in location advantages, the Mekong region seems to have the greatest potential of the evolution of IPNs through the fragmentation. It is because there are large differences in location advantages in the region, as we can see typically in the big gap in GDP per capita between Thailand with about 5,000 US dollars and the other Mekong economies with around 1,000 US dollars.[1] Mekong countries except Thailand and Vietnam, however, show the highest level of service-link costs as discussed later.

This section addresses the issue on Mekong region's connectivity on quantitative base, specifically by clarifying to what extent the region's service-link costs prevent the fragmentation, namely, the IPNs from developing in that region, through the analysis of

[1] According to the World Economic Outlook Database of International Monetary Fund (October 2013), the GDP per capita in 2010 of Thailand, Cambodia, Lao PDR, Myanmar and Vietnam are 4,740 US dollars, 753 US dollars, 1,072 US dollars, 811 US dollars, and 1,298 US dollars, respectively.

the gravity trade model and its modified fragmentation model.[2] The rest of this section is organized as follows. The sub-section 1.1 specifies our empirical framework of the gravity trade model and its modified fragmentation model. After introducing our data sources in the sub-section 1.2, the sub-section 1.3 reports our estimation results. The last sub-section 1.4 summarizes the estimation outcomes.

1.1 Empirical Framework

There have so far been no studies examining the mechanics of fragmentation for Mekong region. Using the gravity model, a few studies examine the trade integration in this region. Poncet (2006) examined the trade-intensity of Yunnan, Chinese province with Mekong and ASEAN countries. Edmonds and Fujimura (2008) investigated the impact of cross-border road infrastructure on trade (and foreign direct investment) in the intra-Greater Mekong Subregion. These two studies are the pioneers to deal with Mekong region in the context of gravity trade model, but do not step into the recent issue of fragmentation, namely, IPNs in Mekong region.

This study tries to contribute to the gravity-model literature by modifying the gravity model for examining the adaptability of fragmentation to Mekong region. Following Kimura et al. (2007), we estimate the modified version of gravity equation. Specifically, we introduce absolute gap in GDP per capita between trading countries as a proxy for location advantage disparity. Furthermore, this study introduces a variable capturing the extent of logistics development in order to examine the role of service-link costs.

In the model, we target the trade of machinery parts and components between Thailand and trade partners including the other Mekong countries. Since the fragmentation is associated with active back-and-forth international transactions of intermediate goods, we explore trade in intermediate goods to examine the mechanics of fragmentation. We select the machinery industry since it occupies the major parts in the IPNs. Our focus on Thailand's trade is because Thailand has played a central role in the intra-trade and the intra-investment within Mekong region.

We then specify three versions of models – ordinary gravity trade model, the model considering one of the fragmentation factors (the difference in location advantages), and the model including two of fragmentation factors (the difference in location advantages and the service-link costs).

Ordinary Gravity Trade Model

In the original form, the gravity equation explains bilateral trade flows by the

[2] The essence of this section relies on Taguchi and Ni Lar (2013).

economic size of two countries and the distance between them. Since Anderson (1979), trade theorists have found that the gravity model equation is consistent with various kinds of trade theories (e.g., Helpman and Krugman (1985), Deardorff (1998)). Furthermore, Bergstrand (1989) developed the augmented version of the gravity model by including per capita income levels for both exporters and importers as additional regressors.[3] The first model is, thus, a usual augmented version of gravity equation as follows:

$$\ln \text{Trade}_{it} = \alpha_1 * \ln \text{Joint GDP}_{it} + \beta_1 * \ln \text{Joint GDP per capita}_{it} + \gamma_1 * \ln \text{Distance}_i + \varphi_1 * \ln \text{REX}_{it} + \mathbf{D}_{it}\boldsymbol{\delta}_1 + u_t + \varepsilon_{it} \quad (1)$$

where the subscript t and i denote year and Thailand's trading partner country, respectively. Trade_{it} is exports or imports of machinery parts and components between Thailand and country i in year t. Joint GDP_{it} represents a product of GDP in Thailand and country i, and Joint GDP per capita_{it} is a product of GDP per capita in Thailand and country i. Distance_i is the geographical distance between the capital cities of Thailand and its trading partner i. REX_{it} is the real exchange rate in the bilateral term between Thailand and its trading partner i in year t.[4] u_t is year fixed effects. α, β, γ, φ, δ and λ are coefficients to be estimated. ε is the disturbance term.

$\mathbf{D}_{it}$ is a vector of dummy variables that take the value of one for a specific trading partner which is supposed to have IPNs with Thailand. Such partners include four Mekong-region countries (i.e., Cambodia, Lao PDR, Myanmar, and Vietnam), which we call "CLMV", and the other four ASEAN countries (i.e., Indonesia, Malaysia, Philippines and Singapore), which we call "advanced ASEAN". Equation (1a) includes the dummy for CLMV and advanced ASEAN for their comparison, and equation (1b) focuses the dummy on only the one for CLMV. Those dummy variables are further divided into the periods –1990-95, 1996-2000, 2001-2005, and 2006-2010. A vector of coefficients for dummy variables, $\boldsymbol{\delta}_1$, is useful for identifying the intensity of trade with Thailand in machinery parts and components. A positive and statistically significant coefficient means that their trade flows with Thailand exceed the level predicted by the gravity elements, thereby implying the existence of IPNs between Thailand and its partners.

One of the recent issues in the gravity model is how to control for multilateral resistance terms (Anderson and Wincoop (2003)). To do that, for example, Feenstra

[3] The augmented version of the gravity model has been widely used in empirical studies of international trade flows. See, e.g. Frankel et al. (1995) and Stack (2009).

[4] We define the real exchange rate, e.g. between Thailand and Japan, by [(Japanese yen per Thai baht)] * [CPI in Thailand] / [CPI in Japan].

(2002) proposed to include importer and exporter fixed effects. However, the introduction of those fixed effects forces us to drop one of our main variables, i.e. $\mathbf{D}_{it}$. Thus, following Vandenbussche and Zanardi (2010), we introduce the bilateral real exchange rate, i.e., REX, to control for multilateral resistance terms; a negative sign in φ in Thailand's exports and a positive sign in Thailand's imports are expected respectively.

Fragmentation Model: Location Advantages

The second gravity equation, which we follow from Kimura et al. (2007), is specifically designed to identify one of the key factors of fragmentation – the difference in location advantages; we introduce the gap in per capita GDP between Thailand and its partner, which is denoted by GAPit, instead of joint GDP per capita of both countries as follows:

$$\ln \text{Trade}_{it} = \alpha_2 * \ln \text{Joint GDP}_{it} + \beta_2 * \ln \text{GAP}_{it} + \gamma_2 * \ln \text{Distance}_i + \varphi_2 * \ln \text{REX}_{it} + \mathbf{D}_{it}\boldsymbol{\delta}_2 + u_t + \varepsilon_{it} \quad (2)$$

Since the per-capita-GDP gap should be shown by a positive scale, the gap is described as the logarithm of the square of the differential in per capita GDP between Thailand and its trade partner. If we get a positive and statistically significant coefficient, β_2, accompanied with the smaller coefficient of a dummy variable, $\boldsymbol{\delta}_2$, than $\boldsymbol{\delta}_1$, the intensity of trade integration of machinery parts and components might be partly explained by one of the fragmentation factors, i.e. the difference in location advantages represented by the gap in per capita GDP. Equation (2) focuses the dummy, $\mathbf{D}_{it}$, on CLMV.

