

Chapter I

Impact of Economic and Technical Cooperation on Northeast Asian Countries

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1. Introduction.

Northeast Asia includes Japan, Korea, Mongolia, North Korea, the Northeast provinces of China and the Russian Federation's Far East provinces.¹ Until the end of the cold war, political relations remained tense and strained in this region because of international political confrontation. These strained and tense relations made it difficult to promote "cooperation" or "co-exist" within this region in spite of the countries' geographical closeness.

However, with the end of the cold war, Northeast Asia began to receive a lot of attention due to its complementary structure in natural, human and capital resources. For example, Russian Far East has plenty of natural resources, Northeast provinces of China have large labor supplies, Korea has intermediate technology, and Japan has high technology and capital equipment. Japan and Korea are short of natural resources such as minerals, energy, forests, land, people, and so on, and these resources are supplied by Russian Far East, Mongolia and China. On the other hand, Russian Far East, Mongolia and China lack sufficient capital goods, services, technology, plant and equipment, and management skills. Korea and Japan surely help supply these shortages.

Looking at these features, trade patterns in Northeast Asia are characterized as vertical, while those of EU and ASEAN are characterized as horizontal. Since trade patterns are complementary in Northeast Asia, it easily conjectures that the amount of intra-regional trade within Northeast Asia is relatively large. However, it is rather limited compared to the amount of trade expected because of different political, social and economic systems, and historical reasons. In addition, particular bilateral relationships such as

¹ This classification comes from the East West Center, in Hawaii. This paper includes Mongolia in the analysis because Mongolia is expected to a member of APEC. Therefore, the inclusion of Mongolia as a member of APEC and as a part of Northeast Asia is considered necessary. This paper excludes North Korea from the analysis due to insufficient data.

Japan-Russia are still very sensitive; therefore, due to complicated bilateral relations, analysis of Northeast Asia becomes very difficult. Unfortunately, it seems that there is no strong consensus among Northeast Asian countries to construct one integrated economy. The main obstacles are matters of economic systems, political regimes and complicated bilateral relationships, as pointed out previously. Since these factors will not change dramatically or immediately, the majority of analysts and researchers consider that the concept of developing an integrated Northeast Asian economy is only a fairy tale.

This paper focuses on analyzing the economic effects of regional cooperation for all Northeast Asian countries. Economic benefits are analyzed based on Economical and Technical Cooperation (ECOTECH) activities in APEC. Since ECOTECH's main purpose is to enhance the environment for liberalization of trade and investment, the introduction of ECOTECH activities contribute to facilitating liberalization. Liberalization is one of APEC's objectives, and as many researchers suggest, liberalization brings desirable effects to the overall economy.² However, in order to promote liberalization and make it much more effective, Russian Far East, Northeast provinces of China and Mongolia, in particular, need to remove their structural problems, i.e., improve infrastructure and human resource development. Without removing these constraints, liberalization will not be effective. ECOTECH activities include various kinds of programs such as developing human capital, constructing stable, safe and efficient capital markets, strengthening economic infrastructure, developing future technology, and so on. The introduction of these ECOTECH activities will not only assist in facilitating liberalization, but they will also contribute to reducing constraints that Northeast Asian countries face. In addition, ECOTECH activities will also increase overall productivity of countries participating in projects by expanding output.

In removing these obstacles, these countries suffer most from the lack of sufficient financial resources, capital, and technology. As a result, bilateral and multinational economic cooperation should also be encouraged. Due to political issues, economic cooperation based on bilateral assistance is difficult. Consequently, not only are ECOTECH activities necessary, but a multinational framework is also necessary in order to make it possible to overcome the toughest constraints.

If regional economic cooperation based on a multinational framework along with

² See Urata (1995) for detailed explanations. His analysis explains in detail how liberalization affects productivity.

ECOTECH activities results in economic benefits in all countries, then, it will stimulate economic cooperation, and bring about a consequent increase in regional trade. As a result, the more the regional trade expands, the better the economic relations become, and it will translate into greater political stability within Northeast Asian countries. Surely, the effects will take time; however, increasing interchange based on purely economic benefits plays an important role in constructing better political relationships. In sum, the purpose of this paper is to estimate the impact of ECOTECH activities in Northeast Asian countries, and particularly, estimate their impact on intra-regional trade and an individual economy. By promoting cooperation, ECOTECH activities will not only contribute to successful and efficient liberalization for these countries, but they will also bring economic benefits to other countries through improved economic relations.

The rest of this paper will be organized as follows. Section 2 provides a brief overview and characteristics of trade patterns by examining the import and export structure in Northeast Asian countries. Section 3 analyzes the degree of intra-regional trade flows. Section 4 explains in depth ECOTECH activities related to Northeast Asia, and estimates the impact of ECOTECH activities on Northeast Asian economies. Lastly, section 5 provides the conclusion of the paper.³

2. Trade Patterns and Trade Characteristics in Northeast Asia

2.1 Overview of Intra-Regional Trade Values in Northeast Asia

Table 1 shows regional trade values in Northeast Asia. In this table, the total of Northeast Asia is the sum of Japan, Korea, Russian Far East, Mongolia, and China. Looking at the degree of dependency on intra-regional trade, Russian Far East and Mongolia have high dependency on intra-regional trade while Japan has low dependency on both exports and imports. Korea and China seem to construct strong linkages with Northeast Asian countries, especially with Japan. In this regard, expansion of intra-regional trade, particularly for developing areas such as Mongolia and Russian Far East, is important; and additionally, Japan plays an important role as a trade partner.

