CGE Analysis on How Formations of FTAs in East Asia Affect Energy Markets

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FTAs in Asia, such as ASEAN, ASEAN+3 and so on, have been forming rapidly. In 2001 Japan, China, Korea and ASEAN agreed to build East Asian FTA progressively by adding up bilateral FTAs. In that sense, we evaluate the impact of some cases of FTA within East Asia quantitatively using CGE in terms of demand and supply of energy, energy security.

Keywords : FTA, CGE, Energy Markets, Supply and Demand of Energy, Energy Security

1. Introduction

FTAs centering on ASEAN have been forming rapidly in Asia, mainly on a bilateral basis. In November 2001, an ASEAN-China FTA concept was proposed at a summit meeting of ASEAN countries and China in Brunei, and the leaders agreed to establish an ASEAN-China FTA within 10 years. At a summit meeting of ASEAN plus 3 (Japan, China, and South Korea) last year, the leaders agreed to build an East Asia FTA progressively by adding up bilateral FTAs, such as ASEAN-Japan FTA and ASEAN-China FTA, in the medium- and long-term.

The purpose of this analysis is to evaluate the impact of FTA formation on the Asian energy markets quantitatively from the aspect of economic effects, energy supply/demand and energy security and thereby, contribute to policy formation.

2. Analysis

By using a general equilibrium model, we make a quantitative analysis with regard to what impacts the changes, etc. of terms of trade, brought about by the conclusion of FTAs, will have on industrial structure, resource allocation, income distribution, and the energy market through changes in relative prices and consequent changes in behavior of economic entities. A general equilibrium model is an excellent tool to analyze market transactions and inter-market transactions conducted by economic entities, such as households and enterprises that play important roles in the actual economy, based on maximization of utility or maximization of profit (cost minimization). For this research, we use the applied general equilibrium model developed by GTAP, which was established by Prof. Thomas W. Hertel of Purdue University for the purpose of evaluating the impact of global trade on countries in the

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world.

2.1 Model Framework

As the macro frame of the model, we assume that there exist enterprises, private households, and government in each country/region. In the GTAP model, private households and government are treated as broadly-defined regional households. Therefore, expenditures of regional households are defined as the sum of private consumption expenditures and government consumption expenditure.

Private households possess production factors – labor, capital, and land – and gain factor income by providing the production factors to enterprises. On the other hand, government obtains revenue from income tax on private households and taxes on products and merchandise trade by enterprises (negative revenue in the case of subsidies).