Fragmentation Model: Location Advantages and Service-link Costs

The third gravity equation is to add to equation (2) one more key factor of fragmentation – the service-link costs; we insert the Logistic Performance Index (LPI) presented by the World Bank of each country as a proxy of the reverse of service-link costs as follows:

$$\ln \text{Trade}_{it} = \alpha_3 * \ln \text{Joint GDP}_{it} + \beta_3 * \ln \text{GAP}_{it} + \gamma_3 * \ln \text{Distance}_i + \omega_3 * \ln \text{LPI}_{it} / \ln \text{GDP per capita}_{it} + \varphi_3 * \ln \text{REX}_{it} + \mathbf{D}_{it}\boldsymbol{\delta}_3 + u_t + \varepsilon_{it} \quad (3)$$

However, LPI may be correlated with many other factors, particularly economic development. In order to isolate the extent of logistics performance to some extent, we

introduce the logarithm of LPI divided by the logarithm of per capita GDP in each trade partner. Our concern in this equation is the impacts of the inclusion of service-link costs on the other coefficients; if the coefficient of LPI, ω_3, is a positive and statistically significant, and at the same time if the coefficient of a dummy variable, $\boldsymbol{\delta}_3$, create the difference from those in equation (1) and (2), it implies that the intensity of trade integration of machinery parts and components might be affected by another fragmentation factor, i.e. service-link costs represented by the LPI. Equation (3) also focuses the dummy, $\mathbf{D}_{it}$, on CLMV.

1.2 Data Issues

In this section, we provide our data sources and take simple overview of Thailand's trade of machinery parts and components. For estimating the equation (1) and (2), we construct panel data for the period between 1990 and 2010 with 199 countries as Thailand's trading partners. As for the equation (3), the period for the panel data is confined to the one from 2005 to 2010 due to the data constraint of LPI. The data of LPI is available only in 2007 and 2010, and thus we assume that the LPI variable during 2005 to 2007 would be the same as the LPI data in 2007, and its variable during 2008 to 2010 would be the same as its data in 2010. We estimate the equation (1), (2) and (3) for Thailand's exports and imports respectively, since we could see the different trends in its exports and imports as shown below. To avoid the problem of sample selection bias in our panel data, we adopt the censored regression model (Tobit model) with dependent variables left-censored at zero and with the distribution for the error term extreme value.

As for the source of the annual data used for estimation, the bilateral trade data of machinery parts and components with Thailand in terms of the export and import values of U.S. dollar are retrieved from the "United Nations Commodity Trade Statistics Database" (UN Comtrade).[5] The data on GDP and per capita GDP on U.S. dollar base comes from the World Bank's "World Development Indicators".[6] The geographical distance between Thailand and each trading partners is measured by the "greater circle" distance formula between Bangkok (the capital of Thailand) and the capital city of each country.[7] The LPI data comes from the database of the World Bank.[8] The components

[5] As for the definition of "machinery parts and components", see Kimura and Obashi (2010) (HS 1992 classification). The UN Comtrade can be accessed by http://comtrade.un.org/db.

[6] Regarding with the data for Myanmar, since there is no data in the World Bank's "World Development Indicators", we alternatively use the data from World Economic Outlook Database, October 2010 and 2012, by International Monetary Fund.

[7] For the calculation of "greater circle" distance, the website, http://www.distancebetweencities.us, is available.

[8] See the website below.
http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/TRADE/0,,contentMDK:23196552~pa

of the real exchange rate, nominal exchange rate and CPI are retrieved from International Financial Statistics of International Monetary Fund.

Table 1 indicates the trade values of machinery parts and components, their shares and growths of Thailand with major trading partners in terms of its exports (the upper part of Table) and its imports (its lower part) in 1990, 2000 and 2010. The rough findings on their trends are as follows. First, Thailand's trade of machinery parts and components with CLMV has rapidly expanded its share from 1990 to 2010, and the export expansion exceeds the import one. Among CLMV, the export to Vietnam signifies a remarkable increase. The level of trade shares with CLMV are, however, still far below that with advanced ASEAM in 2010. Second, Thailand's trade shares with advanced ASEAN, as far as we see their changes from 2000 to 2010, have declined in both of Thailand's exports and imports. The trade growths for 2000 - 2010 with advanced ASEAN are lower than those with CLMV in any trade cases. Third, regarding Thailand's trade with the other major trading partners, it should be noted that Thailand's trade shares with Japan and United States have declined during 1990-2010 period, whereas the trade share with China and India has grown in any cases.

1.3 Empirical Results

This section first shows the estimation results and then discusses the estimation outcomes. Table 2 reports the results of the gravity model estimations on Thailand's trades of machinery parts and components: Table 2a on its exports and Table 2b on its imports. The gravity model estimations include the ordinary model of equation (1): (1a) including the dummy for CLMV and advanced ASEAN and (1b) including the dummy only for CLMV, and the model modified by fragmentation factors, equation (2) and (3).

Findings: Ordinary Model: Equation (1)

The results in ordinary model, i.e., equation (1), are as follows. In this estimation, we could verify the validity of the ordinary gravity trade model through the estimations of both Thailand's exports and imports of machinery parts and components. The basic explanatory variables have the expected signs with statistical significance at the one-percent level: the coefficient of joint GDP is significantly positive; the one of joint per capita GDP is significantly positive; the one of geographical distance is significantly negative; and the one of real exchange rate has an expected sign though not significant in the case of imports.

Our concern is the coefficients of dummy variables to describe the intensity of trade

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integration beyond the gravity-model level, which are introduced for CLMV and advanced ASEAN in equation (1a). The significantly positive coefficient means that the Thailand's trade with the partner exceeds the gravity-model standard. Thailand's exports show their intensity beyond the standard with both of CLMV and advanced ASEAN, except Myanmar (2006-2010) and Vietnam (1990-1995). On the other hand, Thailand's imports indicate their intensity with advanced ASEAN, but only with Lao PDR (2006-2010) and Vietnam (1996-2010) in CLMV. When we focus on equation (1b), Thailand imports represent even disintegration below the standard with Cambodia and Myanmar, and lose their intensity with Lao PDR (2006-2010).

Findings: Fragmentation Model: Equation (2)

In equation (2), as is consistent with our expectation, we can see significantly positive coefficients for Gap of GDP per capita in both cases of exports and imports. This result implies that Thailand gets engaged in back-and-forth transactions of machinery parts and components based on the differences in location advantages with trading partners. The results in Joint GDP and Distance are qualitatively unchanged with those in equation (1). The coefficient for REX turns out to be significantly positive in the case of imports, which is consistent with our expectation.

Our concern here is how the coefficients of dummy variables showing trade intensity are affected in terms of statistical inferences, by inserting the gap in per capita GDP, i.e. one of the fragmentation factors. The coefficients of trade intensity decline in all cases in the 32 cases (4 periods of 4 countries in Thailand's exports and imports) compared with those in ordinary gravity model of equation (1b), even if the degrees of the decline are not so large in some cases. In particular, when we focus on the 8 cases in which trade intensity beyond the gravity-model standard was significantly identified in equation (1b), there are the 6 cases in which their trade intensity becomes insignificant in equation (2) –the import from Vietnam (1996-2005), the exports to Cambodia (1990-2000), and the exports to Lao PDR (1990-1995 and 2001-2005).

Findings: Fragmentation Model: Equation (3)

Lastly, the results for equation (3) are as follows. The results in Joint GDP, Joint GDP per capita, Gap of GDP per capita, Distance, and REX do not change qualitatively compared with those in equation (2) in Thailand imports, though there are unexpected signs of Gap and REX in Thailand's exports.[9] The coefficients for LPI divided by per capita GDP is significantly positive, indicating that the better quality of logistics in

[9] This instability of the coefficients may come from the limited number of samples in the estimation of equation (3).

trading partners increases significantly trade of machinery parts and components with Thailand.

Again, we can see some changes in the coefficients of trade intensity by inserting the variables showing service-link costs. When we focus on the valid equation of Thailand imports, the trade intensity is absorbed into the standard level in the imports from Vietnam. Another noteworthy finding is that the disintegration effects below the gravity model standard in the imports from Cambodia and Myanmar in equation (2) are mitigated in Cambodia and even absorbed in Myanmar.

Discussions

We now discuss the implications of the above-mentioned findings from the estimations of the gravity-trade and fragmentation model. First, the trade integration of machinery parts and components was identified in terms of the trade intensity beyond the gravity model standard in Thailand's trade with Vietnam after 1996 and advanced ASEAN. With regard to the trade with other Mekong economies, Thailand's imports of machinery parts and components are disintegrated especially in those from Cambodia and Myanmar, whereas Thailand's exports are well-integrated to Cambodia and Lao PDR. These observations imply that the international production networks have been evolved between Thailand and Vietnam as well as the other advanced ASEAN in such full-fledged terms as two-way trade of machinery parts and components, and that the other Mekong economies have not incorporated in the production networks due to one-way or disintegrated trade with Thailand. Cambodia and Lao PDR, though having accepted machinery parts and components from Thailand, have not yet equipped the capacity enough to supply machinery parts and components.