³ This paper was supposed to introduce the effects that improved liberalization and productivity have on intra-regional trade based on the CGE model; however, the model is still incomplete. Therefore, results of CGE analysis will be presented in another paper.

Table 1. Trade Flows in Northeast Asia (1998)

(Million US Dollars)

Exporters	Importers						Total
	Japan	Korea	China	Far East	Mongolia		
Japan		15400	20182	140.9	55	35778	
Korea	12238		11944	569.3	34	24785	
China	29718	6266		170.0	65	36219	
Far East	719.6	290.2	878.8		-	1889	
Mongolia	12	31	95	-		138	
Total	42688	21987	33100	880	154	98809	

Source: IMF, "Direction of Trade Statistics".

2.2 Structure of Comparative Advantage in Northeast Asia

In order to discuss trade structure in more detail, the RCA (revealed comparative advantage) index is calculated. RCA index is defined in the following equation:

$$RCA_{xih} = (X_{ih}/X_i)/(W_h/W) \quad \cdot \cdot \cdot \cdot \cdot \cdot \cdot (1)$$

Where RCA_{xih} is the RCA index of Country i in Commodity h , X_{ih} is exports of Commodity h from Country i to the rest of the world, X_i is Country i 's total exports, W_h is the world total of trade in Commodity h , and W is the total world trade volume. If the RCA index is above unity, the country has comparative advantage in the commodity. For example, RCA_{ih} above unity shows that Country i has comparative advantage in commodity h . Note that the RCA index measures the competitiveness of Country i 's exports in a partner Country j . A similar index can be defined for imports; RCA_{mih} implies comparative disadvantage.

Table 2 shows the RCA index in Northeast Asia. Due to insufficient data availability, the author only calculated the RCA index for 1996. Commodity classifications should be divided into more detailed categories, or at least, it is desirable to include more sub-sectors. However, detailed classifications are not available for both Russian Far East and Mongolia. Consequently, quite aggregated classifications are adopted for all other countries in order to obtain comparable indices.

From the table, one can easily recognize that strong complementarity exists in Northeast Asia. Russian Far East has strong comparative advantage in food, which is mainly fish and crude materials and mineral fuels, which are crude petroleum and coal products. In

Table 2 Revealed Comparative Advantage(1996)

Export					
	Far East	Mongolia	China	Korea	Japan
Food and Beverage	2.98	0.25	0.91	0.25	0.05
Crude Materials and Mineral Fuels	4.02	8.14	0.61	0.39	0.12
Animal, Vegetable Oil	-	-	0.51	-	-
Chemical, related Products	0.15	0.07	0.60	0.72	0.70
Basic Manufactures	-	0.10	1.26	1.38	0.73
Machines	0.75	0.04	0.58	1.30	1.73
Other Manufactured Goods	0.01	0.53	3.05	0.77	0.70
Goods not classified by kind	-	-	0.05	1.33	0.81
Import					
	Far East	Mongolia	China	Korea	Japan
Food and Beverage	4.06	1.69	0.53	0.63	1.74
Crude Materials and Mineral Fuels	1.04	1.95	1.16	2.18	2.47
Animal, Vegetable Oil	-	1.46	2.50	0.50	-
Chemical, related Products	0.39	0.52	1.33	0.89	0.67
Basic Manufactures	0.04	1.12	1.51	0.93	0.71
Machines	0.88	1.02	0.98	0.90	0.61
Other Manufactured Goods	1.25	0.07	0.49	0.65	1.26
Goods not classified by kind	-	-	0.18	1.27	0.59

Data sources:

Trade data for Fareast came from Monthly Bulletin on Trade with Russia & East Europe, Japan Association for Trade with Russia & Central-Eastern Europe, June, 1999 and world's trade data from United Nations, International Trade Statistics, various years.

addition, Russian Far East is also a big supplier of wood and pulp. Mongolia also has strong comparative advantage in crude materials and mineral fuels; however, its main products are non-ferrous metals such as copper and gold. Mongolia has comparative advantages in coal and wool. China has strong comparative advantage in basic manufactures and other manufactured goods, which are clothes, shoes and toys. China also has comparative advantage in synthetic fiber. Both Korea and Japan have comparative advantage in basic manufactures and machines. If product categories were

separated into more detail, both countries may have comparative advantage in different industries. However, if one looks at rather broad categories, their complementarity structure is very similar.

Table 3 summarizes comparative advantage and disadvantage of detailed commodities in each country. This table confirms the previous discussion, which concludes that Russian Far East, Mongolia and China have natural and human resources. Contrarily, Japan and Korea have capital and technology.