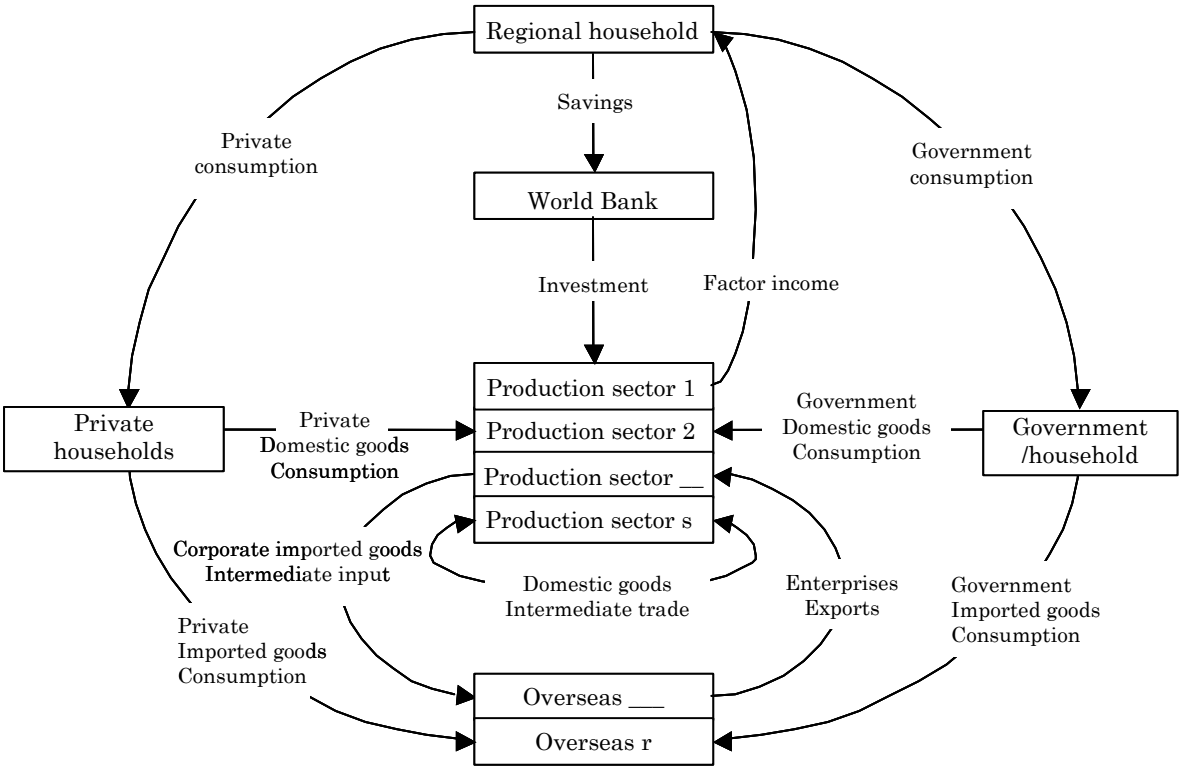

Figure 1: GTAP Macro Frame

The portion left over, after subtracting capital consumption from the sum of the factor income of private households and government revenues from taxes on products and merchandise trade, is defined as the income of regional households. Of the regional income, the portion exceeding the sum of private consumption expenditure and government consumption expenditure is saved and spent on investment by enterprises.

2.2 Regional/Industrial Divisions

There are 10 regional divisions. East Asia, as the subject of FTA research, is divided into Japan, China (including Hong Kong), South Korea, ASEAN (Indonesia, Malaysia, Singapore, Philippines, Thailand, Vietam), and Taiwan. From the perspective of energy supplying region/country, divisions for the Middle East and Russia, which is drawing attention as a future energy supplying country to East Asia, were established.

As for industrial divisions, there are 24 divisions in order to facilitate quantitative understanding of the impact of FTAs on the macroeconomy and energy market. The mining industry has oil, coal and gas divisions, and the manufacturing industry has machine, transport machine and petroelum/coal product divisions.

Table 1: Regional Division

Name of Country/Region	Title	Country/Region included
1. Japan	Japan	Japan
2. China	China	China, Hong Kong
3. South Korea	Korea	Korea
4. ASEAN	ASEAN	Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam
5. Taiwan	Taiwan	Taiwan
6. Middle East	Middle East	Middle Eastern countries
7. Russia	Russia	Russia
8. NAFTA	NAFTA	U.S., Canada, Mexico
9. Europe	Europe	Austria, Belgium, Denmark, Finland, France, Germany, U.K., Greece, Ireland, Italy, Luxemburg, Netherlands, Spain, Sweden, Albania, Bulgaria, Croatia, Czech, Hungary, Malta, Poland, Romania, Slovakia, Slovenia, Cyprus, Turkey
10. Other countries/regions	ROW	Other countries/regions

Source: GTAP Data Base, Version5.0

Table 2: Industrial Division

Industry	Title	Industries included
1. Agriculture	Agriculture	forestry and fisheries industry; Agriculture; Rice, wheat, other grains, non-grain crop, wool, other stock farm products, forest products, marine products
2. Construction	Construction	Construction
3. Mining-Coal	Mining_Coal	Coal
4. Mining-Oil	Mining_Oil	Oil
5. Mining-Gas	Mining_Gas	Gas
6. Mining-Other	Mining_Other	Other minerals
7. Manufacturing-Processed food	Mnf_ProFood	Mnf-ProFood; Rice products, meat products; dairy products, other processed foods, beverage and tobacco
8. Manufacturing-Textile	Mnf_TexAppa	Textile, Clothing
9. Manufacturing-Leather	Mnf_Leather	Leather products
10. Manufacturing-Paper/Pulp	Mnf_Chem	Paper/pulp, printing
11. Manufacturing-Chemicals	Mnf_Chem	Chemical/sythetic rubber/plastic products
12. Manufacturing-Steel	Mnf_NonFeMet	Iron and steel
13. Manufacturing-Nonferrous metal	Mnf_NonFeMet	Nonferrous metal, metal products
14. Manufacturing-Petroleum products	Mnf_PetCoa	Petroleum products, coal products
15. Manufacturing-Transport machi	Mnf_Transpor	Transport machinery
16. Manufacturing-Transport equipment	Mnf_TranEqui	Transport equipment
17. Manufacturing-machinery	Mnf_Machine	Machinery
18. Manufacturing-Other	Mnf_Other	Other manufacturing
19. Service-Electric power	Sv_Elec	Electric power
20. Service-Gas	Sv_Gas	Gas
21. Service-Transport	Sv_Transport	Transportation
22. Service-Trade	Sv_Trade	Trade
23. Service-Public	Sv_Public	Government services
24. Service-Other	Sv_Others	Other services