Second, the Thailand's trade intensity of machinery parts and components could be partly explained by the fragmentation factors, i.e. the gap in per capita GDP and service-link costs through the fragmentation-model estimation, especially in the case of Vietnam. With regard to service-link costs, Vietnam is in the favorable position in its logistic performance. Table 3 shows that the level of the Logistics Performance Index in Vietnam is very close to that of Philippines and Indonesia though the per capita GDP in Vietnam still stay at the lower level (around 1,000 US dollars) than those of advanced ASEAN. In Vietnam, its better performance in service-link costs relative to per capita GDP may contribute to the trade intensity of machinery parts and components with Thailand.

Third, the Thailand's trade disintegration of machinery parts and components with Cambodia and Myanmar could be illustrated by their higher service-link costs through the fragmentation-model estimation. It was clearly observed from the estimation

outcome that the disintegration effects below the gravity model standard in Thailand's imports from Cambodia and Myanmar were mitigated or absorbed under the fragmentation model including service-link-cost variable. Table 3 again tells us that the level of the Logistics Performance Index in Cambodia and Myanmar are still at the lowest level in ASEAN. It can be said that it would be the existence of the higher service-link costs that prevents such latecomer's economies as Cambodia and Myanmar from being involved in IPNs, although they might be in the better position in terms of their location advantages, i.e. the lower factor prices like wages.

1.4 Summary

This section examined the issue on Mekong region's connectivity on quantitative base through the analysis of the gravity trade model and its modified fragmentation model. The main findings are as follows: First, the evolution of IPNs between Thailand and Vietnam as well as the other advanced ASEAN could be identified in terms of their two-way trade integration of machinery parts and components beyond the gravity trade standard. Second, the trade intensity of machinery parts and components, in particular, the one between Thailand and Vietnam, could be partly explained by the fragmentation factors, i.e. their gaps in per capita GDP and the relatively lower service-link costs in Vietnam, through the fragmentation-model estimation. Third, the trade disintegration of machinery parts and components between Thailand and Mekong latecomers, such as Cambodia and Myanmar, could be explained by their higher service-link costs also through the fragmentation-model estimation. The strategic implication lies in the significance in enhancing regional connectivity by reducing the service-link costs for the further penetration of IPNs at the edge of Mekong region.

2. Developing Border Areas as Gateways of IPNs in Mekong Region

For enhancing the connectivity in Mekong region, which is a continental area composed of five countries, national land-borders should be put in the highest attention as critical areas where any kinds of differences in countries should be coordinated and harmonized. If the border area development were carefully designed, the border areas might be the real gateways for IPN penetration across the countries in Mekong region. This section first comes up with basic concept for border area development, then picks up case studies of such forerunners as the US-Mexico border (often named "Maquila") and the Thai-Lao PDR border (Savannakhet) for extracting their lessons, and finally

discusses the strategies focusing on Thai-Myanmar border area development.[10]

2.1 Basic Concept for Border Area Development – Maximizing "Border Bonuses"

The border areas have their own area-advantages, which we call "border bonuses". They are "complementary factor endowment" and "cross-border infrastructure services".[11] To be specific, an industry located in border areas can enjoy the close availability of lower-cost labor forces from the less-developed country and of other inputs (intermediate products, capital and technology) from the more-developed country. At the same time, an industry can avoid high service-link costs and unstable utility services that accrue from underdeveloped infrastructure in the less-developed country, by utilizing cross-border infrastructure services provided from the more-developed country and the third organizations. These bonuses, thus, would be enlarged, when there is a big gap in their income levels between the countries crossing the border.

Complementary Factor Endowment

From an economic point of view, a border is nothing but an impediment to free mobility of production inputs: labor, capital, technology and information. Just because of the existence of border impediment, however, a border creates differences in factor availabilities and in factor prices across the border, and thus complementary inputs become available so that a border industry can combine them to produce cost-competitive products. In fact, in accordance with the big gap in per capita GDP between Thailand and neighboring countries in Mekong region as stated in the footnote 1, Thailand can offer such inputs as parts and components, technology and capital, while the neighboring countries can provide lower-waged and affluent labor forces. According to the 23rd Survey of Investment Related Costs in Asia and Oceania (FY 2012 survey) by Japan External Trade Organization (JETRO), the factory-worker's monthly base salaries are 53 US dollars in Yangon, 74 US dollars in Phnom Penh, and 132 US dollars in Vientiane, while it is 345 US dollars in Bangkok.

Cross-border Infrastructure Services

Border areas, even if they are located in less-developed countries, can avoid high service-link costs and unstable utility services. It is because cross-border infrastructure services have often been provided from neighboring advanced countries, the third countries and international organizations. The advanced countries have an incentive to provide necessary infrastructure for their firms to invest its neighboring countries, and

[10] The essence of this section relies on Taguchi and Nattawoot (2013).
[11] See Kudo (2009).

the third countries and international organizations expect some spill-over effects beyond one country through developing the cross-border infrastructure. In fact, in Mekong region, there have been several cases in which Thai Government provided financial assistances to construct the roads in the border areas in Cambodia and Myanmar. The construction of the Second International Friendship Bridge across the Mekong River between Thailand and Lao PDR was financed by Japanese Official Development Assistance. A border industry in neighboring countries from Thailand can enjoy the cross-border infrastructure as well as the better access to utility services such as electricity, water, and telecommunication that are provided by Thailand. In addition, border companies can also gain the transportation access to the well-developed Laem Chabang Port through well-connected road networks in Thailand.

These border bonuses may provide a favorable opportunity for border areas to invite and accept the IPNs in Mekong region, since the bonuses imply better combination of the larger differences in location advantages and the lower the service-link costs, which are the two key factors for "fragmentation". As matter of facts, Figure 1 indicate that there have been several emerging industrial zones at border areas in Mekong region, such as Savannakhet, Dansavann-Lao Bao, Poipet, Koh Kong and Bavet-Moc Bai as active zones, and Myawaddy-Mae Sot and Dawei-Hit Khee as planned zones. In these zones, the branch factories and twin factories from Thailand and some other countries have been and are planned to be operating as the gateways of the IPNs in Mekong region. The basic concept for border area development is, therefore, to fully utilize the border bonuses for the further extension of the IPNs in Mekong region. For that, there should be several strategies for border area development: careful designing of institutional frameworks for Special Economic Zone (SEZ), enhancing outer-link connectivity from borders to central cities, and securing labor forces with skill developments. These strategies will be discussed at the later sub-section.

2.2 Case Study: "Maquila" at US-Mexico border

This sub-section introduces the case study on the "Maquila" at US-Mexico border by presenting its content, historical performances, recent challenges and lessons. The reason why we pick up this case is that the "Maquila" system, the Mexican "in-bond processing" program is said to be the most successful case as a border area development in the world, since it has contributed a lot to the development of Mexican economy as well as of the US border cities from its spillover effects, though it has faced several challenges under fierce global competition. We first clarify what is the Maquila program.

2.2.1 The Maquila Program

We herein highlight the essence of its original program. The Maquila program is essentially an "in-bond processing" system and its precise definition is shown by Baz (2007) as follows. "A Maquila program entitles the company, first, to foreign investment participation in the capital -- and in management -- of up to 100% without need of any special authorization; second, it entitles the company to special customs treatment, allowing duty free temporary import of machinery, equipment, parts and materials, and administrative equipment such as computers, and communications devices, subject only to posting a bond guaranteeing that such goods will not remain in Mexico permanently." Another important element is that the program permits the companies to bring whatever professional or personnel to serve as managers, technicians and other specialists. These foreigners can obtain non-immigrant visas, effective for six months and renewable as often as may be necessary.

