

Provisional Version of Asian Forest Products Trade Model (AFPM) and Examination on the Request of Free Trade on Forest Products by WTO

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1. Macro Simulation Model and International Negotiation of Environmental Problems

Environmental problems have got the determined status as the global issue from late 1980s'. A lot of international agreements have concluded during the time. In the process of construction of these agreements reliable scientific data and future expectation on the problems are indispensable. In the process of Framework Convention on Climate Change (FCCC), Intergovernmental Panel on Climate Change (IPCC) has set up. IPCC was the panel of submitting the scientific assessment by experts of global warming from many countries backed up by United Nations. On the construction of the macro simulation model and scenario analysis of global climate change 170 natural scientists had joined from 25 countries, and the draft was circulated to 200 scientists. The result has published in 1990, and it has been the basis of the negotiation of FCCC in 1992. Yonemoto (1994) defined such approach as scientific consensus of future expectation. This process seems to indicate the orientation of the negotiation of various environmental problems on global scale.

Also on the process of the negotiation of free trade of forest products, such approach has emerged from U.S. government. USTR published a report named 'Accelerated Tariff Liberalization in the Forest Products Sector: A Study of the Economic and Environmental Effects'. In the report USTR supported Accelerated tariff liberalization in the forest products sector by scenario analysis using spatial equilibrium models constructed by FAO (GFPM) and CINTRAFOR. The analysis and the interpretation of the results seem to have many disputable points, but there is no mechanism of scientific assessment in international organizations and governments in each country in the negotiation of free trade. Only NGO has been against these results, but they have no enough expertise to evaluate them scientifically.

Therefore the scientific evaluation of the result of report of USTR and alternative simulation are necessary to begin the free trade negotiation of forest products in the New Round of WTO.

This report will mention about the process of recent trade liberalization negotiation, the present situation, and the insistence of USTR from the report, and will discuss some disputable points of free trade effects of forest products. On the latter half Spatial Equilibrium Model of Forest Products in Asian Region which reconstruct referring to GFPM will be introduced and the result of base case until 2020 will be presented.

1. New Round of WTO and Forest Products

1) Recent Trend of Free Trade of Forest Products

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Uruguay Round Trade Results

The major points on tariff reduction in Uruguay Round are follows.

- The tariff reduction consensus of reducing global tariffs by an average one-third from base rates
- Commodity sectors in which tariff elimination was agreed to by major trading partners included beer, brown distilled spirits, pharmaceuticals, steel, construction equipment, agricultural equipment, medical equipment, toys, furniture, and paper and paper products.
- The agreement call for tariff reductions to be made over five years in equal annual staged reductions, although in some cases, such as pulp and paper, the reductions are being implemented over 10 years.
- The agreement of pulp and paper subsector in the zero-for-zero initiative for wood products was among US, EU, Canada, Japan, Korea, Finland, Austria, New Zealand, Hong Kong, Singapore, Australia, Brazil, Chile.
- In the lumber and wood products subsector, the Uruguay Round didn't achieved the zero-for-zero initiative for wood products. US, Canada, EU, Hong Kong, New Zealand, Singapore, and Sweden supported, but Japan did not agree.
- In the furniture subsector, the Uruguay Round achieved a zero-for-zero agreement with key countries with tariffs to be eliminated over five years.

The History of APEC and ATL(Accelerated Tariff Liberalization)

In 1994 APEC leaders agreed to a goal of free and open trade in the APEC region by 2010 for developed countries and by 2020 for developing countries. In 1997 APEC leader nominated 15 sectors including forest products (which was nominated by US, Canada, NZ, Indonesia) for Early Voluntary Sectoral Liberalization (EVSL). Forest Products was also selected as one of the 9 for immediate action. The proposals of Forest Products EVSL Initiative by 4 countries were merged and each country were assigned the study of 4 elements (Tariff initiative, Non-Tariff Measures, Standards and Conformance, Economic and Technical Cooperation). At the APEC summit in November 1998, APEC leaders agreed to move the tariff portions of the sectoral EVSL initiatives to the WTO in order to seek a critical mass of support for concluding an agreement in all eight sectors (because telecommunications MRA didn't contain a tariff component) by the end of 1999. Work on the other elements of the sectoral EVSL initiatives continues within APEC.

The Contents of Tariff Initiative

The ATL initiative includes further reductions and acceleration in the timing of reductions of tariffs agreed to as part of the Uruguay Round. Because of the existence of the Uruguay Round zero-for-zero agreement on pulp, paper, and printed materials, different disciplines were proposed for these commodities than for the other products covered by the proposal. The proposal is:

- For wood chemicals, wood, rattan, and wood furniture, developed countries would eliminate tariffs

by January 1,2002. The proposal suggests that developing countries should strive to meet the same targets, but accepts that in special circumstances and on a case-by-case basis, elimination could be delayed until January 1,2004.

-For pulp, paper, and printed products, existing parties to the Uruguay Round zero-for-zero agreement would accelerate tariff removal to January 1, 2000. Others would attempt to remove tariffs by the same date, but developing countries could delay tariff removal until January 1, 2002, on a case-by-case basis for a limited number of specific products.

2) Support of Tariff Elimination by the Spatial Equilibrium Model in the Report of USTR

Points of Support by the Spatial Equilibrium Models in the Report

The major points of support of tariff elimination by the spatial equilibrium models in the Report of USTR (1999) are as follows.

-The absence of significant changes in production and consumption, at the world scale. For both models, and all products, production and consumption change by less than 1%, and typically by less than 0.5%. compared to the baseline, in 2010.

-Changes in the commodity composition of trade (a shift toward more processed products), and in geographic patterns of production and trade, Both models indicate that the ATL is likely to increase production in, and exports from northern Europe, Oceania (Australia and New Zealand), South America (Chile), and Asia (Indonesia and Malaysia).

-The likelihood of changes in U.S. trade (both imports and exports) – accompanied by little or no net effect on U.S. production and consumption. Both models indicate the likelihood of reductions in U.S. exports of logs and increases in exports of some processed products.

-Finally, both models suggest that the ATL is likely to change timber harvests in a number of countries, but both models indicate the likelihood that the net effect at the world scale will be small – less than 0.5% increase in timber harvests for industrial products.

The other points of supporting the tariff elimination by USTR

There are another points in USTR (1999) which supports tariff elimination.

-Competition will encourage the development of cost- and resource-efficient manufacturing technologies, and increasing use of recovered fiber in the manufacture of paper and paperboard.

-Decreases in timber harvesting will be concentrated in primary forests and the increases will be concentrated in secondary forests and plantations.

-Trade liberalization generally, and the package of ATL initiatives in particular, may contribute to higher incomes, especially in developing countries. There is also widely-accepted evidence that increasing income in developing countries will eventually contribute to greater investments in environmental protection, and a reduction in consumption of fuelwood.

3) Objection to USTR opinion from the viewpoints of the Model Simulation and the Real Situation of South East Asia

Defects of the Analysis in the supportive simulation of tariff abolishment

But there are many defects in the analysis in order to prove the legitimacy of tariff reduction.

-Shortage of the analysis about the effect of change of trade to the situation of forest resources in each country, for example acceleration of harvesting natural forests, and incentive of reforestation or plantation

-Shortage of the analysis of industry structure of forest products industries, for example the monopolistic or oligopolistic character of the industries will distort the people getting the profit of free trade from the principle of free trade.

-Shortage of the study and the quantitative and qualitative comparison about what is the merit of the free trade, and who will get the merit of the tariff elimination and who will lose the profit or who will suffer the disadvantage from it in forest products case.

Real Situation of South East Asia

In the countries which already lost their large part of natural forest like Philippines and Thailand, reforestation is necessary, but reforestation projects by Government can't cover and maintain forests in the countrywide by the financial reason. So economic incentives will be necessary to the planting and tending in private sector. The most important incentive for local people to plant trees as their land use is that they can get profit from selling their yield. In order to do this, the local and the domestic log markets are indispensable because their log from man-made forests are not competitive in international market. Therefore domestic forest industries will be necessary as user of domestic log.

On the other hand in the country under the exploitation of natural forest like Indonesia, now the shortage of material to satisfy the production capacity of processing industries happens. Now in transition period from Suharto era Indonesia need the liberalization in the domestic industrial structure, but they concern about the excessive intervention of IMF and multinational corporations. For example in 1997 IMF made the government to reduce of exporting tariff rate of log, and in 1998 IMF recommended the auction of concession acquisition (i.e. open the concession market to foreign companies). IMF requirement will bring about the opening of the exploitation of forest resources (i.e. material goods). It will accelerate the forest degradation. But the beneficial way of Indonesia is the development of efficient processing industries from the viewpoint of employment and earning of foreign exchange, and on the other side the forests which need conservation should be protect from exploitation as much as possible by the utilization their forest resources for themselves. Therefore their real need is to resource exploitation for their profit and to bring up the domestic processing

industries as the infant industry by domestic competition or competition with not-monopolistic companies.

Considering from all above situation forest products trade should be controlled under the principle of forest sustainability and mitigation of degradation of natural forests.

2. Spatial Equilibrium Model of Forest Products in Asian Region

AFPM is a spatial equilibrium model which analyze the dynamic change of production, consumption, trade in Asia region by reconstructing GFPM by FAO.

1) Structure of AFPM

Objective Countries

Objective countries are divided into the two categories. The first group is consisted of the countries whose variables are solved endogenously, and the other group is exogenous countries.