Source: STAP Data Base. Version 5.0

2.3 Case Setting

We worked out six cases for concluding FTAs, mainly cases where moves toward conclusion of FTAs have begun. In addition, we included a case covering all of East Asia, including Russia.

Case 5 is a case of concluding an FTA for all of East Asia, including Russia. As regional energy demand in ASEAN plus 3 is expected to increase sharply in the future, there is a need to examine the impact of incorporating Russia, a potential energy supplier, in an FTA conclusion. We included Taiwan in Case 6 to study the impact of an FTA conclusion for all of East Asia.

Table 3 Setting Cases for Simulation

Case	Abbr. of Case	Content
CASE 1	China-ASEAN	Conclusion of FTA between China and ASEAN
CASE 2	Japan-South Korea	Conclusion of FTA between Japan and South Korea
CASE 3	Japan-China-South Korea	Conclusion of FTA among Japan, China and South Korea
CASE 4	ASEAN+3	Conclusion of FTA among Japan, South Korea, China, and ASEAN
CASE 5	ASEAN+3+Russia	Conclusion of FTA among Japan, South Korea, China, ASEAN, and Russia
CASE 6	ASEAN+3+Russia+Taiwan	Conclusion of FTA among Japan, South Korea, China, ASEAN, Russia, and Taiwan

Note 1) ASEAN here is defined as the six main countries: Indonesia, Malaysia, Singaproe, Philippines, Thailand, and Vietnam.

3. Simulation Results

3.1 Impact on Macroeconomy

●GDP and equivalent variation (change in consmer's utility) increase as a result of FTA conclusion, and the welfare standard of the people of contracting parties to the FTA rises. In principle, the larger the economic size of the FTA contracting parties, the higher the increase in the welfare standard.