Table 3. Commodities of Comparative Advantage and Disadvantage

Comparative Advantage	Comparative Disadvantage
Russian Far East	Russian Far East
Fish(mainly salmons)	Grain
Crude Pertoleum	Meat
Coal Products	Apparel
Wood	
Pulp	
Mongolia	Mongolia
Wool	Petroleum
Mineral Products (copper)	Transport Equipment
	Synthetic Fiber
China	China
Wearing Apparel	Plastic
Toys	Wood
Shoes	Pulp
Synthetic Fiber	
Korea	Korea
Electrical Machinery	Mineral Fuels
	Transport Equipment
Japan	Japan
Electrical Machinery	Mineral Fuels
Transport Equipment	

2.3 Complementarity Analysis

Based on comparative advantage indices, the author calculated a complementarity index.

The complementarity index is defined in the following equation:

$$C_{ij} = \frac{1}{h} [(RCA_{xih}) * (RCA_{mjh}) * (W_h/W)] \dots \dots \dots (2)$$

where C_{ij} is the complementarity index between Country i and j , i being the exporting economy and j the importing economy. Subscript h denotes commodity classification, and RCA_x and RCA_m are the revealed comparative advantage indices of exports and imports, respectively. W_h is world trade volume of commodity h , and W is world total trade volume. The world average of C_{ij} is unity, so C_{ij} greater than unity implies that the export structure of Country i and import structure of Country j are more complementary. However, C_{ij} is not based on any actual trade flow between two countries, i and j . C_{ij} implies a “virtual match” between two countries derived from their comparative advantage structure. It should be noted that C_{ij} tends to be greater when the comparative advantage structure of the two countries are “vertically matching”. Suppose Country i exports technology-intensive commodities and imports mineral resources. If another country, j , exports mineral resources and imports technology-intensive commodities, then C_{ij} in this case shows a high level of C_{ij} .⁴ This case applies to Northeast Asia because the comparative advantage structure shows a strong vertical match, as explained previously.

Table 4 shows the complementarity index in Northeast Asia. Trade complementarity shows a relatively high “vertically matching” trade pattern in the region. From the table, as for import structure, Japan and Korea, two of Asia’s major industrialized countries, are highly complementary with Russian Far East and Mongolia. Since both countries depend on imports of natural resources from Mongolia and Russian Far East, it is natural to obtain such a high complementarity index. China and Russian Far East also indicates relatively high complementarity indices with other Northeast Asian countries. However, Mongolia only vertically matches with Russian Far East.

In export structure, Mongolia shows a strong complementarity index with all Northeast Asian countries. It seems that Korea and Japan are important trade partners for Mongolia. Russian Far East also has a high complementarity index with Northeast Asian countries. On the contrary, Korea and Japan do not show strong complementarity indices with most Northeast Asian countries. There is one interesting point shown by the table. Most countries have relatively strong complementarity indices with other Northeast Asian countries because they complement each other. However, those of

⁴ For a more detailed explanation about “vertical matching” and C_{ij} , see Okuda (1997).

Japan and Korea seem to have high competitiveness. As a result, they have a relatively low complementarity index with each other. This indicates that comparative structure has become competitive in both countries.

3. Determinants of Trade by Incorporating Intra-Regional Trade in Northeast Asia

From the previous discussion, it is inferred that Northeast Asian countries should trade more with each other than with other countries due to their complementarity. This section empirically examines the degree of intra-regional trade volume by analyzing determinants of trade. In this analysis, a gravity model is applied.⁵

3.1 The gravity model and its specification

The model used here is modified from the one used in the author’s previous work.⁶ The estimated equation is as follows:

$$T_{ij} = f [CNST, GDPX, GDPM, DIST, HK, SGP, MEX, RUSSIA, FAREAST, AFTA, APEC, NAFTA, ANZ, NORTH, IND, Cij] \quad \cdot \cdot \cdot \cdot \cdot \cdot \cdot (3)$$

Table 5 lists explanatory variables used in the model. The independent variable is T_{ij} , which is the value of exports from country i to country j . CNST, GDPX, GDPM, and DIST are the traditional or “core” variables in the gravity model. CNST is constant, GDPX is GDP of the exporting country, GDPM is GDP of the importing country, and DIST is the distance between the two countries. Data description and sample countries included in the model are shown in the appendix.

In this model, newly introduced dummies are coefficients for “NORTH”, which indicates the degree of intra-regional trade in Northeast Asian countries and “IND”, which is expected to estimate the degree of involvement in international trade for inland countries. NORTH is considered to be positive and IND is considered to be negative. For the estimation in 1996, C_{ij} is also introduced. As C_{ij} becomes higher, the degree of trade volume is greater. Therefore, the expected sign is positive.

⁵ The concept of a gravity model originated from Newton’s law of gravity in physics, and the idea was utilized in the field of international trade to explain bilateral trade flows. For more detail, see Okuda (1997).

⁶ Fukumoto (2000).

3.2. Estimation Results

Table 6 shows empirical results for the explanatory variables. Signs and t-values of GDP, distance, and traditional countries' dummies show consistent results with previous studies, and regional dummies are mostly similar to previous studies, too.⁷ An estimated coefficient of C_{ij} shows an expected positive sign with a highly significant t-value. This suggests that the vertical match of comparative structure is still an important factor in determining trade flows. Particularly, for Northeast Asian countries, the vertical match in trade is still an important determinant of intra-regional trade.