The "Maquiladora" that is often referred to is a Mexican Corporation which operates under the Maquila program approved by the Mexican Secretariat of Commerce and Industrial Development. These in-bond processing system has been an instrument to subsidize foreign manufacturers just like the US mother factories that set up their twin plants on the Mexico side of the border for processing and assembling their products on commission. The processed and assembled products in Mexico are re-exported by no less than 80 percent again to the US with a low import duty on the value-added in Mexico only. The US-GSP (Generalized System of Preferences) is also applied where if 35 percent or more of the product is deemed Mexican content, it may enter duty free.

2.2.2 Historical Performances

The Maquila program started in 1965 as response to the termination of the US Bracero Program that had allowed Mexican migrants to work legally in the US on a seasonal basis to fulfill US agricultural labor demand. The Maquila enjoyed its heydays in the 1980s and the 1990s. The first background was the peso devaluations in 1982 and 1994, which substantially reduced peso-denominated costs for the Maquiladoras and attracted more foreign companies to Mexico. Second, Mexico joined free trade framework: GATT in 1986, FTA with Chile in 1992, and NAFTA with the US and Canada in 1994. Consequently maximum tariff rates in Mexico fell from 60 percent to 15 percent by 1990.[12] Based on these backgrounds, the Maquila had shown excellent performances in Mexico. According to Gotjidooz and Vasigh (2009), the manufacturing production in Maquiladora had grown twofold from 1993 to 2000; the employment and

[12] See Secretaría de Economía, www.economia.gob.mx.

new establishments in the Maquiladora, recording double-digit growth in the 1980s and the 1990s, reached their highest levels in 2000: 3,700 plants and 1.3 million employment; and Maquiladora exports accounted for half of Mexico's total exports.

The Maquila had also brought good impacts on the US economy through the spillover effects to the US border city's employment. Hanson (2001) found that a 10 percent increase in Maquiladora's production in Mexican border cities leads to a 1.1 to 2.0 percent employment increase in U.S. border cities. Canas et al. (2011), in updating Hanson (2001)'s results, also found that the impact of a 10 percent increase in Maquiladora production leads to a 0.5 to 0.9 percent change in employment in the US border cities.

2.2.3 Recent Challenges

We next pick up two major recent challenges for the Maquila: fierce global competition with industrial evolutions, and inconsistency of the Maquila framework.

The Maquila industry has faced fierce global competition, in particular, from China, Central America and the Caribbean in terms of labor costs. The real appreciation of the peso in the 2000s has strengthened such pressure. As a matter of fact, among the suppliers of imports to the US, Mexico's ranking had exceeded China's one until 2002, but after 2003 its ranking has reversed. When we look at the sector-wise shares, however, there has been no change in the machinery sector, whereas the China's share of textiles and apparel products has become dominant in the US imports.[13] On this point Watkins (2002) argued that Mexico can compete with China in high to medium value-added sectors such as appliances and medical goods, while China has gained in low-value-added sectors such as apparel, luggage, and footwear. There is a further view on the evolutional changes of the Maquila manufacturing operation. Carrillo and Lara (2005) described the industrial evolution by classifying Maquiladoras into four stages: the assembly stage (assembly in Mexico); the manufacturing stage (made in Mexico); the design stage (created in Mexico); and the stage of multiple-coordination activities based on information technology (coordination from Mexico). The actual trends in the value-added and productivity in the Maquila manufacturing in the 2000s have reflected its industrial evolutions (see Canas and Gilmer (2007)). In accordance with the industry evolved, the Maquiladoras have changed their geographical locations, just as the apparel sector opted for the lower wages of central Mexico (see Canas and Gilmer (2009)).

Regarding with the inconsistency of the Maquila framework, the 1998 tax-law changes as "permanent establishment (PE)" in Mexico and NAFTA Article 303 threw the Maquila industry into confusion in income and custom taxation. The PE clause

[13] The data comes from US Department of Commerce, Census Bureau, Foreign Trade Division.

required the Maquiladoras to pay Mexican income taxes in the same way as the domestic companies. It caused some firms to withdraw from Mexico, to downsize their operations, or to be discouraged from new foreign direct investment in Mexico. As for NAFTA Article 303, it eliminated duty drawback (or refunds of duties) for inputs from non-NAFTA origin as of January 1, 2001, if the final products incorporating these inputs were to be subsequently exported to another NAFTA country. The Maquila industry anticipated a large negative effect on operations, since the Maquilaforas of Asian companies were dependent upon certain inputs from the Far East. In response to the industry's appeals, the Mexican government passed a decree creating 20 Sectoral Promotion Programs to protect the tariff-free entry of non-NAFTA components. Though it allows companies to apply for reduced tariffs of 0 to 5 percent, they must undertake extensive paperwork to track the origin of thousands of parts.

2.2.4 Lessons

We extract some lessons from the challenges the Maquila has faced as follows.

First, the program for the "in-bond processing" should be carefully designed in relation to other frameworks like free trade agreements and to its historical trends. The facts pointed out that the NAFTA agreement phased out some of Maquila benefits and the change in tax system gave a disincentive for further investment of the Maquila industry. Several privileges for the "in-bond processing", once established, should be secured independently from other frameworks and in a way of time-consistency.

Second, industrial evolution should be continuously promoted under fierce global competition. The Maquila industry has experienced its generation alternation, and has still kept the improvements in its value-added and productivity with geographical expansion. As prerequisites for industrial evolution, Gotjidooz and Vasigh (2009) suggested "improvement of labor skills" and "modernization of infrastructure". The success of Maquiladora requires a large number of highly educated workers, while there is a low level of educational attainment in the economically active population along the border areas. The improvement of Mexico's infrastructure is also critical with a typical example of road network along with the geographical expansion of the Maquila industry towards inland areas. Although Mexico's border areas can share the US adequate road networks, about 32 percent of the Mexican federal highways are still in poor condition.

2.3 Case Study: Savannakhet at Thai-Lao PDR border

This sub-section shows the case study on Savannakhet at Thai-Lao PDR border. There are mainly two reasons why we pick up this case. First, it is the case where the service-link costs have been rapidly declined with the construction of the Second

International Friendship Bridge across the Mekong River, together with the implementation of the institutional arrangement such as Cross Border Transportation Agreement (hereinafter, CBTA).[14] Due to the lowering service-link costs, together with the wage gap between Thailand and Lao PDR, there has been a symptom for IPNs to be extended to this border area from Thailand. The second reason is that the border area of Savannakhet is the first area where the framework of SEZ was adopted in Lao PDR. In the process of the SEZ development, we could observe the skill-enhancement in the SEZ officials, which results in better business environment for foreign investors.

2.3.1 Lowering Service-link Costs and IPN at Savannakhet

It was expected that the construction of the Second International Friendship Bridge across the Mekong River would improve the advantage of the connectivity with Thailand for Lao PDR. Before the Bridge was constructed, in case that the Thai companies convey their freight by land, they had to depend only on the First International Friendship Bridge which connects between Nongkai in the border of Thailand and Vientiane, capital city of Lao PDR. In addition to the hard infrastructure, the soft infrastructure – logistics for transportation is another key to decrease the service-link costs. As mentioned above, CBTA has facilitated the institutional arrangement for enhancing the logistics performance. Under the CBTA framework, the memorandum of understanding (MoU) between Thailand and Lao PDR for Mukdahan and Savannakhet was concluded in 2005 for stipulating the detailed items for their cross-border transportation, and it has contributed a lot to increasing the border trade. When we see the figures of border trade released by the Bank of Thailand[15], the increase of border trade through Mukdahan and Savannakhet is notable in recent years (see Table 4). In fact, the share of the Mukdahan trade among northeastern Thai border trade was around 25% until 2006, but it increased drastically to almost 50% in 2012. The expansion of trade volume, at the same time, seems to contribute to the cost-reduction of transportation through economy of scale.

The rapid reduction of service-link costs due to infrastructure development and SEZ formulation together with wage gap between Thailand and Lao PDR creates new opportunities to attract foreign investors and IPNs at Savannakhet. As a matter of fact, one Japanese camera-producing company which has mother plants in “Ayutthaya” at the

[14] Regarding with the Cross-Border Transport Agreement in Greater Mekong Subregion, see Ishida (2013).