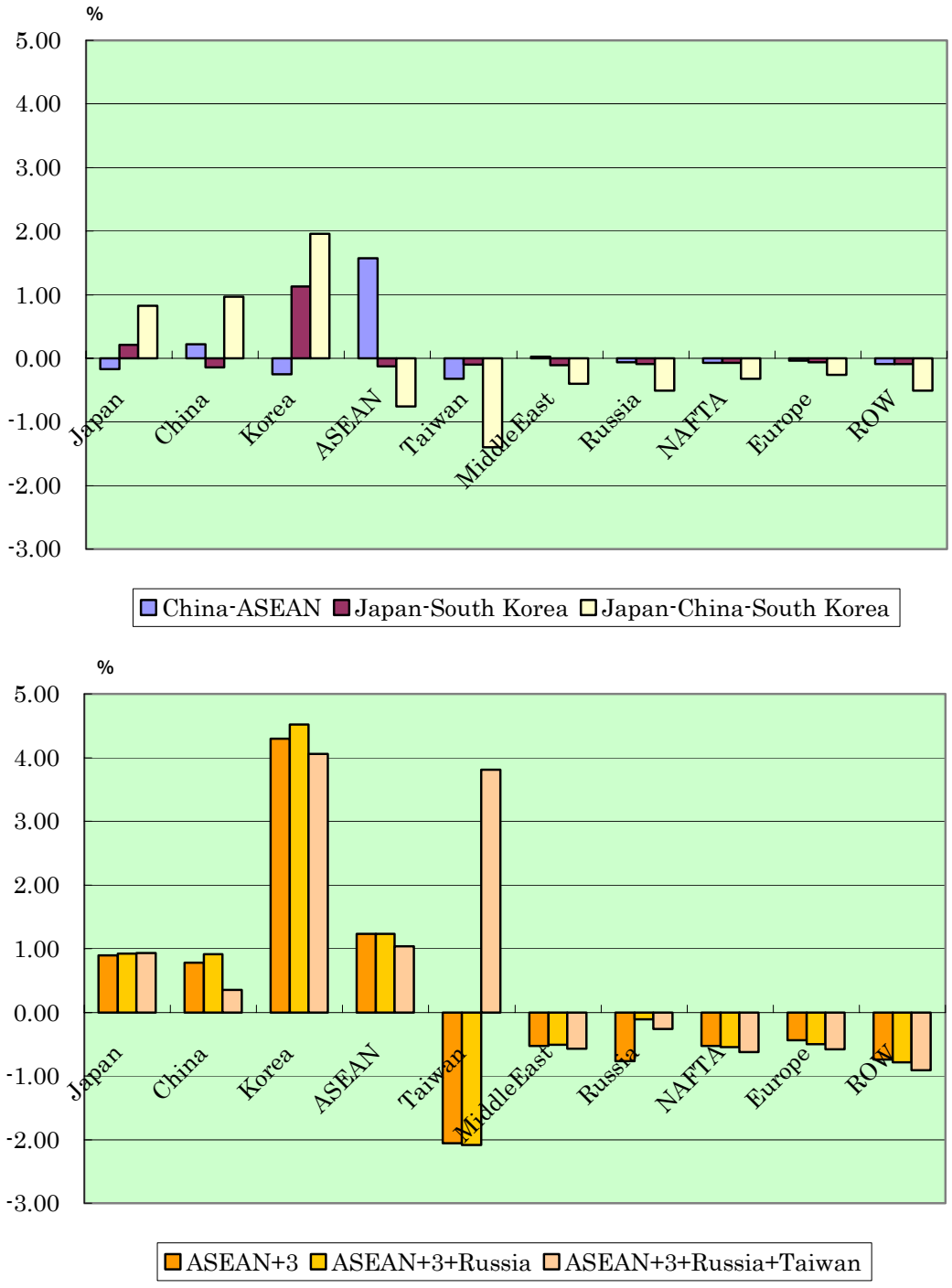

Figure 2: GDP Change Caused by FTA

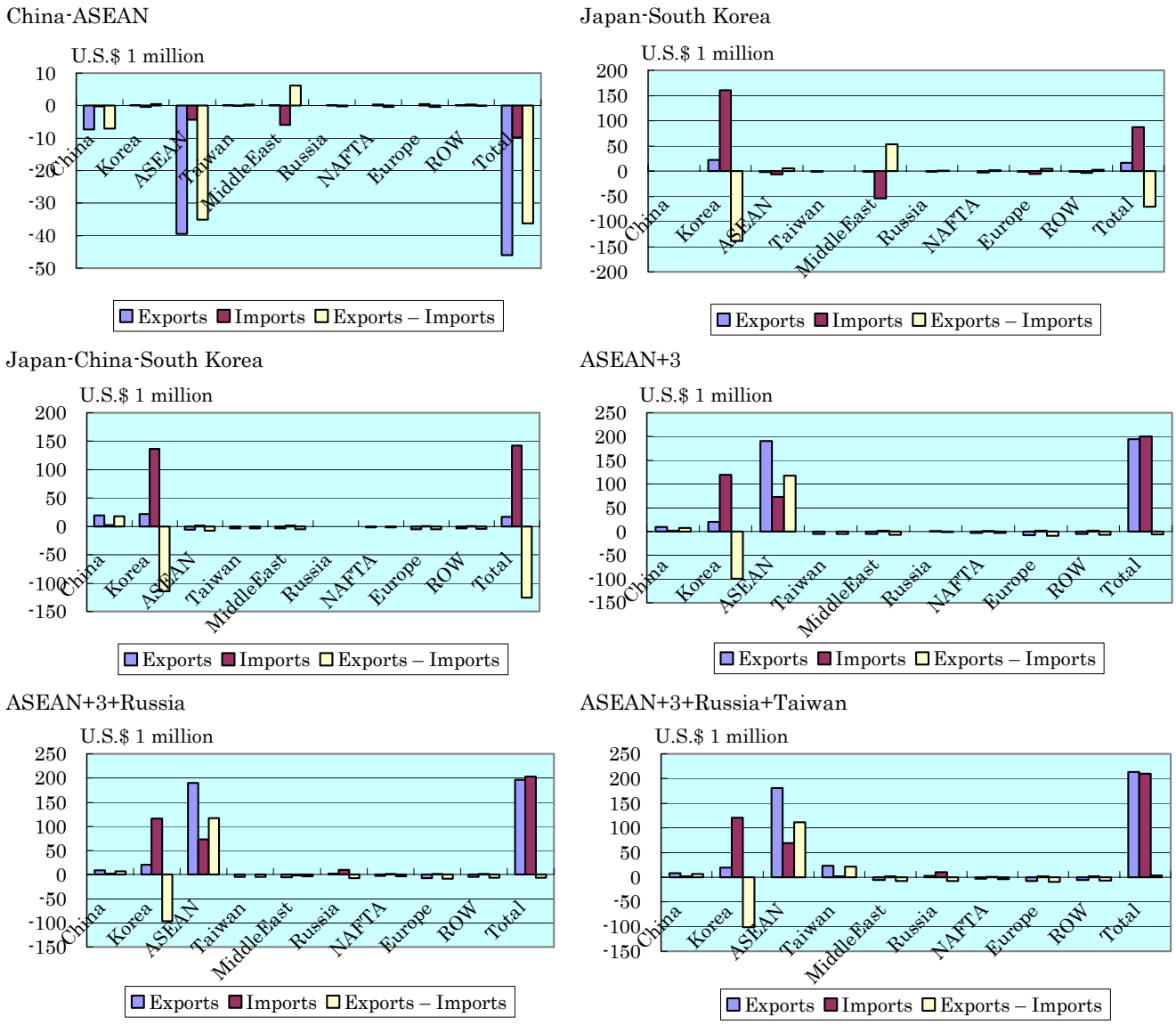

Figure 3: Impact of FTA on Japan's Petroleum/Coal Product Exports and Trade Balance

●On the other hand, conclusion of a bilateral or bloc economy-type FTA decreases GDP and equivalent variation of non-contracting parties.

●Trade balance of FTA contracting parties in principle deteriorates due to increases in imports of capital goods, etc. caused by the price effect of tariff abolition.

●The impact of FTA conclusion is larger on countries/regions with high tariffs and other trade barriers.

3.2 Impact on Energy Market

●The impact of FTA conclusion is high on petroleum/coal products and crude oil, whose import barriers, including tariffs, are high, while low on gas and coal, whose import barriers, including tariffs, are low.

●Conclusion of an FTA causes wild fluctuation in the trade flow of petroleum products. Conclusion of an FTA in any case causes a negative effect on Japan's petroleum/coal product trade balance. The Japan-China-South Korea FTA has the largest negative effect on the trade balance.

●However, in the FTA cases of Japan-China-South Korea, ASEAN+3, ASEAN+3+Russia, or ASEAN+3+Russia+Taiwan, domestic prouction of petroelum/coal products increases in Japan.

●Conclusion of an ASEAN+3 level of FTA raises Japan's and ASEAN+3's dependence on Middle East oil by 1.3 and 0.5 percentage points, respectively.

●As for the energy supply potential of ASEAN+3, its confirmed oil deposits account for only 2.6% of the total deposits in the world, and they are decreasing by about 4% every year. As for confirmed natural gas reserves, ASEAN+3 accounts for about 4% of the global reserves, but stands at only one-seventh that in Russia.

●Considering future energy development in Siberia and Sakhalin, Russian has great potential to become an energy supplier to Asia.

●This is borne out by the fact that simulations of FTA cases in which Russian takes part show a sharp increase in Russian's exports of crude oil and petroleum products.