In this regression analysis, since the main purpose is to show the trade characteristics of Northeast Asia, the author confines discussion only to the newly introduced dummies of NORTH and IND.

Northeast Asia Dummy

For the Northeast Asia dummy, estimated coefficients for each period, except for 1994, show expected positive signs. T-values are mostly significant with a 5% level of significance. This result confirms the previous discussion. Since Northeast Asian countries are complementary in economic structure, the values of intra-regional trade should be substantial. Although trade within Northeast Asia as a whole has great importance, the degree of involvement in intra-regional trade might be different from country to country. Based on this perspective, another regression is conducted in a following sub-sector.

Inland Dummy

The inland dummy is introduced to estimate whether inland areas tend to trade less. Its estimated coefficient is negative for all periods of estimation with a high level of significance. The results show strong negative effects from being inland, and Mongolia is a case of an inland country among Northeast Asian countries. In order to achieve rapid economic expansion, it is extremely important for inland countries to make a commitment to participate in international trade. Therefore, particularly for Mongolia, inland countries need to find ways to develop international trade. However, the areas surrounding Mongolia lack efficient infrastructure such as highways, rail, air, and transportation systems to make it possible. The strong negative coefficient might imply that underdeveloped infrastructure negatively affects international trade for inland countries.

⁷ Results obtained here are consistent with those of Okuda (1997, 1998), and Fujita (1999).

For example, Mongolia depends on railroads for international transportation.⁸ Although some railroads already connect Mongolia with Russia and China, the total amount of freight transactions remains small. As for port facilities, the closest route is the Tianjin port in China, nearly 1,700km from Mongolia. However, for Mongolia, it is not easy to access to the port because both China's railroad freight transportation and the Tianjin port are too congested. Therefore, annual cargo transactions in Mongolia are very limited. According to data from ERINA, the annual total amounts to only two hundred tons. Consequently, if efficient infrastructure isn't constructed, it will be very difficult to develop international trade, and it will also negatively impact on the entire national economy. Nevertheless, Mongolia faces investment constraints and all of these infrastructure improvements require huge funding. Consequently, financing the capital investment remains an important part of the construction of the region's transportation system. At the same time, cooperative work by neighbor countries is also expected. Construction of efficient infrastructure will also contribute to promoting intra-trade within Northeast Asia through activating physical distribution and human interchanges, and it will benefit all countries through transferring resources. Recently, some major ongoing projects have focused on developing infrastructure, such as the Tuman River Area Development Program and the Siberia Land Bridge. The purpose of these projects is to facilitate and activate international transactions by developing various transportation systems within Northeast Asia, especially among Russia, Mongolia, North Korea and China. Basically, several countries support most projects, and therefore, multinational cooperation is a key to whether or not these projects succeed. It is true that the projects face difficulties because of political matters, and it takes a long time to complete projects. However, it should be evaluated as contributing to not only Mongolia's international trade but also contributing to intra-regional trade as a whole.

3.2 Analysis of Residuals

Tables 7a&7b show residuals of estimated equations for 1992 and 1998. As is well known, the meaning of regression analysis is to estimate the expected value of Y (in this analysis, Y is exports from country i to j) given that explanatory variables take the specific value. Residuals include all effects of omitting variables from the model. Therefore, larger residual values indicate that omitted variables have greater effects. In other words, since residuals in this regression analysis imply the difference between

⁸ These descriptions are mostly based on the "Northeast Asia Economic Report", The Economic Research Institute for Northeast Asia (ERINA), 1999.

average value of exports and actual value of exports between two countries, a large residuals value suggests that bilateral trade relations are not as strong as expected.

To obtain consistent residuals, some variables should be excluded from the model. The ultimate goal is to achieve mutual relationships among Northeast Asian countries, so Northeast Asia related regional and country dummies are temporarily omitted. If these dummies are included, the residuals tend to show relatively small values, particularly when it is a trade with Northeast Asian countries. Obviously, dummies of APEC, NORTH, RUSSIA and FAREAST are excluded and require a new equation as follows:⁹

$$T_{ij} = f [CNST, GDPX, GDPM, DIST, HK, SGP, MEX, AFTA, NAFTA, ANZ, IND] \dots \dots \dots (4)$$

Estimation results are not shown. However, the results are mostly consistent with the previous analysis, and they have expected signs with high levels of significance. **Table 7a and 7b** reveal some characteristics of intra-regional trade within Northeast Asia. In the following analyses, we only focus on residuals of Japan, Mongolia and Russian Far East and extract some characteristics of bilateral relationships.

Russian Far East

From **Table 7a**, in 1992, Russian Far East exported mostly to three major countries in Northeast Asia, which are Japan, Korea and China, but only Russian Far East imported less than expected from Japan. Looking at **Table 7b**, in 1998, export values to Japan became less than expected.¹⁰ More interestingly, China and Korea switched relative importance as trade partners between 1992 and 1998. The main cause of this shift is mainly due to decreased total production. On the other hand, Korea’s position has become more important in Russian Far East mainly through FDI and imports. Korea provides food and machinery for Russian Far East because commodity prices are relatively low compared to Japan. In quality, Japan-made products are much better; however, they are too expensive to imports. Therefore, Russian Far East tends to increase its imports from Korea. In addition, according to **Table 4**, Russian Far East also has a good match with Mongolia in both exports and imports, but actual trade values can’t be analyzed due to the unavailability of trade data between the two countries.