First group is as follows,

(1) KOREA D P RP, (2) KOREA REP., (3) JAPAN, (4) CHINA, (5) HONG KONG, (6) FIJI, (7) PAPUA.GUIN, (8) PHILIPPINES, (9) INDONESIA, (10) MALAYSIA, (11) SINGAPORE, (12)VIET NAM, (13)THAILAND, (14)CAMBODIA, (15)LAO P.DEM.R, (16)MYANMAR

Second group is as follows,

(17) NEW ZEALAND, (18) AUSTRALIA, (19) USA, PR, USVI, (20) CANADA, (21) RUSSIAN FED, (22) BRAZIL, (23) CHILE, (24)Rest of the WORLD

Production and Trade Data and Objective Products

In order to construct spatial equilibrium model production and trade volume of each product and each country, and trade flow matrices of each product are necessary. In AFPM Production and trade volume, and import and export prices are from Yearbook of Forest Products by FAO. But trade matrices of each country are not found in FAO data. TAS by United Nations Statistical Division are used to make trade flow matrices. Basically TAS data follow values by monetary base, and there are few cases that follow by volume base. Therefore the trade matrices were made from TAS data which had been reported by exporting countries, and the unit export prices of forest products in each country from Yearbook of FAO are used to calculate each export volume. Comparing total export values of each product in each country with FAO data, the obvious discrepancies were adjusted by manipulate the export prices. Next total value of import of each country and each product of trade matrices from TAS data was compared with those from FAO data, and if TAS data were smaller than FAO data, the differences were treated as import value from the rest of the world. ITTO data follows trade matrices of only log, sawnwood, veneer and plywood but they are reliable, so trade matrices were adjusted by ITTO data in some regions and some products.

TAS data are classified by Standard International Trade Classification (SITC), but FAO data have its own classification, therefore product categories in AFPM need some adjustment between TAS

and FAO data. Table 1 shows 15 products of AFPM and the comparison of classification of FAO and TAS. The consistency of two categories were confirmed by comparison of each data.

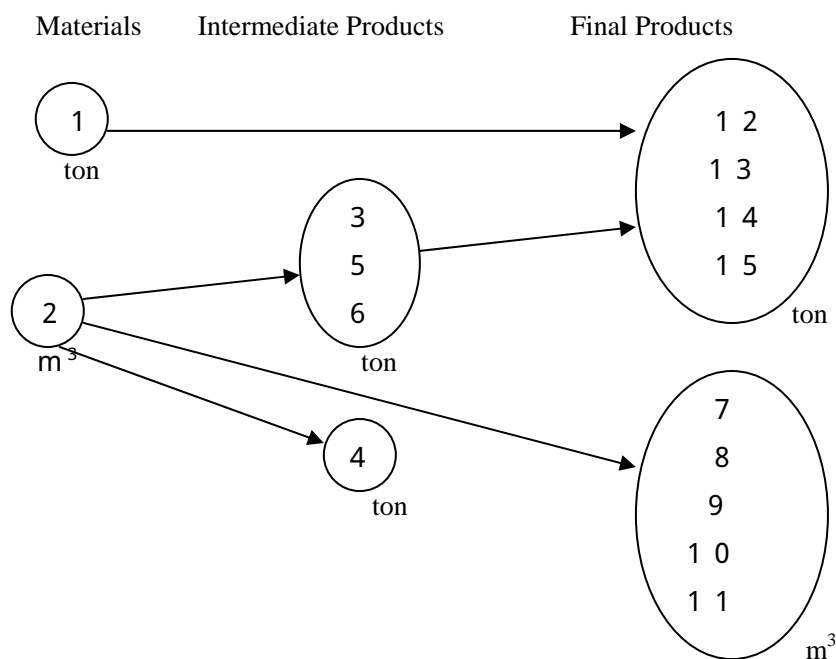
AFPM consists of 15 products. They are divided into materials, intermediate products, final products. Materials are consisted of recovered paper and log. In AFPM log are not divided into conifer and nonconifer wood following the way of GFPM. It is because data of the ratio of input of conifer and nonconifer wood into each final product are very difficult to get. Such integration cause some difficulty of consistency of prices of log and trade direction.

Table 1.

	Name of Product	Classification of FAO Data		Classification of TAS Data
1	Recovered Paper	Recovered Paper	2511	Waste, scrap, paper paperboard
2	Industrial Log	IND-RWD-WIR(C) IND-RWD-WIR(NC)	2474 24751 24752	Wood coniferous, rough, untreated Wood non-coniferous, tropic rough Wood non-coniferous, rough, other
3	Mechanical wood Pulp	Mechanical wood Pulp	2512	Mechanical wood Pulp
4	Dissolving Wood Pulp	Dissolving Wood Pulp	2513	Chem. Wood pulp. Dissolving
5	Chemical wood Pulp	Chemical wood Pulp	25141 25142 25151 25152 2519	Chem. Wood Pulp, conifer Chem. Wood Pulp, non-conifer Chem. Wood Pulp. Conifer, bleached Chem. Wood Pulp. Non-Conifer, blched Chem. Wood Pulp, sulphite
6	Semi-Chemical Pulp	Semi-Chemical wood Pulp	2519	Semi-Chemical Pulps
7	Sawnwood	Sawnwood(C) Sawnwood(NC)	2482 2484	Wood, conifer, sawn Wood, nonconifer, sawn
8	Veneer Sheets	Veneer Sheets	63411 63412	Coniferous, Veneer, etc. Non-conifer, veneer, etc.
9	Particle Board	Particle Board	6342	Densified, reconstit, wood
10	Plywood	Plywood	63431 63439 63441 63449	Plywood, ontr, trop. Nonconifer Plywood, solely wood other Oth, plywood, ontr, trop, nonconifer Plywood, veneer, panel, nes.
11	Fiberboard	Fiberboard compressed	6345	FibreBoard
12	Newprint	Newsprint	6411	Newsprint, rolls, sheets
13	Printing + Writing Paper	Printing + Writing Paper	6412 6413 6422 6423	Paper, Paperbrd Paper, paperbd, coated, etc. Stationery, etc. Registers,acct, books, etc.
14	Wrapping+Packi ng paper +Paperboard	Wrapping+Packing paper +Paperboard	6414 6415 6421	Kraft paper brd, uncoated Paper,paperbd, unctd,bulk Containers, etc. of paper
15	Other Paper +Paperboard	Other Paper +Paperboard	6416 6417 6419 6424 6429	Paper,paperboard, corrq. Paper, paperbd, coated. Nes Convrted, paper, ppbrd, nes Paper, paperboard, cut, nes Artcls, pulp, papr, brd, nes

Intermediate products are 4 kind of pulp. They become input of 4 kind papers except dissolving pulp. Final products consist of sawnwood, veneer, plywood, particle board, fiberboard which are made of log, newsprint, printing & writing paper, wrapping & packing paper and paperboard, other paper and paperboard which are made of the combination of recovered paper and the three kinds of pulp.

Figure 2. Structure of Input / Output and Unit of Each Products in AFPM



Recovery Rate and Input / Output Ratio

Generally how many percent of volume of log become final products is called recovery rate. In producing each kind of paper how many percent each pulp and recovered paper consist of are defined input / output ratio here. These data are very important and indispensable data to construct spatial equilibrium model, but they are quite difficult to get especially at the macro level, so after collecting the individual data as much as possible as Table 3., the standard values were estimated which seemed to correspond to the industries whose productivity are middle level in Asian region. Starting from the values the recovery rates of each country were adjusted to ensure compatibility to FAO data in 1997 (base year).

In the cases of recovery rates, the measures of adjustment can be divided into following four patterns.

- (1) Cambodia, Hong Kong, Laos, Singapore ...Although they seem the countries of low productivity, the log demands calculated by the standard values are larger than FAO data of log consumption (production +import-export). FAO data seem to be too small. Therefore first

standard values were used, and if there were some difficulty, the figures were adjusted.

- (2) Japan, Korea Rep.Although the log demands calculated by the standard values were larger than FAO data of log consumption, their data seem to be reliable and real recovery rates seem to be higher. Therefore the recovery rates were adjusted to compatible to the FAO data.
- (3) Indonesia, Malaysia Their log demand are compatible to the FAO data.
- (4) China, Fiji, Korea D., Myanmar, PNG, Philippines, Thailand Viet Nam The log demands calculated by the standard values are smaller than FAO data of log consumption, and real recovery rates seem to be smaller than the standard values. Therefore the recovery rates were adjusted to compatible to the FAO data.

Table 3. Data of Recovery Rate

Philippines	Indonesia	Thailand	Japan
Log Sawnwood 60%	Log Sawnwood 55%	Log Fiberboard	Log Particleboard
Log Veneer 50%	Log plywood 52%	85%	73.5-82%
Log plywood 43% (52-53%)	Log particleboard 84%	Log Particleboard	Log Plywood
	Log MDF 58.83%	84.99%	65%
	Log Pulp 5 ton/m3		

Source: Philippines ...DENR (1996) *Philippines Forestry Statistics*.

Hearing from Philippines Wood Product Association in 1998

Indonesia.....Muh. Yusram Massijaya, Hariadi Kartodihardjo 'Forest Resource and Forest Products Industry in Indonesia', in *Interim Report of IGES*, mimeo.

Thailand.....Hearing in Bangkok in 1999

Japan..... Hearing from Japan Plywood Association in 1994

Hearing from Western Trading Co. in 1994

Table 4. Standard Values of Recovery Rates

Output Input	3	4	5	6	7	8	9	10	11
2	2.3	3.8	3.5	3	1.82	2	1.19	2	1.18

In the cases of Input / Output ratio there are detail data by Japan Paper Association in Japan, but in other objective countries data were not found. Therefore the standard values were estimated referring to Japanese data, and they were adjusted to ensure compatibility to FAO data in 1997. The ways of adjustment were divided into three types.

- (1) Japan, Viet Nam, Thailand ... The rates of input of recovered paper are middle level.
- (2) Korea, Rep.....The rate of input of recovered paper is high.
- (3) Indonesia, Malaysia, Philippines, Myanmar.....The rates of input of recovered paper are low.

Table 5. Standard Values of Input / Output Ratio

Output Input	12	13	14	15
1	0.4	0.15	0.8	0.8
3	0.1	0.85	0.16	0.15
5	0.5	0	0.025	0.025
6	0	0	0.025	0.015

Demand Functions and Supply Functions of Each Product

The ways of setting of these functions are followed to the GFPM. Demand values are defined as function of real price and GDP. Objective countries are divided into three income groups, and for each group demand function are estimated by OLS or AR1 for each forest products. The same parameters were also used in AFPM. Supply functions are horizontal up to the production capacities which are given by actual production data in the case of base year.