[15] Bank of Thailand collects the information of Customs Houses in the northeastern region and releases each borders trade value with Lao PDR through its website: http://www.bot.or.th/English/Statistics/RegionalEconFinance/Northeastern/Pages/ForeignTrade.aspx#.

central part of Thailand has just started to operate a new plant for assembling camera parts. It imports the assembled parts again into "Ayutthaya" to produce final goods with other parts. It is nothing more than a formation of the IPN extension to the border area of Lao PDR side, and a number of suppliers are expected to accompany that camera company by relocating their factories at Savannakhet.[16]

2.3.2 Progress in SEZ at Savannakhet

Savannakhet is located at the border area of Lao PDR side, which is close to the Second International Friendship Bridge across the Mekong River. Lao government had come up with the idea to set up SEZ in this area to create manufacturing-production sites for avoiding a mere pass-though role on the way of the East West Economic Corridor.[17] The government issued its decree of Savan-Seno Special Economic Zone (hereafter, SaSEZ) in 2003 before the Bridge was open in the end of 2006. The SaSEZ offers to foreign investors such privileges as: corporate tax incentive, custom duty exemption, and preferential rates on land-lease, electricity and water charges.

It is of course important to provide institutional arrangements for accepting foreign direct investment. It is, however, more critical to implement the privileged measures in prompt and appropriate ways. On this point, in an authority responsible for SaSEZ named Special Economic Zones Authority (hereafter, SEZA), there has been great progresses in the implementation capacity towards foreign investors. According to the Nozaki (2009), Japanese company to locate in SaSEZ had had complaints about the confusing explanations by the staff of SEZA. It had offered one stop service for both the Ministry of Planning and Investment on new investment projects and related ministries to supervise each industry that the investing companies belong to. However, the investing companies had had to visit Vientiane, capital city of Lao PDR many times to take procedures on their investment projects. On the contrary, when the authors conducted the interview-survey to newly investing companies at SaSEZ in August 2013, we heard from the companies no serious complaints and rather satisfactions toward SEZA's performances. Since the institutional frameworks have not been changed, the behaviors and capacities of SEZA's staffs should have been improved. During the five years, the staffs seem to have accumulated their experiences and developed their skills.[18]

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[16] At present, however, the trades of intra-industrial products between Lao PDR and Thailand are not so large. It is because the Lao economy highly depends on the natural-resource-related industry. Most of Lao exports to Thailand are energy and materials, and more than half of Thai exports to Lao PDR are also energy and materials which come from refined fuel. See Nozaki (2014).

[17] The idea of SEZ was based on JICA's studies.

[18] Regarding with issues on CBTA, the officials at the border also need their skill developments.

2.3.3 Acquisition of Labor Force at Savannakhet

Savannakhet has its own advantage in addition to the usual "border bonuses" we already referred to. It is similarity of language with Thailand so that Lao people can understand Thai language. In case that Thai investors set up their factories at Savannakhet, they can dispatch Thai managers and technicians to handle the factories and make them train Lao workers with less communication gap. In this sense, the acquisition of skilled workers is not such a serious issue compared with the case of investing other neighboring countries.

The problem is whether a number of semi-skilled factory-workers are available for new investors at Savannakhet. According to the Statistical Yearbook of Lao PDR (2012), population of Lao PDR is 6.39 million in 2011, which means that there are not so abundant number of labor force compared with neighboring countries such as Myanmar and Vietnam. Among total population, however, Savannakhet Province holds 922 thousand people, which are more than Vientiane Capital of 783 thousand. In addition, it is said that many of Savannakhet-origin people have migrated to Thailand for work. If they had job opportunities in their home region, they might come back to take the job. In this regard, Savannakhet may provide labor forces for new investors to some extent. Whereas the licensed investment projects in SaSEZ up to August 2013 require tentatively around 2,500 workers, SEZA expects that the labor demand will grow as many as 10 to 15 thousand for the future prospect.[19] It might become a serious issue to acquire necessary workers and to provide them with necessary trainings and educations at Savannakhet, in case this border SEZ accepted many investors.

2.3.4 Lessons

We extract the following two lessons from the experiences of the development of Savannakhet. First, it is true that the rapid development of SEZ framework as well as the hard and soft infrastructure at Savannakhet has been providing opportunities to attract foreign investors and thus participate in the IPNs mainly from Thailand. The emphasis should, however, be put on the significance in their implementation progress with capacity development of the officials of SEZA and border offices. In particular, transition economies such as Lao PDR should accumulate the experiences to be accustomed to market mechanism by communicating foreign investors. To concentrate limited manpower to the specific zone also contributes to making SEZ an investor-friendly industrial zone. Second, regarding with the issue of labor force, we should avoid the situation that the shortage of workers will be a bottleneck for border

[19] The authors interviewed the SEZA official in February 2012.

area development. The system of trainings and educations should be well-prepared for the supposed factory workers including migrant workers in Thailand.

2.4 Strategies for Border Area Development Focusing on Thai-Myanmar Border

We finally discuss the strategies for border area development based on aforementioned basic concept and lessons from case studies. When we look at the border areas in Mekong region, several industrial zones have been developed under the framework of SEZ as shown in Figure 1. The border areas in Myanmar across Thailand, however, have no operating industrial zones at present, and thus the areas would be the frontier to be developed as the gateway for the IPNs to extend from Thailand. Thus, we herein focus the strategies on those at Thai-Myanmar border areas.

There are four border areas with main formal checkpoints (Thai border – Myanmar border): Mae Sai – Tachilek, Mae Sot – Myawaddy, Phu Nam Ron – Hit Hkee, and Ranong – Kawthaung. It is, however, only in Mae Sot where manufacturing production sites are located in Thailand side. Mae Sot has a large industrial agglomeration that is composed of labor-intensive manufacturing such as garment, textile, and food-processing. About 400 factories are located and around 20,000 migrants with legal qualification are working in Mae Sot. The Mae Sot industries had so far enjoyed relatively lower wages of migrant workers. The minimum-wage has, however, been raised to 300 baht since January in 2013. Then, most of factories has lost an advantage of lower wages since the minimum-wage has also been adapted to migrant workers, and thus they are facing the serious and urgent needs to save labor costs and to step up to high-value-added operations.[20] On the other side, Myanmar has a policy demand to create job opportunities at the border area, Myawaddy, by inviting any production sites from Thailand, under its economic reformation to pursue "balanced, proportionate and inclusive growth".[21] It is at the border of Mae Sot – Myawaddy, therefore, where the "fragmentation" is needed. Specifically, the labor-intensive production blocks at Mae Sot are expected to be relocated to Myawaddy where lower-wage workers are instantly available. For Myawaddy side, the acceptance of production bases as the fragments of production networks may contribute to income generation and job creations in the areas, whereas for Mae Sot side the outsourcing of the labor-intensive production may save labor costs and make it easier for the border industries to concentrate on the higher

[20] The description here on Mae Sot is based on the interviews at Mae Sot on Oct.29 - Nov.1, 2012 under the JICA research project "Job Creation by Border Area Development between Thailand and Myanmar". Some of the factories have the plan to relocate factories to Cambodia or to central areas of Thailand with innovative facilities to save their labor-costs.

[21] This strategy was declared by President U Thein Sein as the second phase of reform strategy in June, 2012. In fact, creating job opportunities in its border areas where most of minority groups are living would contribute to stabilizing the society and economy.

value-added operations. In this sense, the "fragmentation" would be a win-win strategy for both sides.

Here comes the urgent necessity to facilitate the IPN extension through the "fragmentation" from Mae Sot to Myawaddy by the following strategies: careful designing of institutional frameworks for special economic zone (hereafter SEZ), enhancing outer-link connectivity from border to central cities, and securing labor forces with skill developments.

Creating Institutional Frameworks for SEZ with Careful Designing

One of the reasons why foreign manufacturing companies have not yet been invested so much in a border area consists in its higher institution-wise service-link costs. They are many restrictive regulations and heavy burdens imposed on foreign firms explicitly and implicitly: customs duties, minimum capital requirements, labor-immigration, export and import licenses, restriction on foreign currency transactions, restriction on using utility services such as electricity provided by foreign countries[22], etc.