For Russian Far East, it is also important to consider the effect of border trade with

⁹ Russia has to be excluded from the model because Far East is a part of Russia, and it gives a bias estimation if Russia is included.

¹⁰Causes of the decrease in exports from 1992 to 1998 to Japan are explained later.

China. These two countries maintain a strong linkage through border trade, and the importance of border trade may remain stable for both countries. Consequently, Korea and China will both be main trading partners for Russian Far East.

Mongolia

According to **Table 4**, Mongolia is well matched with all Northeast Asian countries as export partners. Looking at actual trade, from **Tables 7a and 7b**, Mongolia imported more from Northeast Asian countries than expected. As for exports, in 1992, Mongolia imported less than expected from Korea, but in 1998, imports from Japan decreased. However, it seems that trade with China remained stable both in exports and imports. Both tables show that China is an important trade partner for Mongolia. Until the late of '80s, Mongolia depended on Russia as a trade partner. However, Mongolia started trading more with China, which is a neighbor of Mongolia, and its share has increased since the collapse of the Soviet Union. Looking at residuals, trade with China is much more than expected. It is considered that Japan and Korea both will also be major trade partners for Mongolia.

Whether or not Mongolia will be able to build a strong linkage with these countries depends on the development of transportation systems. As noted previously, the lack of transportation systems limits the amount of total freight. Therefore, if efficient transportation systems are constructed, Northeast Asian countries will become more important trade partners.

Japan

Even though Japan has high complementarity indices with Northeast Asian countries, its real trade is far less than expected. **Table 7a and 7b** confirm that tendency. From **Table 7a**, Japan exported more than expected only to Korea and imported more than expected only from Russian Far East. However, **Table 7b** shows Japan imported less than expected from all Northeast Asian countries. As for exports, only trade with Mongolia shows positive residuals. These results indicate that there might be some causes hindering trade between Japan and other Northeast Asian countries. Taking its high complementarity index into consideration, Japan should trade much more with Northeast Asian countries. For example, Japan's imports from Russian Far East will be affected negatively due to the failure of ongoing natural resource related projects. Besides, import commodities from Northeast Asian countries are mainly primary commodities, which are fairly easily affected by international prices. Therefore, one should not jump to the conclusion that Northeast Asian countries are not so very

important to Japan as trade partners.

As for the Japan and Korea relationship, it is understandable because Korea has become a major competitor of Japan in international trade; therefore, trade with Korea is less than expected. On the contrary, it is surprising that in 1998 Japan traded with Russian Far East less than expected and trade values decreased both in exports and imports. Considering complementarity with Russian Far East, trade values with Russian Far East should be more substantial than expected. There are some possible explanations for why Japan's trade with Russian Far East is not so substantial.

Considering commodities imported from Russian Far East, they are mostly (1) fish products, (2) natural resources, (3) wood and pulp. As for fish products, the real amount of exports from Russian Far East to Japan is not observable due to a lack of data for actual trade volume in Russian Far East. In Russian Far East, unregistered exports of fish products are very large but its actual trade values can't be estimated. Therefore, official statistics show small values of trade compared to actual trade. Japan's imports from Russian Far East become more substantial if all unregistered exports are included in trade statistics. Japan also depends on imports of natural resources from Russian Far East. However, the entire industry's amount of production decreased in 1998 due to financial crisis. It is considered that this fall in production may hinder exports of natural resources to Japan. Japan is also one of the largest timber importers, as well as China and South Korea. Between 1990 and 1999, wood output decreased 75%. This is mainly due to aging harvesting and wood processing equipment, which caused a consequent decrease in total production. It is considered that the decrease in total production of wood negatively affected trade values, mainly bilateral trade between Japan and Russian Far East. However, in 2001, the situation has changed due to a weakening of the rubles. During 2001, Russian output is expected to expand in most timber sectors, and Russia's timber exports are also expected to rise as a weakened ruble improve price competitiveness in world markets. Russia's timber exports in 2000 were significantly up from 1998 levels.¹¹ Although poor infrastructure and the lack of railway connections hinder development of this industry, Russia still has a lot of potential to increase its production and exports.

If these factors are all taken into consideration, Japan imported more from Russian Far East. Considering entire trade relations with other Northeast Asian countries, it might be characterized as one-way relations, which is, other countries such as China, Mongolia and Russian Far East somewhat depend on trade with Japan. On the contrary, for Japan,

¹¹ Dow Jones Commodities Service, 05/03/2001.

trade with Northeast Asian countries is not so substantial compared to trade with other countries.

To all Northeast Asian countries, it should be noticed that Korea's role becomes increasingly important. Most countries have good relations with Korea, politically and economically; therefore, Korea could possibly be a key country in leading regional cooperation. Japan should also assist Korea, and its main role will be to provide financial and technological assistance.