2) Calibration of Base Year

Base year was set in 1997, and calibration was done for 1997. In order to fit the base year model with actual value upper bound and lower bound of production value were set 1 and 0.99 of actual data. Upper and lower bound of the trade flow were set 1 and 0.99 in case of indigenous countries, and set 1.005 and 0.995 in case of exogenous countries.

A small change was necessary for objective function in order to escape the trade distortion when there are endogenous countries and exogenous ones. If simulation is implemented by the same objective function as GFPM, some distortions of trade will be occurred. The trade flow between an exogenous exporting country and an endogenous importing country will have upper bound value, and the trade flow between and an endogenous exporting country and an exogenous country will have lower bound value. Because when the same objective function as GFPM is used, in the former case the export of exogenous country will have no production costs but the consumer surplus of the import of the endogenous country will be counted. The contrary distortion will be happened in the latter case. Therefore in the former case the prices of the forest products in importing countries were subtract as the proxy of the production costs from the objective function. In the latter case the prices of the forest products in exporting countries were added as the proxy of the consumer surplus to the objective function.

The first result was infeasible and had a lot of incompatibility. Various modifications were according to the following orientation.

- (1) Prices of products were adjusted to be compatible with the directions of trade flow. Comparing the prices of materials and ones of products, the latter were adjusted to ensure realistic profit rates.
- (2) The recovery rates and Input / Output ratio were set more conservatively than IIASA model in

1980's (Dyktra and Kallio (1987)) in which the recovery rates were very low in developing countries. Because when the recovery rates are set extremely low, unless the export prices of log are extremely cheap, the industries in developing countries can't get profit from production. Log production data of FAO are not so reliable in some countries, therefore if the production volume of log in FAO data were much smaller than demand of log calculated from production of final products, the production volume are modified by the demand volume.

- (3) Except the cases of (2) manipulations of production volume were avoided and mainly imported volumes in each country from the rest of the world were adjusted to keep compatibility with FAO data.
- (4) When the adjustment were not enough by all above measure, input /output ratios and consumption volumes (production + import – export) were reconsidered.

Dynamics Model

The dynamic models were made in every 5 years from 2000 until 2020. The future expectations of log supply in each country were according to scenario 2 in GFPM. GDP growth rates and the growth rates of the trade flow of exogenous countries were also according to scenario 2 in GFPM.

As for the change of production capacity GFPM was determined the following way. First at global level, change is a function of changes in production during the past three years;

$$K_t = b_1 Y_{t-1} + b_2 Y_{t-2} + b_3 Y_{t-3}$$

Then global capacity change is allocated to each country in proportion of its production level and the marginal value of capacity revealed by the shadow price of capacity in the static phase.

$$K_i = Y_i \lambda_i / \sum_i Y_i \lambda_i K$$

Where

K_i ...production capacity in country i

K ...production capacity in the world

λ_i ...shadow price of capacity in country i

Y_i ...production volume in country i

But there were some problems in this way of adjustment in the simulation at this time. First the percentages of growth of capacity of the countries whose prices of final products are expensive tend to be higher than those of countries whose prices of products are cheap. Second some global growth of capacities are fluctuated and after 10 years the scale of the fluctuation were grow drastically, and at some time negative value had appeared. Moreover the growing speed of production capacity was generally slower than growth of demand of forest products, but the upper limits were given to the world total capacities in each product, so the gaps were expand time after time, and in some case shadow prices became extremely high.

Therefore in this simulation production capacity were determined to the value which keep the average shadow prices in each forest products around the same level in each period. At the result the

analysis of prices trend became meaningless.

3. Result of Simulation

1) log

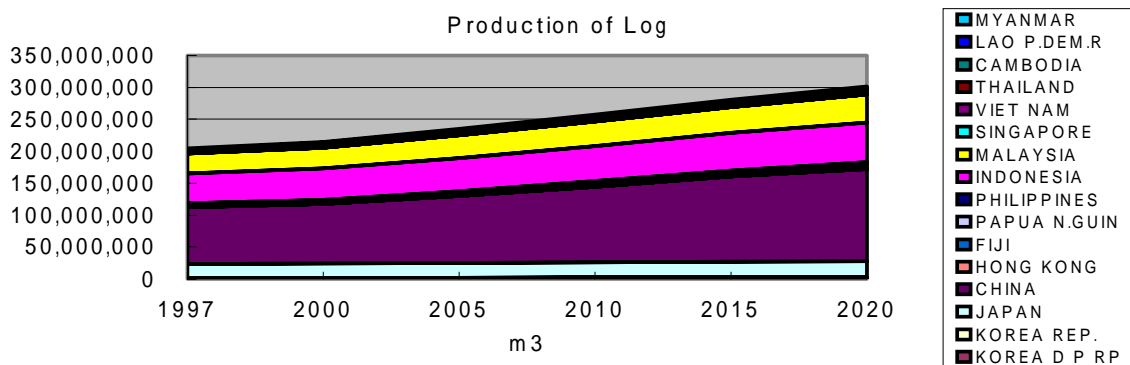
From 1997 to 2020 production volume of log will grow 1.76 % per year on the average. On the other hand consumption of log will grow 1.80 % per year on the average, so import volume from outside region will increase a little rapidly more than export volume to outside region will grow. It seems that it is because the resources of natural forest of southeast Asia has decreased especially in the island areas. As for the trade flow export will increase 1.5 % per year on the average from 1997-2020, and import will increase 1.87 % per year on the average. It also indicate the import from outside region will grow more than export to outside area.

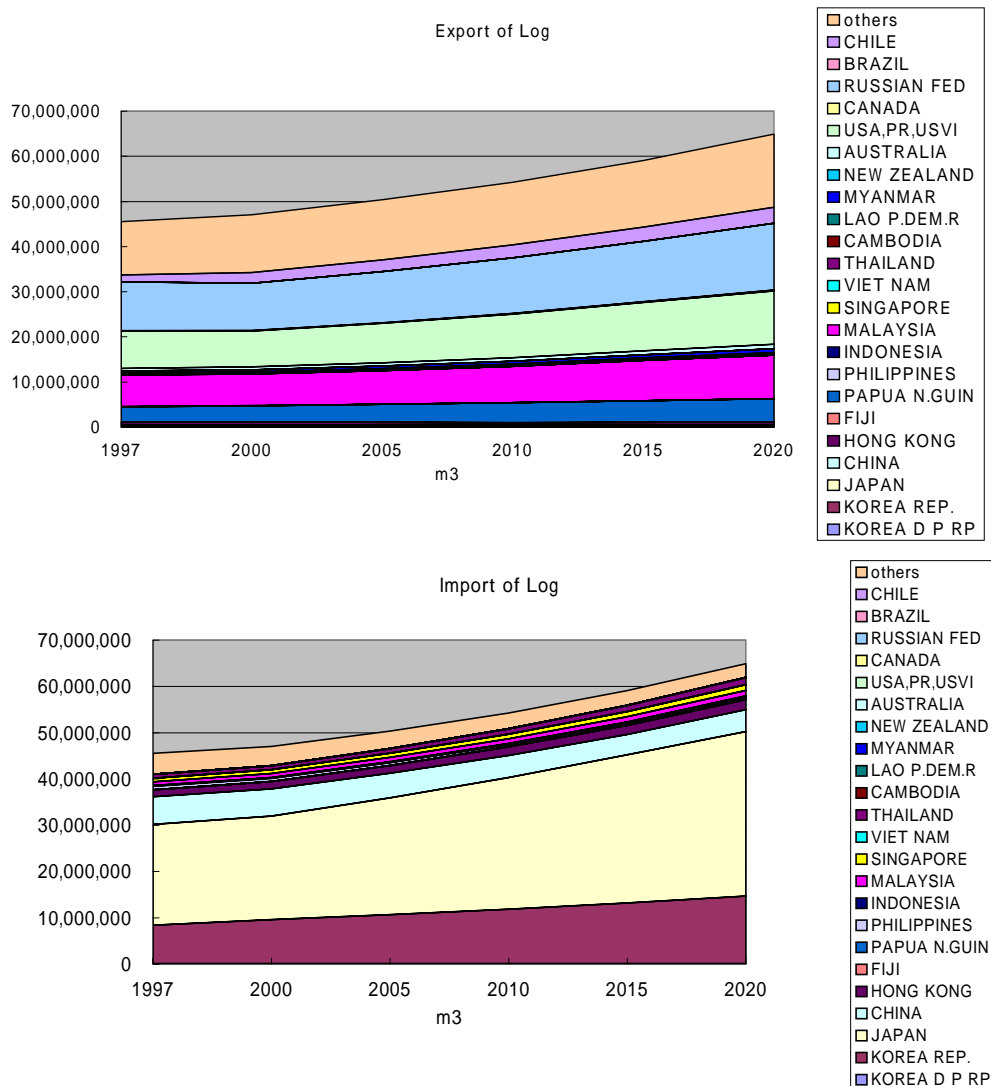
For individual countries, production volume of china will increase in higher ratio than other countries. On the average it will increase 2.23 % per year form 1997 to 2020. It is because by the higher rate of GDP growth the demand of forest products will generally increase. In this model the import will not increase by the cheap domestic log price, and GPFM set the enough material capacity in the case of China, therefore China will respond by domestic log to the strong demand of log from forest products industries.

Other major producers of log in Asian area will continue to be Indonesia and Malaysia, but in both countries production will not so grow. Their growth rates of production per year on the average from 1997 to 2020 are 1.29 and 1.42, which are lower than the average of Asian region. Rather growth rates are higher in Indo-china, especially in Viet Nam.

In Japan production growth rate is lower than other Asian countries, the average growth rate is 0.72 % per year. On the contrary import will be increase by 2.26 % per year on the average on the same period.