The special economic zone (SEZ), including the free trade zone (FTZ) and export processing zone (EPZ), can be a effective policy tool to reduce such business and transaction costs. Such frameworks can provide well-developed infrastructure with intensive investment in the demarcated production sites, and also efficient administrative procedures including customs and transport facilitation through e.g. single-stop and single-window services for export and import, one-stop business services including offshore banking and any other logistics, and public supports for human resource development and technological transfer. All these services can be made possible in SEZ by insulating them from the rest of the country. The aspect of implementation capacity of providing these services for foreign investors should not be ignored as the Savannakhet case tells us.

If we follow the Maquila lessons, the "in-bond processing" system among the SEZ frameworks shall a core vehicle for facilitating the fragmentation at border areas. In the case of Mae Sot – Myawaddy, the system would allow Thai manufacturing companies at Mae Sot to set up their branch factories at Myawaddy side, and to leave labor-intensive processes such as cutting, making, and packing to their branch factories on commission. The necessary machinery, equipment, parts and materials can be imported to Myawaddy without any import-customs duties, and the products processed

[22] For instance, the electricity provided from a Thai side is in fact available in Myawaddy. Unless the usage of this electricity is admitted legally and regularly, however, the border industries cannot enjoy this availability, thereby dampening the incentive for foreign investors to relocate their factories there. See Kudo (2009).

and assembled at Myawaddy can be re-exported to Thailand or exported to other countries with preferential customs duties under such frameworks as free trade agreements (FTAs) and Generalized System of Preferences (GSPs).[23]

The Maquila lesson, at the same time, told us that the benefits of the in-bond processing system should be secured independently from other frameworks. In case of the Mekong region, the framework of SEZ usually have the in-bond processing function and it can be an alternative to the Maquila program.[24] In the Thai-Myanmar border, the same kind of SEZ with the in-bond processing system should be adopted in Myawaddy.[25] The crucial issue is the relationship between the SEZ framework and the related free trade agreements (FTAs) such as ASEAN Free Trade Area (AFTA) and ASEAN plus One. If the FTA framework overrode the in-bond processing system in the SEZs as if the NAFTA did the Maquila program, the in-bond processing benefits might be phased out in the following ways. First, the duty-free imports of the necessary inputs for processing in Myanmar would be confined to the countries within the FTA frameworks, and not allowed to its outside countries. Second, even though the duty-free imports were allowed within the FTA-related countries, the "Certificate of Origin" in exporters, which would impose logistical burdens on exporting companies, would be required. The in-bond processing privilege under the SEZ framework should, therefore, be secured independently from any FTAs.

The Maquila program includes not only the special customs treatment but also such incentives as foreign investment participation by 100 percent and transferability of any personnel. The SEZ in Myawaddy, if applied, should have similar incentive-frameworks, in particular, the transferability of the personnel from Thailand to Myanmar. It should allow Thai managers and technicians to enter the factories in Myawaddy industrial zone with non-immigrant visas, and also should permit Myanmar migrant workers in Thailand to come back to the Myanmar site without strict procedures. It would contribute to job creation in Myanmar side and also to skill development in Myanmar workers through the on-the-job training from migrant-experienced workers to newly-entered workers in manufacturing sectors.

In sum, the adaptation of the SEZ including the in-bond processing system might

[23] The changes in GSPs of EU may also encourage the fragmentation from Thailand to Myanmar. Thailand will graduate from GSP of EU in January 2015, and Myanmar will be applied by GSP for LDC (least developed countries) from July 2013.

[24] For instance, the SEZ with in-bond processing function is established in Cambodia (see "Sub-Decree No. 148 on the Establishment and Management of the Special Economic Zone" dated December 29, 2005), and in Lao PDR (see "Decree of the Prime Minister on the Management Regulations and Incentive Policies regarding the Savan-Seno Special Economic Zone, Ref. No. 177/PM" dated November 13, 2003).

[25] As of today (July 21, 2013), the draft of the SEZ law, which is supposed to have the in-bond processing framework in Myanmar, is under discussion in its Parliament.

contribute to the creation of the IPN and the development of manufacturing-related industries at Mae Sot as well as that at Myawaddy, as if the Maquila program contributed a lot to the development of the US border cities from spillover effects as well as of Mexican economy.[26]

Enhancing Outer-link connectivity

The border areas would not be developed if the areas were isolated and were not linked with domestic and foreign markets, as the Maquila case suggested the modernization of infrastructure in accordance with its geographical expansion. The Mae Sot – Myawaddy border will also need the infrastructure to secure the outer-link connectivity towards such big cities as Bangkok and Yangon, and the largest shortcomings consists in a road network in Myanmar side.

According to the truck-running test from Ayutthaya to Yangon conducted by JETRO in 2012 (Table 5), it took 68 hours, around 3 days, which are far faster than the necessary days, 21 days, for the sea transportation between Bangkok and Yangon. It should be noted, however, that among the total 68 hours, the waiting time of 35 hours is exceeding the truck running time of 26 hours. The waiting time is composed of the one for the border gate to be opened, and the one for the traffic control to be lifted. While the opening time at the border gate is from 6:00am to 18:00pm, the truck arrived at the border gate at 18:50pm, and thus had to wait at the gate until 6:00am on next day. In addition, since the road from Myawaddy to Kawkareik, an inland city of Myanmar is quite narrow and hilly, the traffic is controlled in one-way from day to day, and thus the truck had to wait until another day to be allowed for running. On this road section, the truck could run at the slowest speed, 18 km/hour. This survey implied that the lead time from Ayutthaya to Yangon could be saved by half if the road condition in Myanmar side were improved and the border gate were open for 24 hours.[27]

The outer-link connectivity is not confined to creating road networks, and may be related to a matter of community development in each region. Each region has a potential to create its own products by using regional resources and to be a site to attract tourists, and can communicate each other for their development. In fact, Thailand's regions have experienced the community development in terms of the "one village one product" as called "OTOP", and thus can disseminate their experiences to Myanmar

[26] The "Preliminary Feasibility Study of Special Economic Zone and PPP Scheme in Myawaddy and Hpa-an" has been conducted in 2013, funded by Ministry of Economy, Trade and Industry, Government of Japan. At the side of Mae Sot, Government of Thailand is considering to set up SEZ, too.

[27] Thai government has a plan to construct an alternative road from Myawaddy to Kawkareik. JICA is also about to start its feasibility study.

side. The connectivity should not be a mere transporting method, but should be a catalyst for the community development.

Securing Labor Forces with Skill Development

One of the "border bonuses", namely, endowment of low-cost labor forces does not automatically guarantee the acquisition of necessary workers for border industries, and also the appropriate job opportunities for potential workers, since there might usually be a gap between labor demand and supply especially in terms of labor quality at border areas. The lessons from Maquila case and Savannakhet one also told us the necessity for improvement of labor skill as a prerequisite of their developments.

The case of Mae Sot – Myawaddy development is not an exception on the serious needs for labor forces with necessary skills. In case the industrial estate is developed and fully invested by manufacturing companies in Myawaddy, it will require a lot of manufacturing workers, by more than a hundred thousands of workers. These worker's demands can be matched by the new entry of domestic workers in Myanmar and also the return of migrant workers from Thailand.[28] In Thailand side, in accordance with industrial reformation from labor-intensive operations toward higher-value-added ones, the new demands for the skilled managers, technicians and other specialists may arise.

The TVET (Technical and Vocational Education and Training) should, therefore, be reinforced for labor skill developments targeting the human resources at the border area in both Mae Sot and Myawaddy sides. The TVET sites should be located at the moment in Mae Sot side, since the manufacturing production bases have existed in Thailand side and it has enabled the TVET to include the on-the-job-training in the factories as well as the off-the-job-training in the classroom. The JICA research project entitled "Job Creation by Border Area Development between Thailand and Myanmar, Phase II" is now considering a TVET comprehensive strategy at Mae Sot. The strategy is composed of three programs: 1) the program targeting Thai personnel for providing such skills as management, accounting, etc. for supply-chain management and as fashion, design, quality control, etc. for high value-added operations; 2) the program targeting Myanmar workers including migrants for providing basic and technical skills for factory-working; and 3) the program for community development including the dissemination of Thai OTOP experiences. To materialize these strategies, the inter-governmental group in Thailand has been set up under this project. This project also pursues the collaboration between Thai-Myanmar TVET institutes in terms of the exchanges of their trainers and trainees.