4. Impact of ECOTECH on Intra-Regional Trade and Individual Countries

The above explanations reveal the different degrees of involvement in intra-regional trade from country to country; such as Japan tending to trade less with Northeast Asian countries than expected. Contrarily, Korea seems to play an important role in intra-trade. In this section, analysis focuses on the impact of economic cooperation on intra-regional trade and an individual economy. Although the degree of involvement in intra-regional trade differs from country to country, it is considered that if economic relations become strong, it will benefit all Northeast Asian economies. In this regard, ECOTECH activities will have positive implications, and it is interesting to estimate the economic impact of these activities.

4.1. Expected effects of ECOTECH activities in Northeast Asia¹²

Internet Business Cooperation in APEC¹³

APEC has recently focused on the role of IT development in the Asia-Pacific region, and has emphasized the importance of technology transfer and regional cooperation. Also, APEC has been working on promoting Economic and Technical Cooperation, which is called "ECOTECH". ECOTECH includes various kinds of projects, which are closely related to development of Internet Business. The APEC Leaders' Meeting held in Brunei in 2000 declared the implementation of APEC's IT related activities. This includes action agendas focusing on developing a policy environment conducive to

¹² The discussion presented here is based on presentations from APEC Study Center Japan Consortium 6th Annual Meeting held in December 2000.

¹³ Based on a presentation from "Internet Business Cooperation in Northeast Asia and APEC", Yoo Soo Hong.

increasing investment in infrastructure and the development of technology; inducing innovation and entrepreneurship and building human capacity and knowledge through comprehensive and high-quality education, training and skills development programs, and continue work towards pro-competitive and market based policy frameworks for liberalization of trade in telecommunications and IT services; promoting cooperation between governments and the business sectors to work towards affordable quality access to telecommunications services and the internet for all APEC economies.

Internet Business, such as Internet access service, on-line advertisement and e-commerce, is characterized as a rapidly growing industry and clearly receives a lot of attention as one of the most profitable industries. Individual firms and consumers also benefit from Internet business. Compared to a physical marketplace transaction, Internet based transactions reduce transaction processes and costs. As a result, the development of e-transactions will enhance overall efficiency of individual firms and consumers will be able to achieve higher levels of consumption. In order to achieve desirable benefits, future economic cooperation should progress toward strengthening ties in Internet related industries within Northeast Asia. Successful Internet business cooperation in Northeast Asia will contribute to enhancing not only each economies' overall efficiency but also intra-regional economic cooperation itself.

Russia and China will receive the most benefits from promoting internet business along with cooperation. Considering Russia's well-developed technology and well-educated labor, Russia will fairly easily accomplish the introduction of internet business. However, the most serious problem Russia faces is the failure to connect high technology and human capital to management skills such as quality control, production management, and so on. A lack of management skills hinders the development of not only private firms but also the entire Russian economy. Internet business cooperation will contribute to alleviating these issues, and the results will improve productivity by transferring information technology together with management skills. China also has high potential for developing its IT industry due to its relatively well-educated labor force. However, China has similar problems to Russia's which also need to be solved. If these constraints are resolved by cooperation or ECOTECH activities, Russia and China will be strong competitors in IT industry.

As a result, successful cooperation among APEC will enhance relations among Northeast economies, and the promotion of internet business would also bring higher productivity to Russia and China. Therefore, in addition to cooperative efforts among APEC countries, Korea and Japan, as a leading countries in technology, should also simultaneously make efforts to provide IT related technology and if necessary,

management skills and appropriate training. Due to these favorable effects, internet business related projects should be strengthened further.

Development of Natural Gas Infrastructure in APEC¹⁴

Japan and Korea are both large consumers and importers of natural gas. Therefore, its stable supply is a critical issue. APEC recognizes the importance of stabilizing the supply of natural gas. In 1988, The Natural Gas Initiative endorsed by Energy Ministers at their 3rd meeting was presented at the APEC Economic Leaders meeting in November 1998. There are still plenty of underdeveloped natural resources in Russian Far East regions, and development of natural resources is an important issue. Northeast Asia, particularly Japan and Korea, benefit most from participating in projects associated with these underdeveloped resources because it facilitates and stabilizes supplies of resources, and it also stimulates intra-regional trade. However, while promoting these projects, political relations become a key factor as to whether or not ongoing projects end successfully. Obviously, the Japan and Russia relationship continues as one of the toughest issues because of the unresolved territorial dispute between Russia and Japan, which becomes an obstacle to fulfilling projects. Therefore, Japan has another reason to become involved in APEC activities meant to develop natural resources; this will also enhance bilateral relationships.

Although these APEC activities facilitate liberalization of trade and investment, they also support development of intra-regional trade and Northeast Asia relations. APEC activities provide various kinds of cooperation, and using the APEC framework will make it possible to expand regional cooperation and also moderate political relations.

4.2 Simulation by Incorporating Effects of ECOTECH Activities¹⁵

The above discussions clarify the role of APEC activities in promoting intra-regional trade and Northeast Asian relations. In this analysis, the author conducts simulations by assuming that APEC activities succeed in having positive impacts on intra-regional trade. As mentioned above, it is considered that APEC activities such as internet business cooperation and natural resource development, facilitate intra-regional trade. In

¹⁴ Based on a presentation from “APEC’s Natural Gas Initiative and Northeast Asia”, Vladimir Ivanov.