Major exporting countries in Asian region are Papua New Guinea and Malaysia, and especially export of Papua New Guinea will grow. Recently export tax rate of log in Indonesia has become lower, so also Indonesia has possibility to become major exporting country of log again. In outside of Asia U.S., Russian Federation and Chile are the major countries which export log. But on the



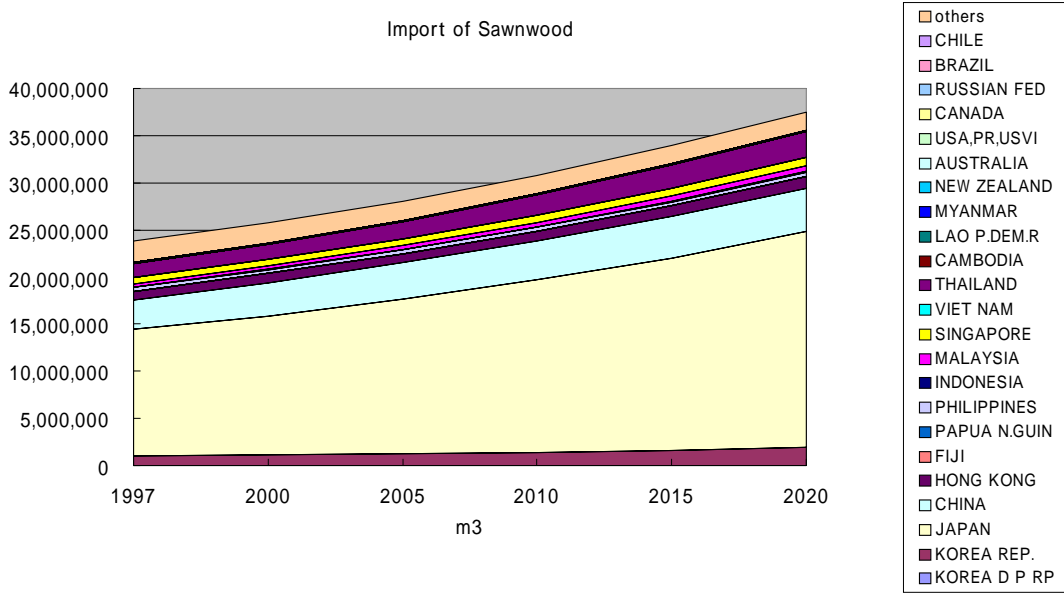
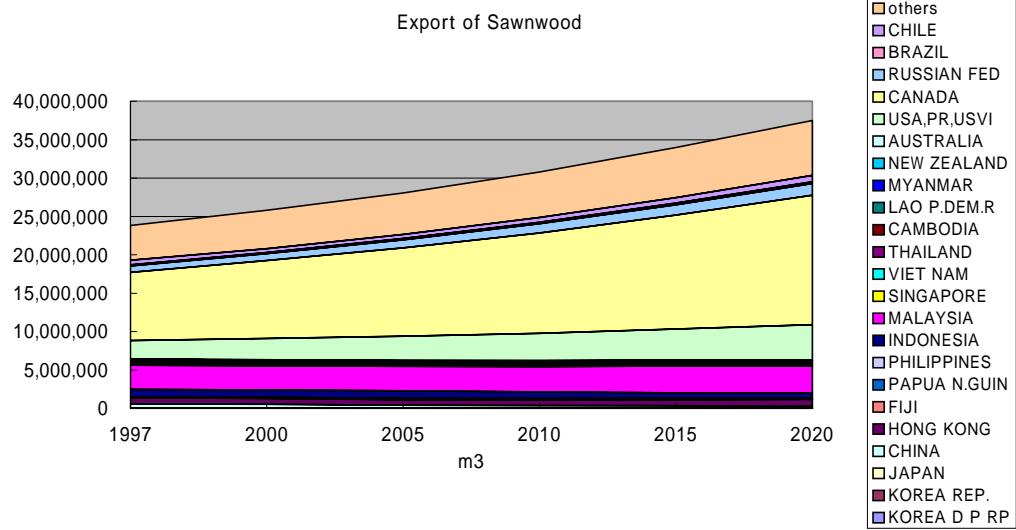
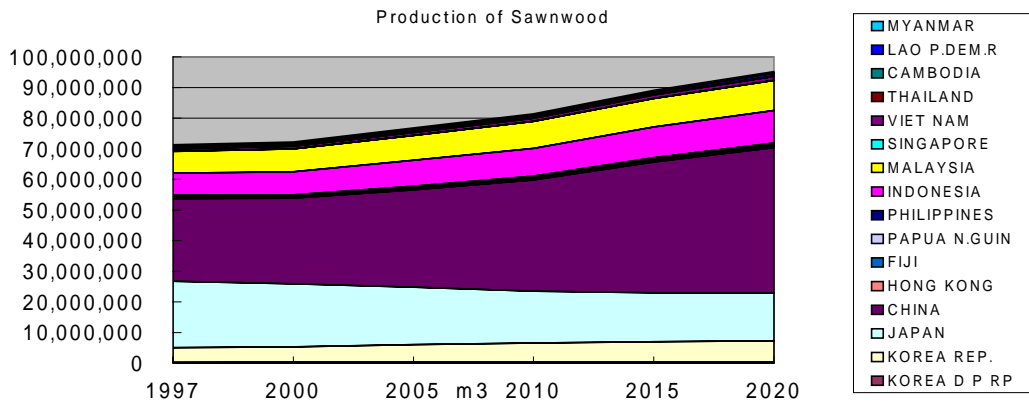


other countries on outside of Asia growth rate of export are higher than Asian region, and in most countries the growth rate of export volume are more than 2 % per year on the average from 1997 to 2020.

2) Sawnwood

The average annual growth rate of production volume of sawnwood in Asian region is 1.3 % from 1997 to 2020 while the growth rate of consumption is 1.65%. It is because the exports from the exogenous countries are set to increase 2.7 % annually and imports to these countries are set to decrease 2.06% annually during the period. The target of the exporters is Japan. Meanwhile production volume of Japan will decrease 1.36 % per year and import volume will increase 2.45 % per year.

In Asian region China will increase the production volume to respond the demand growth like the production of log. The annual growth rate is 2.61 % from 1997 to 2020. Other major



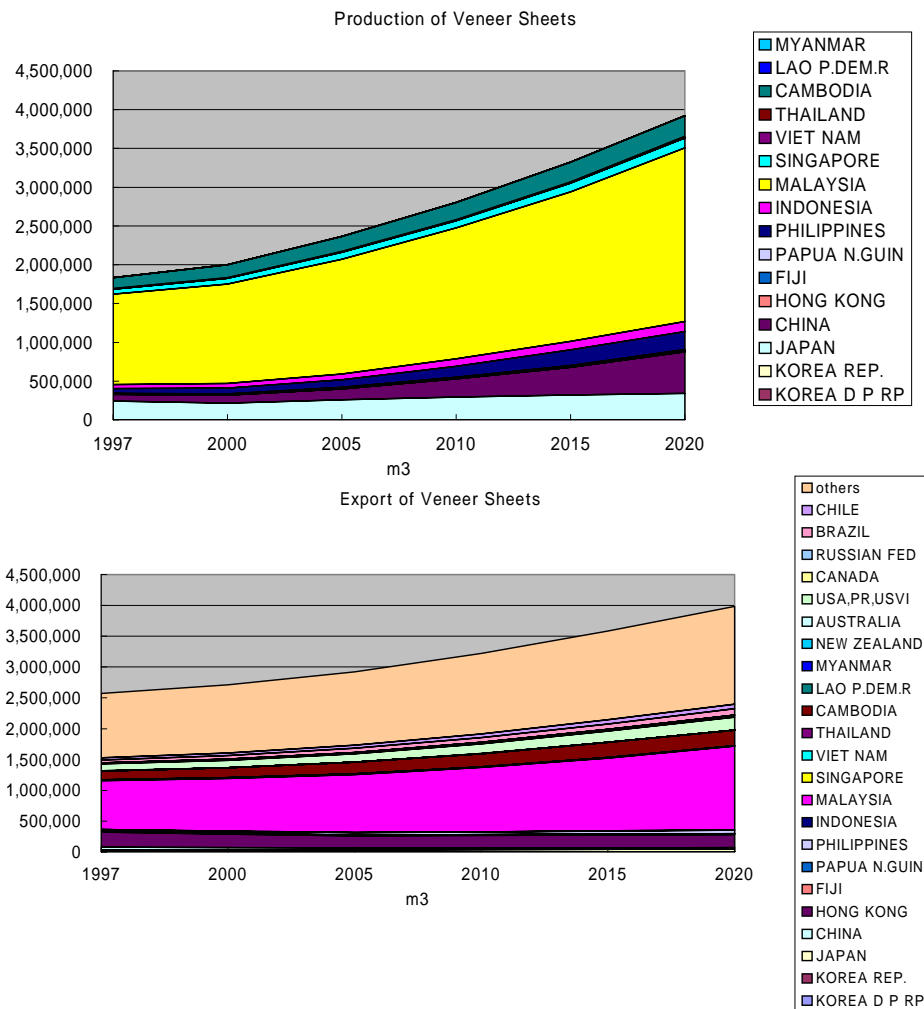
producers are Indonesia and Malaysia, but the annual growth rates are 1.76 % and 1.41 %, so the increment will be moderate. Other country in Asia whose growth rates are high are Viet Nam

and Myanmar. They are 2.66 % and 2.03 %. On the other hand Thailand decrease the production of sawnwood drastically because of the resource degradation and the increase of import. The annual growth rate of import volume is 2.85 %.

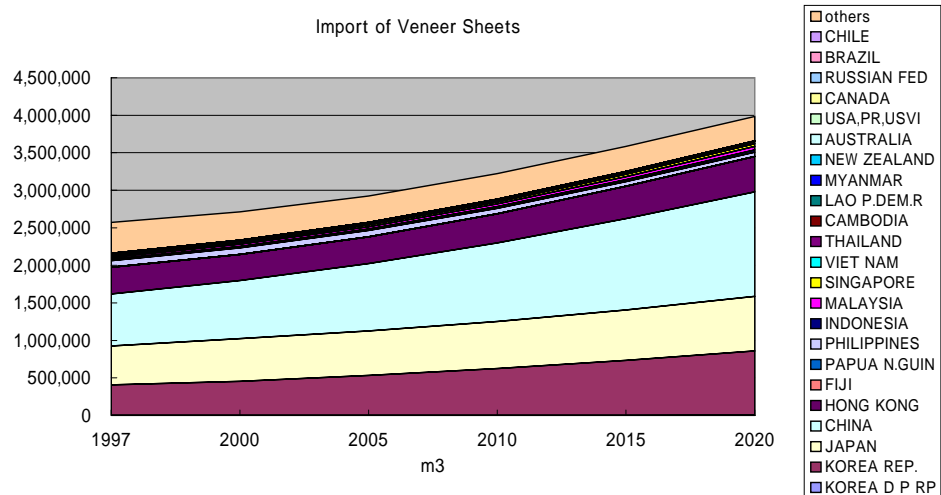
In outside area main exporters are Canada and U.S., but the major part of the export of Canada is not Asian region but U.S. In Asian region main exporter is Malaysia. Except Malaysia, Myanmar, export volumes of Southeast Asia will rather decrease from 1997 to 2020.