[28] See the Phase I report of the JICA research project "Job Creation by Border Area Development between Thailand and Myanmar" in March, 2013.

2.5 Summary

This section focused on the border area development in Mekong region, which is a crucial issue for the connectivity in a continental area. Since the border areas have their own area-advantages called “border bonuses”: “complementary factor endowment” and “cross-border infrastructure services”, the areas might be the real gateways for IPN penetration across the countries in Mekong region, if their development were carefully designed. This was proved by the success stories of forerunners: the Maquila case at US-Mexico border and the Savannakhet SEZ at Thai-Lao PDR border. Considering their lessons, the strategies for border area development should be careful designing of institutional frameworks for Special Economic Zone (SEZ), enhancing outer-link connectivity from borders to central cities, and securing labor forces with skill developments.

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Table 1 The trends in Thailand's trade of machinery parts and components

Thailand's exports to:	1990		2000		2010		2010/2000
	mil.dollars	% of total	mil.dollars	% of total	mil.dollars	% of total	growth
CLMV	7	0.2	278	1.4	1,359	3.5	4.9
Cambodia	0	0.0	27	0.1	198	0.5	7.4
Lao PDR	6	0.2	53	0.3	120	0.3	2.3
Myanmar	1	0.0	34	0.2	106	0.3	3.1
Vietnam	0	0.0	164	0.8	935	2.4	5.7
Advanced ASEAN	1,009	29.6	4,927	25.2	8,664	22.2	1.8
Indonesia	16	0.5	256	1.3	1,768	4.5	6.9
Malaysia	102	3.0	1,217	6.2	2,819	7.2	2.3
Philippines	51	1.5	479	2.4	1,094	2.8	2.3
Singapore	839	24.6	2,976	15.2	2,983	7.6	1.0
China	2	0.0	939	4.8	3,696	9.5	3.9
India	4	0.1	158	0.8	980	2.5	6.2
Japan	525	15.4	2,989	15.3	5,235	13.4	1.8
United States	953	28.0	3,419	17.5	3,624	9.3	1.1
World	3,409	100.0	19,553	100.0	39,100	100.0	2.0

Thailand's imports from:	1990		2000		2010		2010/2000
	mil.dollars	% of total	mil.dollars	% of total	mil.dollars	% of total	growth
CLMV	0	0.0	208	1.0	398	0.9	1.9
Cambodia	0	0.0	0	0.0	1	0.0	4.9
Lao PDR	0	0.0	0	0.0	16	0.0	-
Myanmar	0	0.0	0	0.0	2	0.0	6.7
Vietnam	0	0.0	207	1.0	379	0.8	1.8
Advanced ASEAN	840	10.1	4,420	20.8	7,168	15.6	1.6
Indonesia	2	0.0	213	1.0	894	1.9	4.2
Malaysia	83	1.0	1,621	7.6	3,060	6.6	1.9
Philippines	25	0.3	932	4.4	1,196	2.6	1.3
Singapore	730	8.8	1,654	7.8	2,018	4.4	1.2
China	43	0.5	1,128	5.3	7,294	15.8	6.5
India	25	0.3	19	0.1	306	0.7	15.8
Japan	4,219	50.9	6,850	32.2	15,986	34.7	2.3
United States	1,190	14.3	3,685	17.3	3,516	7.6	1.0
World	8,296	100.0	21,262	100.0	46,034	100.0	2.2

Note: As for the definition of "machinery parts and components", see Kimura and Obashi (2010) (HS 1992 classification).

Source: United Nations Commodity Trade Statistics Database

Table 2a Gravity Model Estimation on Thailand's Exports

Dependent variables	Thailand's exports: *Exp* it			
	Equation (1a)	Equation (1b)	Equation (2)	Equation (3)
Const.	-28.161 ***	-23.244 ***	-23.796 ***	-37.011 ***
	(0.895)	(0.910)	(0.930)	(2.408)
Joint GDP: ln(*Yi***Yt*)	0.974 ***	0.973 ***	1.031 ***	1.117 ***
	(0.014)	(0.015)	(0.014)	(0.025)
Joint GDP per capita: ln(*Yi*/*p* i**Yt*/*p* t)	0.176 ***	0.203 ***		
	(0.022)	(0.023)		
Gap of GDP per capita: ln((*Yi*/*p* i-*Yt*/*p* t)^2)			0.031 ***	-0.035 *
			(0.011)	(0.018)
Logistic: ln(*LPI* i)/ln(*Yi*/*P* i)				16.534 ***
				(2.682)
Distance: ln(*D* it)	-0.836 ***	-1.352 ***	-1.313 ***	-1.173 ***
	(0.050)	(0.044)	(0.045)	(0.073)
Real Exchange Rate: ln(*rex* i)	-0.172 **	-0.262 ***	-0.280 ***	1.283 ***
	(0.079)	(0.083)	(0.091)	(0.429)
Cambodia_9095	3.570 ***	2.085 *	1.871	-
Cambodia_9600	2.944 ***	1.440 **	1.203	-
Cambodia_0105	2.145 ***	0.659	0.466	-
Cambodia_0610	2.185 ***	0.742	0.553	0.978
Laos_9095	2.684 ***	1.166 *	1.019	-
Laos_9600	3.855 ***	2.349 ***	2.173 ***	-
Laos_0105	2.848 ***	1.347 *	1.207	-
Laos_0610	2.141 ***	0.666	0.561	1.250 *
Myanmar_9095	1.103 *	-0.310	-0.782	-
Myanmar_9600	1.760 **	0.314	-0.123	-
Myanmar_0105	1.549 **	0.118	-0.284	-
Myanmar_0610	0.382	-1.044	-1.392 *	-0.275
Vietnam_9095	1.507	0.366	0.008	-
Vietnam_9600	1.950 ***	0.767	0.442	-
Vietnam_0105	2.227 ***	1.056	0.781	-
Vietnam_0610	2.011 ***	0.878	0.619	0.399
Advanced ASEAN_9095	2.781 ***			
Advanced ASEAN_9600	2.869 ***			
Advanced ASEAN_0105	2.899 ***			
Advanced ASEAN_0610	2.136 ***			
Number of observations	2,834	2,834	2,834	827

Note: *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively. The figure in parenthesis denotes standard error.

Sources: UN Comtrade; World Development Indicators and Logistic Performance Index by the World Bank; World Economic Outlook Database (October 2010 and 2012) and IFS by IMF