¹⁵ This simulation is based on Okuda’s previous work (1998). The author would like to thank Okuda for his insightful comment in conducting this simulation. However, the author is solely responsible for views expressed here.

addition, according to Urata (1995), an increase in exports also contributes to rapid economic expansion through creating a continuous cycle, which is, expanding exports attract investment and promote domestic production, and greater production improves overall efficiency. Therefore, expanding exports is considered to have a positive impact on productivity. Simulations are conducted based on the following assumptions:

- (1) As a result of the development of internet business cooperation, markets will expand for all Northeast Asian countries because it will integrate economies electronically. This will result in an increase to the Northeast dummy variable.
- (2) Since cooperation in developing natural gas will progress, this will also lead to increased intra-regional trade. In addition, taking several ongoing projects into consideration, if projects are completed successfully, intra-regional trade will become more active and result in a consequent increase to the Northeast dummy variable.
- (3) It also should be noted that several ongoing projects will improve the transportation infrastructure, as referred to in section 3. The completion of these projects will lead to a decrease in the inland dummy variable.
- (4) However, improvements from these projects will appear moderately. Therefore, considering all effects, the Northeast dummy and inland dummy will increase by 10% and 5% respectively.
- (5) Under these assumptions, the estimations are conducted using equation (3).¹⁶ Actual trade values for 1998 are used for the calculations by adopting new increased dummy variables.

Table 8 shows expected values from equation (3), and **Table 9** shows discrepancies between expected values and actual trade values. From **Table 9**, Japan, Korea and China all imported more than expected with Russian Far East; however, only Russian Far East imported more than expected from Korea. Russian Far East and Mongolia seem to depend on intra-regional trade. **Table 10 and Table 11** show simulation results. **Table 10** shows discrepancies between projected trade values and actual trade values, and

¹⁶ The dependent variable is the export value from country *i* to country *j*. The method used here is to apply the new coefficients for equation (3) and calculate a new expected value for the dependent variable. This becomes projected (expected) values. Increased coefficients result in expanding intra-regional trade values. In this analysis, as seen from Table 9, most countries traded less than expected values; therefore, show negative values. Adopting increased coefficients must shrink these discrepancies, and based on assumptions discussed above the degree of decrease in discrepancies is estimated as gains.

Table 11 presents growth rates of intra-regional trade.

Under the above assumptions, simulated total intra-regional trade increased by 19.5%. Looking at total intra-regional trade, the impact of ECOTECH activities is very limited. This is because APEC activities focusing on a specific region will produce small effects, and this implication points out the importance of organizing projects based on a more global perspective. From the table, the most remarkable point is that Japan will strengthen trade relations with Korea, China, and Russian Far East as a result of ECOTECH activities. On the contrary, Russian Far East and Mongolia, which are both characterized as less developed, showed slight improvements to intra-regional trade.

This analysis excludes some important factors in considering expansion of intra-regional trade. First, natural gas initiatives are mostly related to the Japan and Russian Far East trade relationship. If the supply of natural gas increases, Japan will import more from Russian Far East. Therefore, the Japan and Russian Far East relationship would strengthen and would bring a consequent increase to total intra-regional trade. Second, in this analysis, trade between Mongolia and Russian Far East was excluded due to insufficient data availability. Considering that Mongolia and Russian Far East show a relatively high complementarity index both in exports and imports, the lack of sufficient bilateral data limits the gains from intra-regional trade.

Conclusions

This paper analyzes the impact of ECOTECH activities by focusing on Northeast Asia. The main findings are summarized as follows:

- (1) Northeast Asian economies have resource complementarities, i.e., Japan and Korea can provide technology, capital and equipment, and management skills, and Far East, Mongolia and China can provide human and natural resources. If these complementarities are combined effectively, Northeast Asia will achieve regional economic growth and development by activating intra-trade.
- (2) In order to promote intra-trade, cooperative activities should remove many obstacles impeding progress. In particular, constructing a transportation system is a central issue. Several ongoing projects are underway, and if these projects end successfully, all Northeast Asian economies will benefit from the positive effects.
- (3) In Northeast Asia, particular bilateral political relationships remain complicated, such as Japan-Russia relations. Without solving territorial issues, economic cooperation based on bilateral assistance will be difficult. Therefore, in considering

- (4) economic cooperation, a multinational framework is much more important. In Northeast Asia, it is desirable for Korea to take a leadership role in promoting cooperation.
- (5) ECOTECH activities, provided by APEC, are also important to developing economic cooperation. Several activities are strongly related to economic growth in Northeast Asian economies. For example, internet business cooperation extends markets because electronic transactions connect markets beyond a country's borders. In addition, a natural gas initiative taken by APEC suggests further involvement and assistance by APEC member economies in developing natural resources. Both of these factors contribute to increased intra-trade in Northeast Asia; however, its effects will be rather small if projects and activities are targeted to a limited region.
- (6) Participation in ECOTECH activities and promotion of regional cooperation will facilitate liberalization of trade and investment, which also produce desirable effects on the economy.
- (7) The entire region's economic growth will expand the markets for all Northeast Asian countries, and this will result in further economic growth and development. Further strengthening of economic relations are expected to affect political relations positively.