Major Importers in Asian region are Japan and Korea Rep. The annual growth rate of import volume of Korea Rep. is 3 %.

3) Veneer Sheets



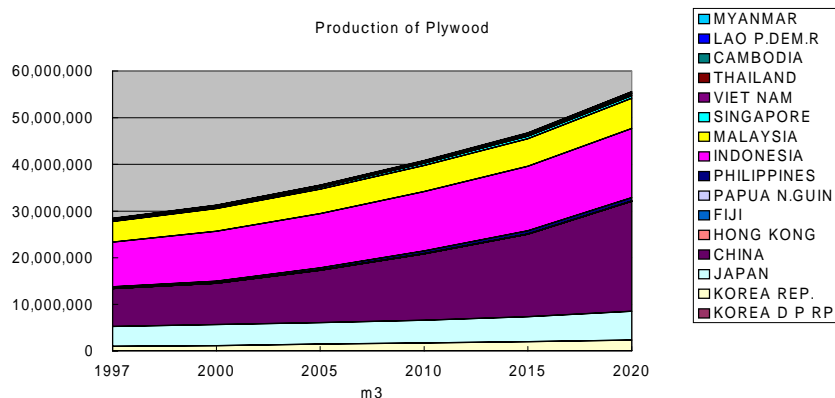
The average annual growth rate of production volume in Asian region is 3.58 % from 1997 to 2020 while the growth rate of consumption volume is 3.48 %. This high rate is coming from the high GDP elasticity of veneer sheets in developing countries. The GDP elasticity in developed country is moderate, so the annual growth rate of production in Japan is 1.68 %. Major producer and exporter country of veneer sheets is Malaysia. The annual growth rate of production and export in Malaysia



are 3.04 % and 2.47 %.

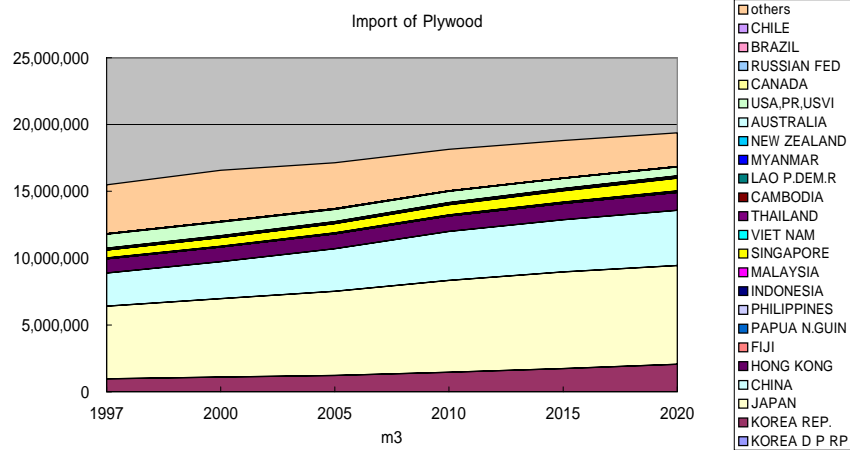
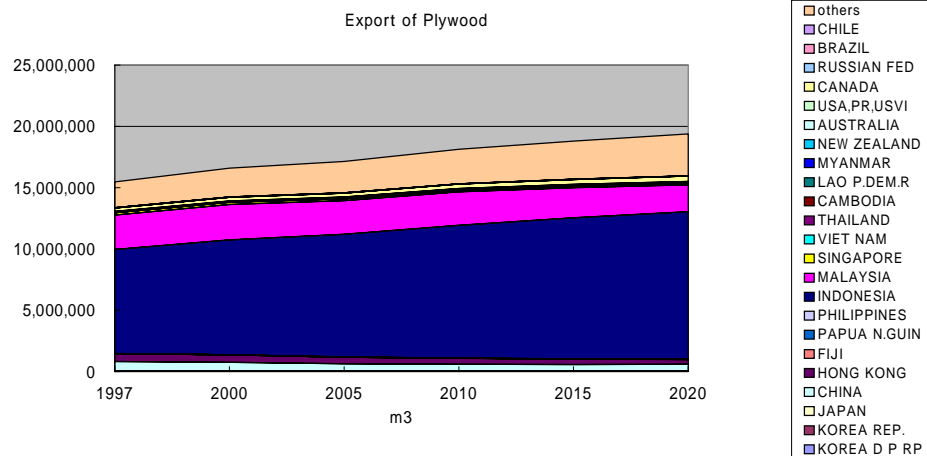
Major importers in Asian region are Korea Rep., Japan, China, and Hong Kong. Korea Rep. and China indicate higher rates of growth of import which are 3.53% and 3.25 %.

4) Plywood



The production volume of plywood will grow at 3.13 % per year on the average from 1997 to 2020, and consumption will grow at 3.62 %. This high rate is coming from the high GDP elasticity of plywood in developing countries as same as veneer sheets. Especially the growth rate of china is 5.25 % per year because of high rate of GDP growth. Other country whose production will increase rapidly is Viet Nam whose growth rate is 4.45 %. On the other hand the growth rate in developed country like Japan is moderate, and the annual growth rate is 1.69 %. Major producer countries in Southeast Asia are Indonesia and Malaysia, but their growth rates are also moderate. It is partly because they will be shift their production to more highly processed goods or paper industries.

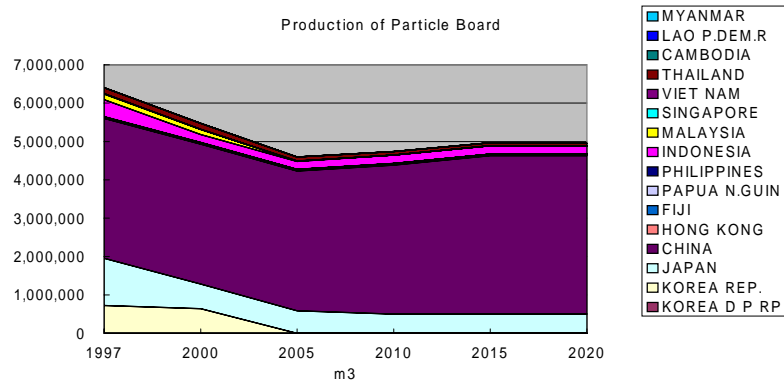
The large part of export of plywood is from Indonesia. But the relation between production volume and GDP is reflected by the strategic export policy in Suhart era, so from now on whether this trend



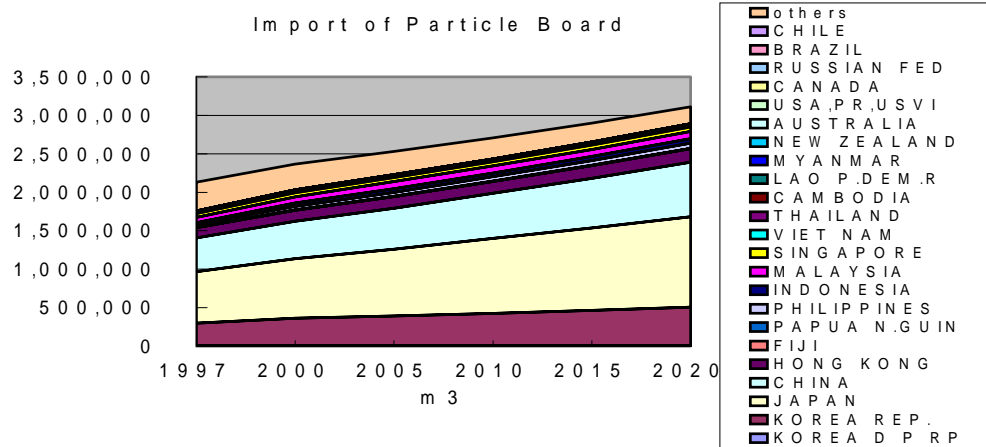
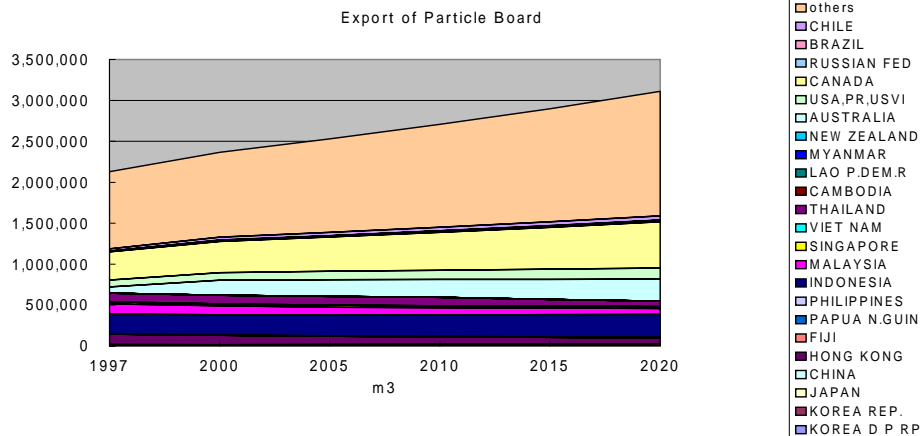
will continue or not seems to be a disputable point.

Major importers in Asian region are Japan, China, and Korea Rep. Their average annual growth rates of import are 1.39 % , 2.34 % , and 3.53 %.

A remarkable point is that in the exogenous countries both the export and the import of plywood and veneer sheets are small scale.