Table 2b Gravity Model Estimation on Thailand's Imports

Dependent variables	Thailand's imports: *Imp* it			
	Equation (1a)	Equation (1b)	Equation (2)	Equation (3)
Const.	-40.755 ***	-29.606 ***	-31.592 ***	-68.941 ***
	(2.020)	(1.905)	(2.011)	(5.387)
Joint GDP: ln(*Yi***Yt*)	0.979 ***	0.958 ***	1.101 ***	1.425 ***
	(0.025)	(0.027)	(0.026)	(0.052)
Joint GDP per capita: ln(*Yi*/*p* i**Yt*/*p* t)	0.667 ***	0.679 ***		
	(0.040)	(0.043)		
Gap of GDP per capita: ln((*Yi*/*p* i-*Yt*/*p* t)^2)			0.165 ***	0.172 ***
			(0.019)	(0.032)
Logistic: ln(*LPI* i)/ln(*Yi*/*P* i)				17.307 **
				(6.719)
Distance: ln(*D* it)	-0.846 ***	-1.761 ***	-1.497 ***	-1.450 ***
	(0.102)	(0.086)	(0.086)	(0.146)
Real Exchange Rate: ln(*rex* i)	0.794 ***	0.376	0.465 *	4.152 ***
	(0.257)	(0.256)	(0.276)	(1.013)
Cambodia_9095	-2.706	-5.471 ***	-6.007 ***	-
Cambodia_9600	-1.366	-4.115 ***	-4.538 ***	-
Cambodia_0105	-0.435	-3.213 ***	-3.582 ***	-
Cambodia_0610	-0.904	-3.651 ***	-4.068 ***	-3.006 **
Laos_9095	-0.521	-3.232 ***	-3.639 ***	-
Laos_9600	-2.862 **	-5.605 ***	-5.892 ***	-
Laos_0105	1.298	-1.482	-1.777	-
Laos_0610	2.967 ***	0.154	0.019	1.601
Myanmar_9095	-2.531 *	-5.166 ***	-6.557 ***	-
Myanmar_9600	-1.029	-3.732 ***	-4.821 ***	-
Myanmar_0105	0.494	-2.177 *	-3.232 ***	-
Myanmar_0610	-0.326	-3.108 ***	-3.963 ***	-1.588
Vietnam_9095	-0.949	-3.034	-4.014	-
Vietnam_9600	4.147 ***	2.013 *	1.334	-
Vietnam_0105	4.366 ***	2.247 **	1.625	-
Vietnam_0610	4.709 ***	2.593 **	1.990 *	1.882
Advanced ASEAN_9095	3.115 ***			
Advanced ASEAN_9600	3.743 ***			
Advanced ASEAN_0105	4.430 ***			
Advanced ASEAN_0610	4.418 ***			
Number of observations	2,234	2,234	2,234	728

Note: *, ** and *** indicate significance at the 10%, 5% and 1% level, respectively. The figure in parenthesis denotes standard error.

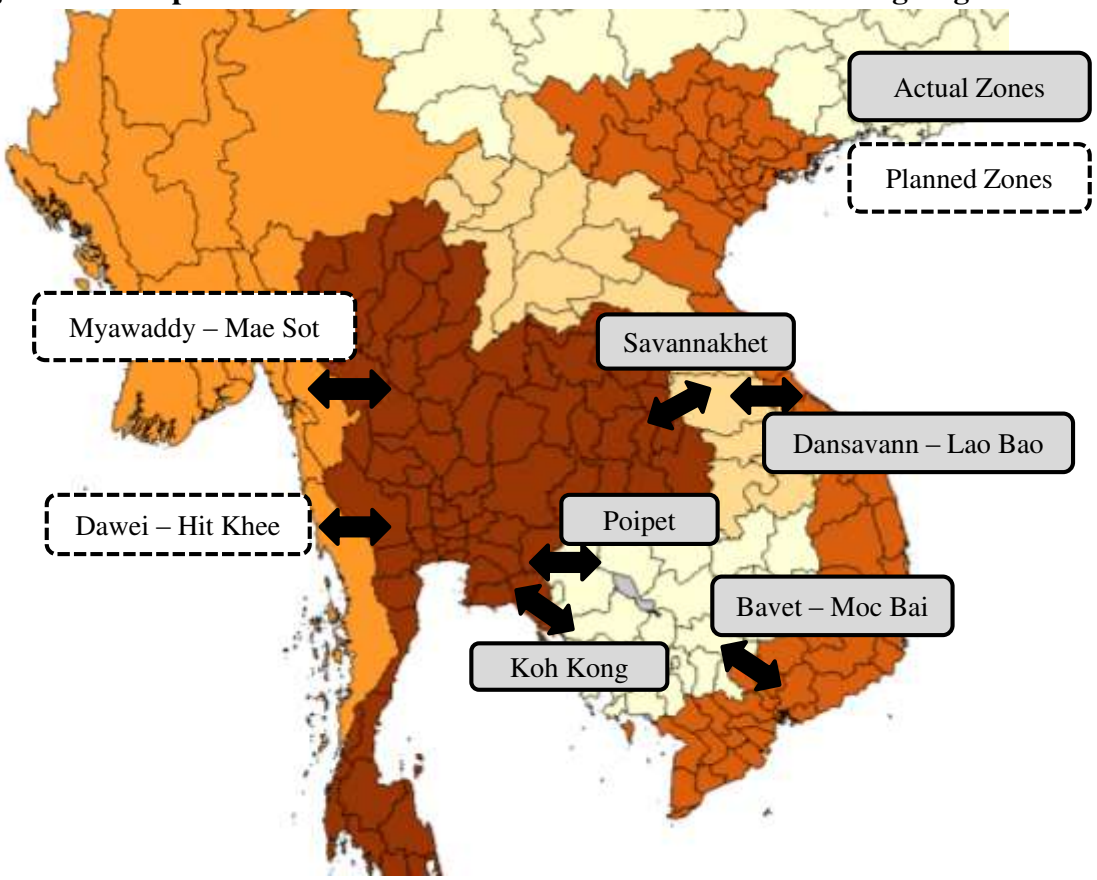
Sources: UN Comtrade; World Development Indicators and Logistic Performance Index by the World Bank; World Economic Outlook Database (October 2010 and 2012) and IFS by IMF

Table 3 GDP Per Capita and Logistics Performance Index in ASEAN

	Singapore	Malaysia	Thailand	Philippines	Indonesia	Vietnam	Lao PDR	Cambodia	Myanmar
GDP per capita (US dollar) in 2010									
	43,865	8,737	4,992	2,123	2,981	1,174	1,105	753	742
Logistics Performance Index 2012									
	4.13	3.49	3.18	3.02	2.94	3.00	2.50	2.56	2.37
Global Ranking in Logistics Performance Index 2012 (Total: 155 countries)									
	1	29	38	52	59	53	109	101	129
<Customs>									
	1	29	42	67	75	61	94	108	122
<Infrastructure>									
	2	27	43	62	84	72	107	127	133
<International shipments>									
	2	27	36	55	57	38	124	103	117
<Logistics competence>									
	6	30	48	39	61	81	105	103	111
<Tracking & tracing>									
	6	29	45	38	51	48	111	78	129
<Timeliness>									
	1	28	39	69	41	38	118	103	140

Sources:
GDP per capita: World Economic Outlook Database, October 2012, IMF
Logistics Performance Index 2012: The World Bank, (http://lpisurvey.worldbank.org/international/global)

Figure 1 Development of Industrial Zones at Border Areas in Mekong Region



Source: Author

Table 4 Border Trade between Thailand and Lao PDR through Customs Houses in the Northeastern Region

(Unit: Millions of Baht)

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Export	16,562	18,013	20,691	36,187	43,484	55,841	54,816	78,721	115,347	155,979
Nong Kai	7,206	7,100	7,380	18,318	23,730	29,072	31,079	36,138	45,346	62,136
Mukdahan	3,722	5,288	5,372	6,419	6,347	10,298	7,875	23,709	47,836	64,328
Import	4,051	4,599	4,936	12,569	17,231	19,364	15,908	21,313	32,314	44,530
Nong Kai	808	1,150	1,165	1,507	1,560	2,053	2,314	2,799	2,383	3,853
Mukdahan	741	620	955	6,531	12,654	13,739	9,422	14,555	24,760	34,120
Trade Value	20,613	22,612	25,627	48,757	60,716	75,206	70,724	100,034	147,662	200,512
Nong Kai	8,014	8,250	8,545	19,825	25,290	31,124	33,393	38,937	47,729	65,989
Mukdahan	4,463	5,907	6,327	12,950	19,001	24,037	17,297	38,264	72,596	98,448

Source: Website of the Bank of Thailand. It uses the data of customs houses in the northeastern region

Table 5 Truck-running Test from Ayutthaya to Yangon

Total time needed (hours: minutes) for 870 km	**68:25**
Truck running time	26:36
Ayutthaya - Mae Sot border (km/hour) for 445 km	10:28 (57.1)
Myawaddy border - Yangon (km/hour) for 425 km	16:08 (40.5)
(Myawaddy - Kawkareik for 54 km)	02:57 (18.2)
Waiting time	35:45
Waiting for border-gate to be opened	14:45
Waiting for traffic control to be lifted	21:00
Costum procedures	05:54
Export at Mae Sot	00:30
Import as Myawaddy	05:24
Transshipment	00:10
Reference: Sea transportation between BKK and Yangon	21 days

Source: JETRO, 2012