APPENDIX

Data and Sample Countries Used for Gravity Analysis

Trade data:

Nominal U.S. dollars in billions and natural log transformed. Data came mainly from the IMF, *Direction of Trade Statistics*, except for Taiwan. Since the IMF doesn't provide Taiwan's trade data, bilateral export figures with Taiwan were taken from the Department of Statistics, Ministry of Finance, Republic of China, *Monthly Statistics of Exports and Imports, Taiwan Area, the Republic of China*. Trade data used in this analysis are mainly export figures. However, import figures recorded in the partner countries were used instead if export figures were not available. Trade data for the Far East came from the Institute for Russian and European Economic Studies, *Russian Far East in Figures, 1999*.

GDP figures:

Nominal US dollars in billions, natural log transformed. Main data source is IMF, *International Financial Statistics (IFS)*, and data for the Far East came from the Institute for Russian and European Economic Studies, *Russian Far East in Figures, 1999*. GDP figures in national currencies were converted using the average exchange rate for each year (series *rf* in IFS).

Distance:

Estimated in miles, natural log transformed. Most data of distances between two major cities or ports were taken from Fujita (1999). The author calculated the distance based on Fujita (1999) for the countries not included in her analysis.

Countries included in the sample:

(1) APEC member economies, excluding Papua New Guinea and Brunei; (2) CIS (Kazakhstan, Ukraine, Belarus); (3) EU (UK, France, Germany, Italy, Netherlands, Finland, Ireland); (4) East Europe (Hungary, Poland); (5) Other countries not included in any of the above categories: Mongolia, Switzerland, and India.

References

- Asian Development Bank, *Key Indicators of Developing Asian and Pacific Countries*, various years.
- China, *Statistics of Capital Stock Investment in China*, Chinese Statistics Publications, 1998.
- Easterly, William, and Fischer Stanley, “The Soviet Economic Decline: Historical and Republican Data”, NBER Working Paper Series, No. 4735, National Bureau of Economic Research, 1994.
- Fujita, Mai, “Vietnam in APEC: Changes in Trade Patterns After the Open Door Policy” in Satoru Okuda ed., *Trade Liberalization and Facilitation in APEC—A Re-evaluation of APEC Activities*, APEC Study Center, Institute of Developing Economies, Tokyo, 1999.
- Fukumoto, Mayumi, “Russia’s Participation in APEC and Economic Development in the Far East”, in Satoru Okuda ed, *Industrial Linkage and Direct Investment in APEC*, APEC Study Center, Institute of Developing Economies, Tokyo, 2000.
- Institute for International Trade and Investment, “Economic Trend and Investment Infrastructure in the Russian Fareast”, Institute for International trade and Investment, 1999.
- International Monetary Fund(IMF), *Direction of Trade*, various years.
- International Monetary Fund(IMF), *International Financial Statistics*, various years.
- Interstate Statistical Committee of the Commonwealth of Independent States, *Commonwealth of Independent States Statistical Yearbook*, Moscow, 1998.
- Kawai, Hiroki, “International Comparative Analysis of Economic Growth: Trade Liberalization and Productivity”, *The Developing Economies*, volume xxx (4, December) IDE, Tokyo, 1994.
- Okuda, Satoru, “Trade Flow and Foreign Direct Investment in APEC Region” in Keiji Omura ed., *The View of Economic and Technology Cooperation in APEC*, APEC Study Center, Institute of Developing Economies, Tokyo, 1997.
- Okuda, Satoru, “Can a Sub-Regional Group Enhance the Tie?-With Emphasis on East Asia” in Keiji Omura ed., *The Deepening Economic Interdependence in the APEC Region*, APEC Study Center, Institute of Developing Economies, Tokyo, 1998.
- Okuda, Satoru, “The Role of Exports in Korea”, Institute of Developing Economies, JETRO, Tokyo, 2000.
- Republic of China, Executive Yuan, Directorate-General of Budget, Accounting and Statistics, *Statistical Yearbook of the Republic of China*, 1998.
- Shimazu, Asami, “Situation of the Russian Timber Producing Areas and the Timber Trade between Japan and Russia”, Monthly Bulletin of Trade with Russia & East

- Europe, September, 1999.
- State Committee of the Russian Federation of Statistics, *Russia in Figures*, Moscow, 1998.
- State Committee of the Russian Federation of Statistics, *Russian Regional Statistics* (Регионы России), Moscow, 1998.
- The Economic Research Institute for Northeast Asia (ERINA), “Northeast Asia Economic Report”, Niigata, 1999.
- United Nations, *Economic Survey of Latin America and the Caribbean*, 1997-1998.
- United Nations, *National Accounts Statistics*, various years.
- United Nations, *Statistical Yearbook for Asia and the Pacific*, 1998.
- Urata, Shujiro, “Trade Liberalization and Productivity Growth in Asia: Introduction and Major Findings”, *The Developing Economies*, volume xxx (4, December), IDE, Tokyo, 1994.
- World Bank, *The East Asian Miracle –Economic Growth and Pacific Policy-*, New York: Oxford University Press, 1993.
- World Bank, *World Development Report*, Washington, D.C.: Oxford University Press, various years.