5) Particleboard

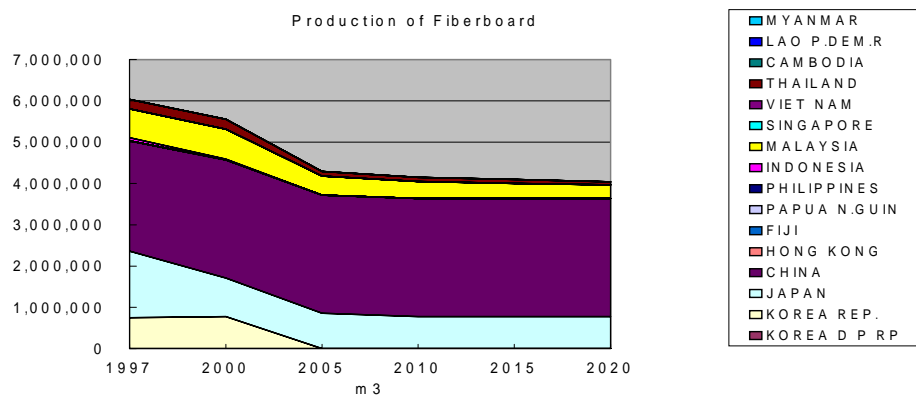


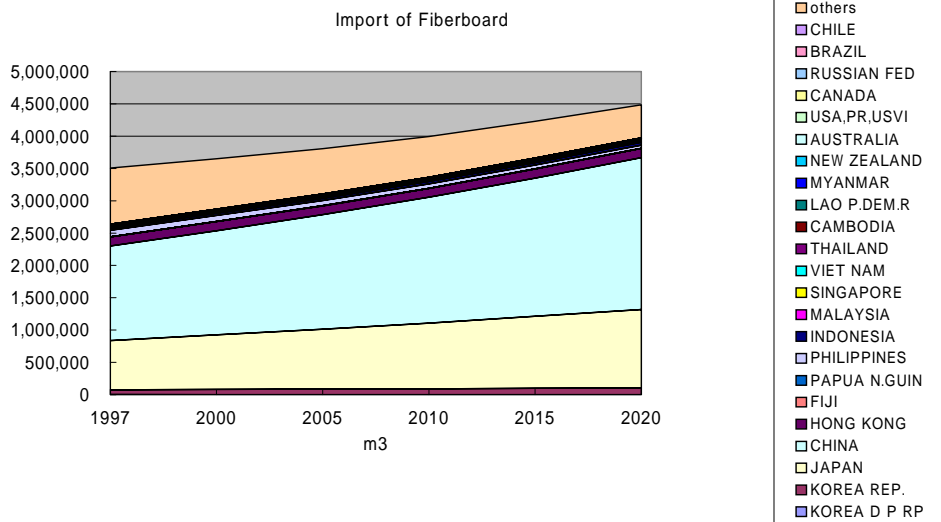
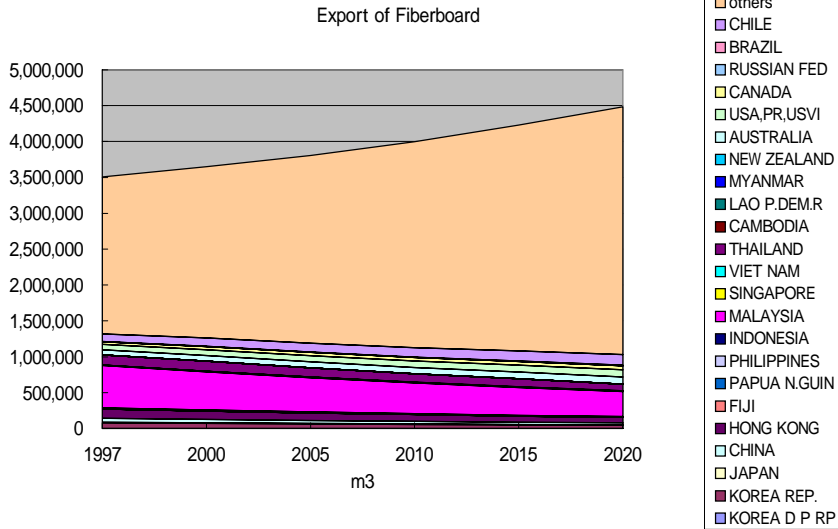
The growth rate of the production volume of particle board has indicated negative value, but it is caused by the mistake of setting of shadow prices. It should be positive value.

The large part of production of particle board in Asian region is made in China. The major exporters in Asian region are Indonesia and Malaysia, and the one in exogenous area is Canada. The major importers are Japan, China, and Korea Rep.

5) Fibreboard

The growth rate of the production volume of fibreboard has indicated negative value, too, but it is

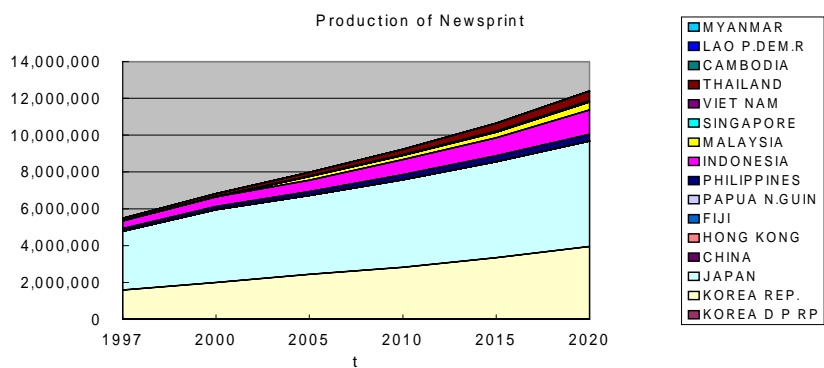


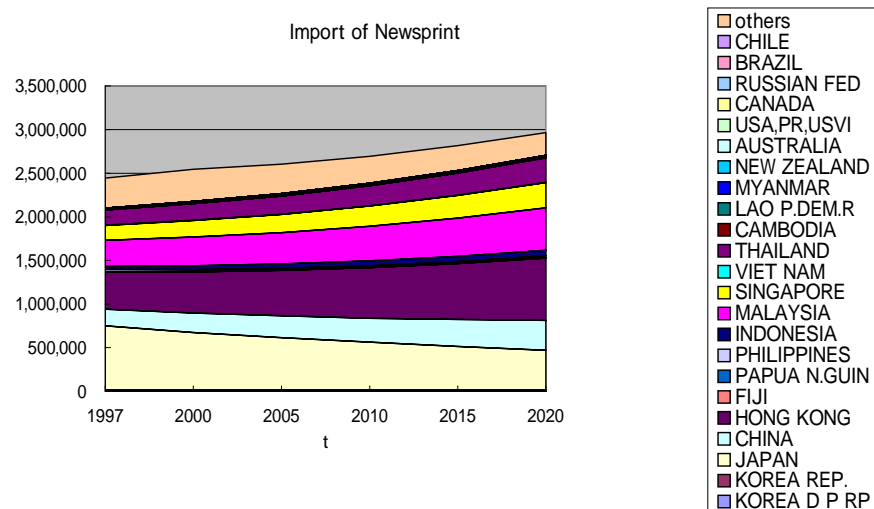
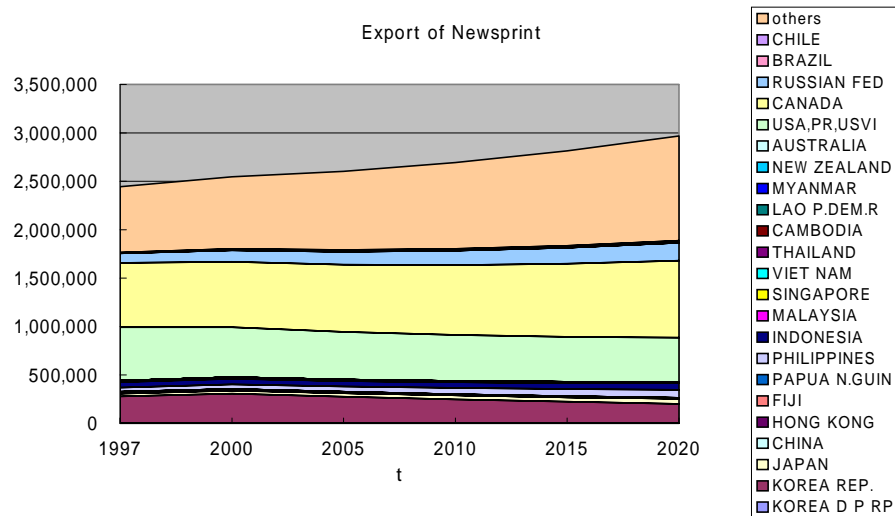


also caused by the mistake of setting of shadow prices. It should be positive value.

The major producers of fibreboard are China, Japan, and Malaysia. Malaysia is also the major exporting country of fibreboard. China and Japan are rather major importing countries.