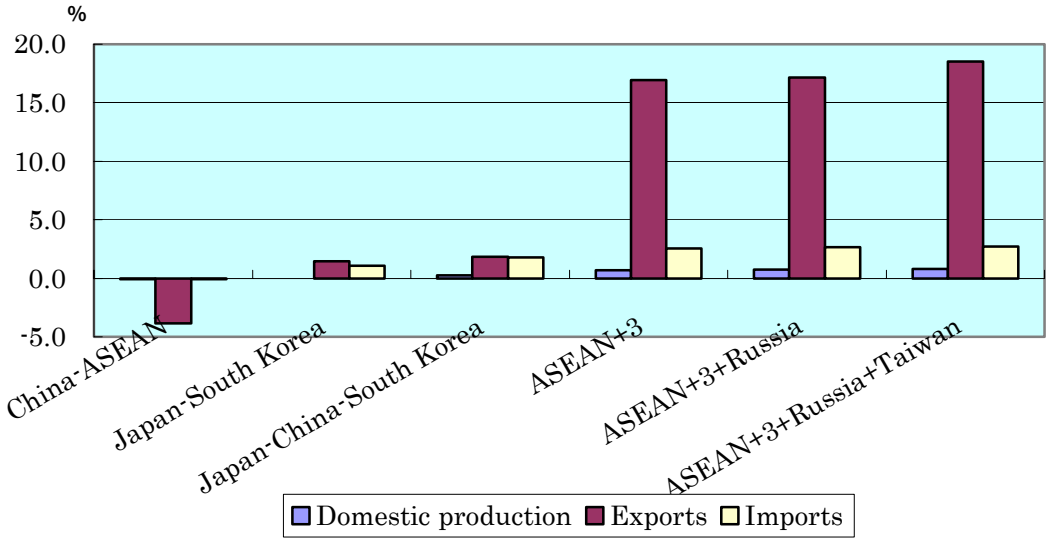

Figure 4: Impact of FTA on Japan's Domestic Production, Exports, and Imports of Oil and Coal Products

4. Policy Implication

4.1 Strategic Use of FTA by Japan

●In order to survive amid accelerating globalization, it is necessary to enhance Japan's competitiveness, as well as Asia's, by strategically utilizing FTAs.

●Japan should promote formation of FTAs in Asia promptly, keeping in mind that conclusion of FTAs with its major Asian trading countries is incomparably more important than an FTA with Mexico.

4.2 Further Strengthening of the Competitiveness of the Oil Refining Industry (Promotion of Strategy Keeping FTA in Sight)

●Conclusion of an FTA could drastically change the trade flow of petroleum products. Conclusion of an FTA intensifies competition in transactions of petroleum products within the region

●In view of the fact that demand for petroluem products has been increasing rapidly in China, it is necessary for Japan to study comprehensive measures, including promotion of oil refining businesses in China.

4.3 Promotion of FTA Strategy Incorporating Energy Strategy in Asia

●Since an ASEAN+3 level of FTA has a strong effect of expanding GDP, it will result in increasing energy demand and further increase the dependence on Middle East.

●Therefore, it is necessary to address the following problems by utilizing FTAs, centering on the framwork of ASEAN+3.

①Establishment of emergency response measures, such as stockpiling of oil
②Establishment of energy infrastructure
③Promotion of efficient utilization of energy and energy-saving technology
④Diversification of energy sources, including development and introduction of nonfossil fuel.
⑤Fund-raising methods for establishment of energy infrastructure
⑥Establishment of an investment environment through liberalization of the energy market
⑦Utilization of cleaner energy

4.4 Study on ASEAN+4 FTA incorporating Russia

●While demand for energy in the ASEAN+3 area is expected to increase sharply, the area is not endowed with energy resources to meet the increasing demand. Therefore, from the standpoint of energy security (diversification of supply sources), it would be better to study a framework incorporating Russia, which is blessed with abundant energy resources (oil and natural gas resources in Siberia and Sakhalin), into the area.

●We believe that an ASEAN+4, including Russia, is an important framework that deserves serious study in order to comprehensively promote matching energy supply and demand, to ensure energy security in the ASEAN+3 area, energy development in the Russian Far East, expansion of direct investment from abroad, and balanced development of Russia.

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