6) Newsprint



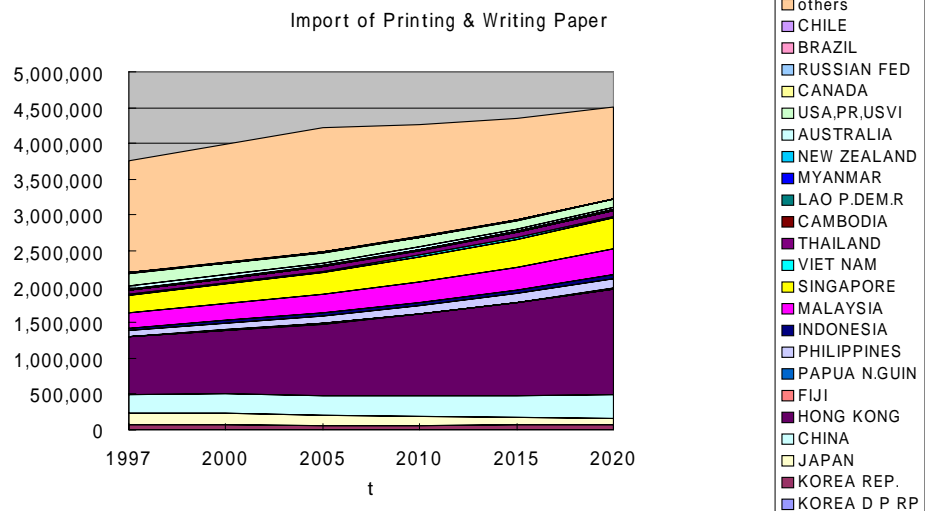
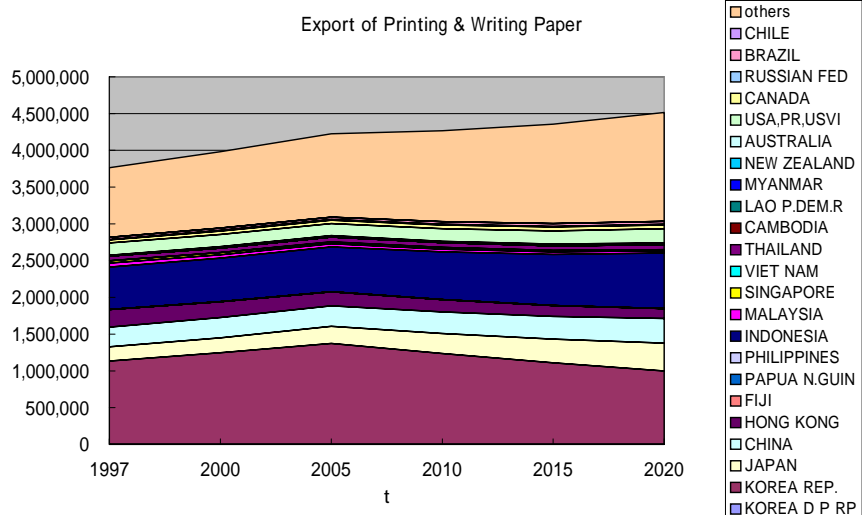
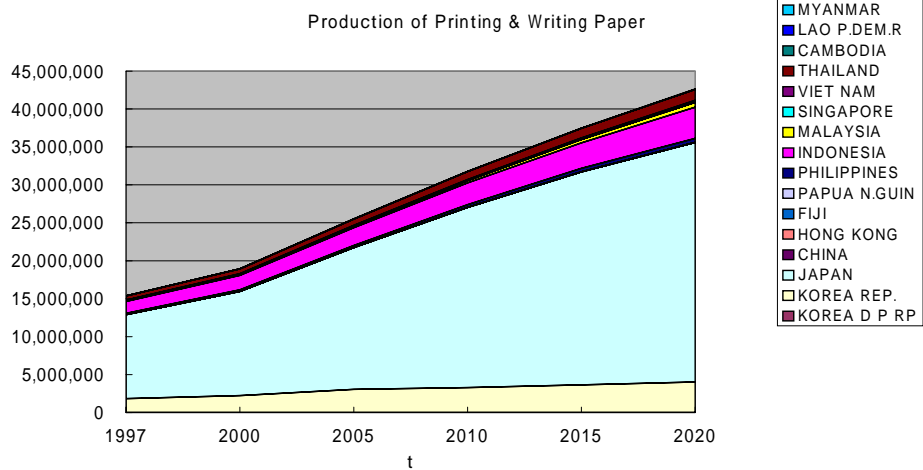


The annual growth rate of production volume of Newsprint is 3.86 % from 1997 to 2020, and consumption growth rate is 3.88%. It is more rapid growth than other products because GDP elasticity is set 1.07 in developing countries. Especially Viet Nam and Thailand will increase by 7.45 % and 7.5 % annually. The major exporter in Asian region is Korea Rep. But exporters' trade flows in exogenous region are much larger scale. The major exporting countries in exogenous region are U.S. and Canada. But their annual growth rate of export are -0.8 % and 0.82 %, therefore their export pressures are moderate than log and sawnwood.

The major importers in Asian region are Japan, China, Hong Kong, Malaysia, Singapore and Thailand. Except Japan import volume in each country will increase by 2-3 % per year.

8) Printing and Writing Paper

The annual growth rate of production volume from 1997 to 2020 is 4.97 %, and the growth rate of

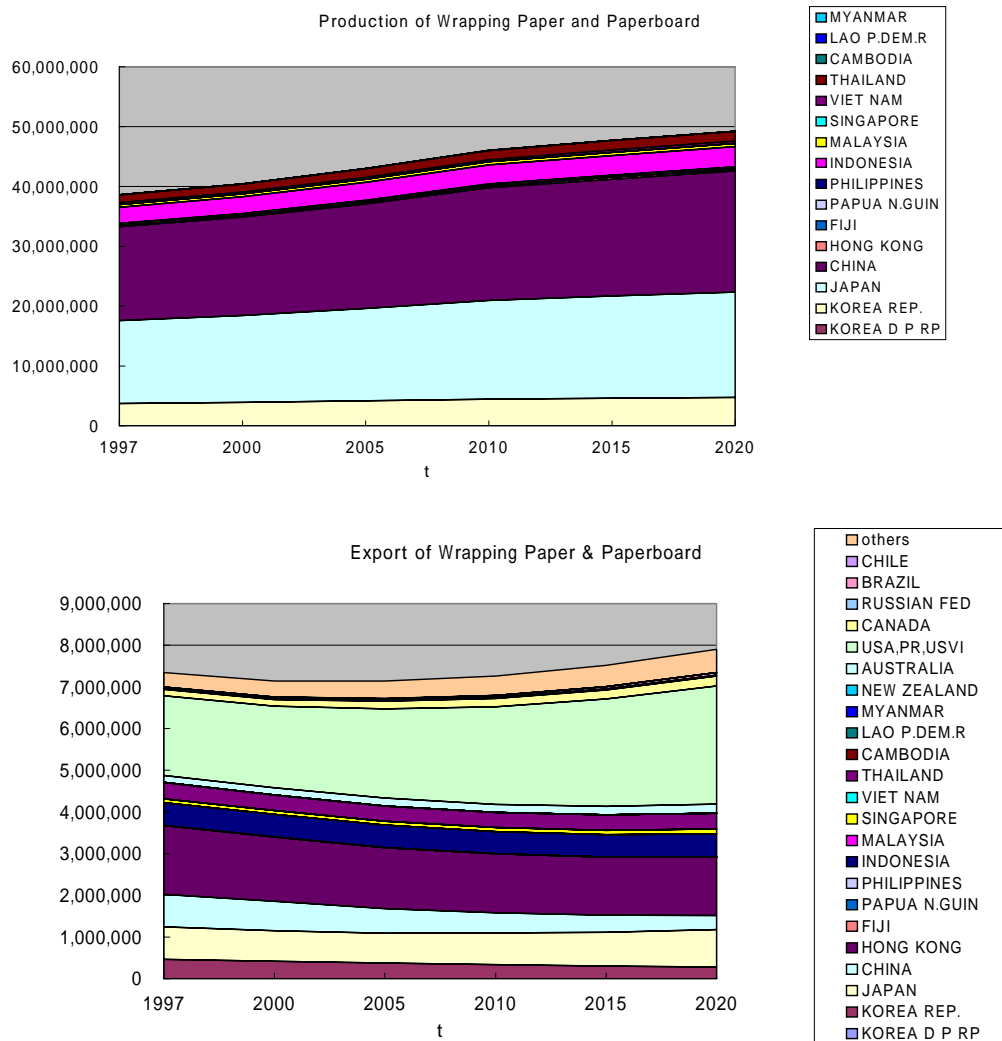


consumption is 5.23. This high rate is partly because of the high GDP elasticity. But the most

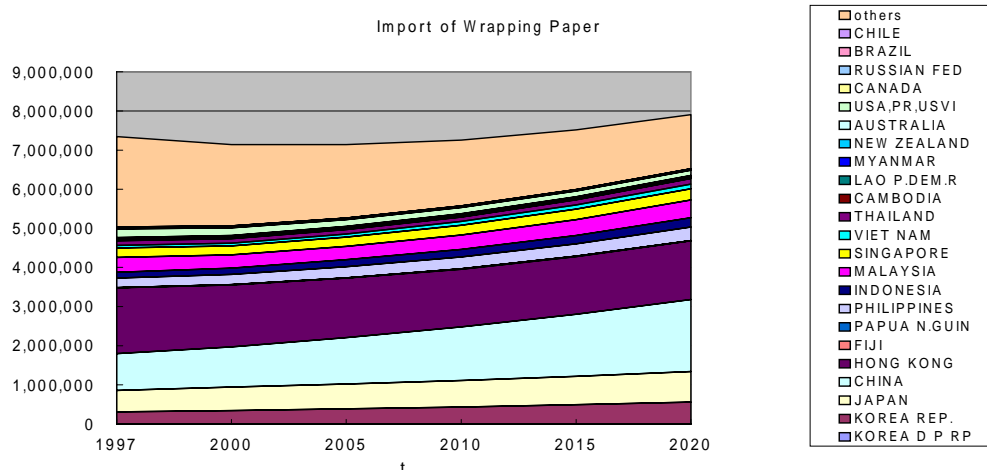
important reason is that the shadow prices of developing countries rose quickly, it is reflected to the expansion of the total amount of production capacity in Asian region, and the large part of the expansion consequently caused the increase of production volume in the developed countries. Therefore the renewal system of the production capacity in this simulation was not proper in case of this product.

Major producer of this product is Japan. Major exporters are Korea Rep. and Indonesia. Major importers are Hong Kong, Malaysia and Singapore. The exogenous countries are not major players in both export and import in printing and writing paper. Canada and U.S. are rather major exporters of chemical and mechanical pulp. The percentage of Canada occupying to the total export in endogenous and exogenous countries in 1997 were 23% in mechanical pulp, and the percentage of Canada and U.S. of the same kind were 23 % and 22 % in chemical pulp.

9) Wrapping Paper and Paperboard



The annual growth rate of production volume of wrapping paper and paperboard from 1997 to 2020

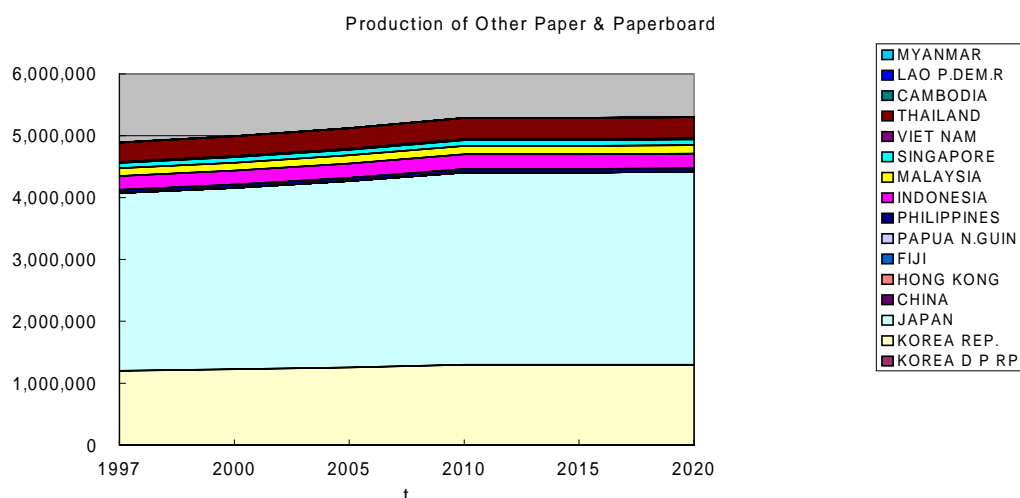


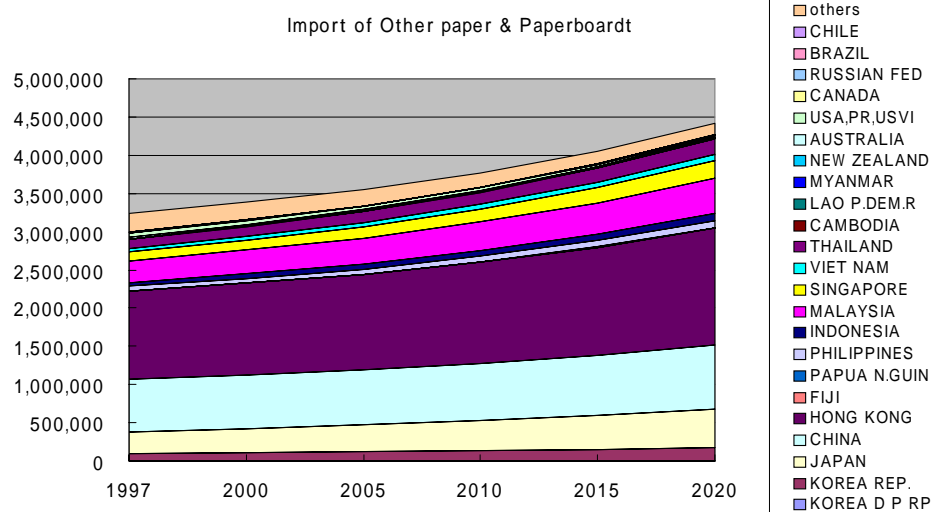
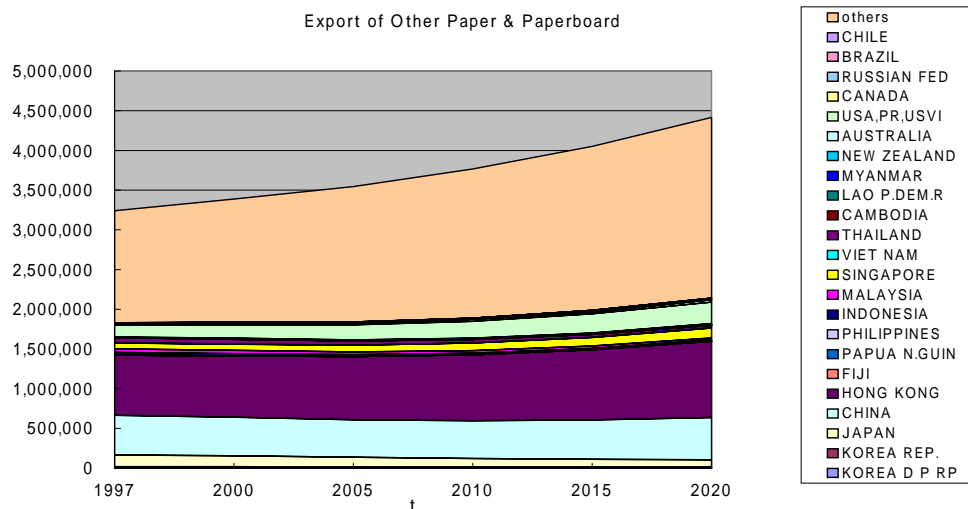
is 1.09 %, and the growth rate of consumption is 1.30 %. This low rate is from the low GDP elasticity especially in developing countries. The GDP elasticity in developing countries and developed countries are 0.36 and 0.55.

The major producers in Asian region are Japan and China. But major exporter is Hong Kong. In Southeast Asia Indonesia and Thailand are the main producers and exporters. In the exogenous region U.S. is the major exporter and the annual growth rate of the export is 1.78 %.

10) Other Paper and Paperboard

Other paper and paperboard include the household and sanitary paper and etc. The consumption of this kind of paper especially inclines toward the developed countries. The growth rate of production volume from 1997 to 2020 is 0.35 % and the growth of consumption is 1.01 %. China and Hong Kong are major exporters and importers of this product.





4. Notable points of simulation

In the above simulation, there are many notable points and defects.

- 1) The endogenous and exogenous countries are set in this simulation. But the trade constraints of the exogenous countries often cause the stiffness of this model. Such setting is caused by the shortage of the data in the exogenous countries, but it is hopeful that the exogenous countries of this model are treated as the endogenous countries to improve the usefulness of this model.
- 2) On the material supply the data of GFPM were used in this simulation. But it is the critical point of the future outlook of forest products, so the own analysis will be necessary. Especially the future in which the man-made forests will become major part of log production, the reflection of the market situation to the reforestation and the future supply of log will be important point of consideration.
- 3) In this simulation the technological improvement has set to catch up the Japanese level of resource efficiency. But it will be debatable whether the technological improvement will be the type of catching up or the type of division of kinds of products.

4) The data of prices of forest products were referred to the FAO data. The price data of FAO are calculated by dividing the total amount of export or import (US\$) by the total volume of export or import. Those data were often inconsistent with the trade directions. Therefore in this simulation the prices of each forest product were adjusted by the direction of trade flow.

But the prices adjusted by the direction of trade flow have another problem that the prices of final products in developed countries are often cheaper than those in developing countries. The real situation is that the qualities of products exported from developed countries are different from those of the same kind of products exported from developing countries, but they belong to the same category of product. Therefore it is sometimes necessary to separate the same products into the products of high quality and those of low quality especially in the case of products which have two-way trade.

5) In GFPM in dynamic phase the change of production capacities are determined by distributed-lag function in the world level, and it is divided into each region by the weighted average of shadow prices. But the same kind of approach caused the problem as follows,

- This kind of change of production capacity are referred to the past production volume, and are not necessarily respond to the change of demand function shifted by GDP growth. So in a certain country the growth rate of GDP was rapid, the expansion of production capacity did not catch up, and the price rose drastically especially because of low price elasticity of demand function.
- Some of the distributed-lag functions estimated from the past production data had waves which expanded time after time and at last in some year the production value came to be negative.
- In GFPM the total production capacity in the world is divided into each region by their weighted average of shadow prices. But the shadow prices of regions where prices of the product are expensive are generally high level, so this way of the division tend to distribute larger part of capacity to developed countries whose price of forest products are expensive.

Considering these points in this simulation the analysis of prices was sacrificed and the production capacity were adjusted to the average value of shadow prices kept the same level in each product. Because except the resource constraints there seems to be no reason why the price rises drastically because the production capacity can not satisfy the demand of the domestic market during 5 years.

From some interviews to the managers of forest product companies, the adjustment of production capacity will be possible during 1 or 1.5 years.

But the mechanism of adjustment of production capacity should be researched and analyzed more in order to endure the proper future outlook of forest products.

6) There was no system that new routes of trade will open, or some country whose production has been zero will begin their production.

7) The price elasticity is the same value among developing countries and among developed countries. But the smaller the consumption volume is, the more drastically the price fluctuation happens by the

same amount of change of volume. Therefore the more analysis will be necessary to use the same elasticity to many countries.

5. Further Analysis of USTR Report from the Model Simulation

The above simulation is not still a counter simulation to the USTR report, but from this simulation and further analysis of the report the following points should be pointed out.

- It is very fundamental point that the profit from the free trade is measured by the expansion of production volume in the trade theory. The reason why the tariff should be eliminated is also that the production will expand totally. But USTR report insists that the total consumption of forest products will not increase. Then there is no meaning to eliminate tariff of forest products. Therefore the standpoint of USTR is contradictory. If the total production volume will not increase but the volume of trade flow will increase, it means the scramble of the market share. The analysis of USTR indicates that the countries which get the market shares will be U.S., Northern Europe, Australia, New Zealand, Malaysia, and Indonesia and the losers of the market share will be the other Asian Countries. It will not be sure that the welfare of the world will be improved by such kind of measure.

Even if the former countries are more efficient in the recovery rate than the latter countries, this kind of change of producers will damage the labor markets and earning of foreign exchange, and will decrease the land use for forests in the latter countries. It will be a fetter of macro economies in these countries.

- The speed of change of export and import will critically be determined by the scale of upper and lower bound of the trade. It is not sure that the values can properly indicate the degree of the change of the market by the drastic change of tariff of forest products. For example when Indonesia took the strategic export policy of plywood by Apkindo, Japanese plywood companies lose the large part of market share of plywood in Japan during the short period. But upper bound and lower bound set by observation of the past data under the stable market structure will not sure to indicate such kind of phase. Therefore more specific analysis will be necessary about the impact of tariff reduction to the market structure in each country.

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