

THE SPATIAL EQUILIBRIUM MODEL AND POLICY ANALYSIS OF FOREST PRODUCTS INDUSTRIES AND FOREST SUSTAINABILITY

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ABSTRACT

The Spatial Equilibrium Model is a major method of large-scale analyses of the agricultural and forest products trade over the long term. The standard structure of the trade model using the spatial equilibrium method has already been established, but in order to establish the specific structure of a trade model, one should examine what kind of proposition is to be simulated by the model. From research of the first year of the IGES forest project, the following topic should be examined: the impacts on domestic forest products markets and forest products industries in the Asian region of the recent request for accelerated tariff reduction from ASEAN and the World Trade Organization (WTO). From the point of view of the countries which have already lost a large part of their natural forests (e.g. Philippines and Thailand), there is now a need to recover their degraded forest resources through reforestation, in order to keep their people from further land degradation and natural disasters. But reforestation projects by the national governments have not been able to cover the forests in the country successfully. In order to promote plantations by the private sector, the existence of the domestic log market is a necessary condition, and domestic forest industries must survive competition against imported forest products. Therefore the trade liberalization of forest products should be controlled under the principle of forest sustainability.

BASIC CONCEPT OF SPATIAL EQUILIBRIUM MODEL

The Spatial Equilibrium Model can be defined as a model solving simultaneous equilibria of plural regional markets under the assumption of the existence of transportation costs between two regions. This complex proposition can be arranged into a simpler style by applying the theorem that the solution of the competitive equilibrium is equal to the maximization of social surplus (i.e. the total amount of producer and consumer surplus) under perfect competitive market conditions. The social surpluses of one exporting and one importing country are indicated by the shaded area in Figure 1.

STRUCTURE OF SPATIAL EQUILIBRIUM MODEL OF FOREST PRODUCTS TRADE

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The Spatial Equilibrium Model is a major method of large scale analyses of the agricultural and forest products trade over the long term. Especially since the construction of the simulation model for forest products trade by IIASA in 1980s, international organizations or institutes such as the Center for International Trade in Forest Products (CINTRAFOR), the International Tropical Timber Organization (ITTO), and the Food and Agriculture Organization (FAO) have repeatedly prepared outlooks of forest products on the global and regional scales using this method. Accordingly, it can be said that the standard structure has been already established, and is as shown in Figure 2.

Forest products markets can be divided into two kinds: log markets and products markets. Log markets generally consist of concessionaires or forest owners as suppliers, and various kinds of forest products processing companies on the material demand side. The latter entities are also the suppliers of final products markets, and the demand sides of products markets are consumers. An analysis of the relation between forest resource and forest products trade has been attempted by using changes in the amount of forest stock as a shifter of the supply function of logs.

Data required in the spatial equilibrium model of forest products trades are shown Figure 3. In particular, the data about forest processing industries require detail such as the recovery rate of wood material, and production costs.

THE POLICIES WHICH SHOULD BE SIMULATED

The specific structure of the trade model largely depends on what kind of scenarios we will simulate by the model. From research about forest products industries and forest sustainability in the first year of IGES, the following policy orientation should be examined about forest product trade and forest sustainability. Two scenarios exist on the relation between forest sustainability and forest products trade. The first scenario can be called the separated scenario, that the trade of the forest products as one of the economic goods should obey the free trade principle, and forest sustainability should be preserved by zoning and reforestation efforts by the governments or local communities. The second one can be called the integrated scenario, whereby the forest product trade should be controlled under the principle of forest sustainability.

Based on several interviews that were conducted about the forest products industries and the situation of forest resources in the Philippines and Thailand, one can tentatively establish the hypothesis that the second scenario will be necessary to secure forest sustainability in these countries. The Philippines and Thailand have already lost a large part of their natural forests. They are now facing a situation in which they need to recover their degraded forest resources by reforestation in order to keep their people from further land degradation and natural disasters. But reforestation projects by the national government have not been able to successfully cover the forests in the country on a broad scale. On the other hand, economic incentives will be necessary to encourage planting and tending in the private sector. This means that the existence of a domestic log market is a necessary condition because the logs of the planted species in these countries generally will not be able to meet price competition in the international market. In order to secure the domestic log market, domestic forest industries will need to survive competition with the imported forest products. Accordingly, the trade

liberalization of forest products should be, to some extent, controlled under the name of the principle of forest sustainability.

From these kinds of hypotheses, specifically we should examine the impact of the recent request of the accelerated tariff liberalization from ASEAN and the WTO regarding the domestic forest products markets and forest products industries in these countries.

THE CASE OF THE PHILIPPINES

The national woodland of the Philippines was 15.68 million ha in 1996, although the national park area and forests planted by the public sector are only small part of the whole. Forest plantations funded by the Overseas Economic Cooperation Fund (OECF) and Asian Development Bank (ADB) were 345,000 ha, IFMA concessions were 525,000 ha, the social forests were 786,000 ha, and local people's estates were 1.125 million ha in 1996. These figures show that zoning policies and plantation projects by the national government have covered only a small part of the whole forest area in Philippines.

On the other hand, recently domestic forest product industries are facing a very severe situation. For example the plywood industry in the Philippines has focused on the domestic market during the 1990's because they could secure the stable demand in their own way, and the quality of the products are too poor to export. Another reason was that they were protected by high tariff rates. Until 1995 the tariff rate of plywood was been 50 percent, but recently ASEAN and the WTO began to request tariff reductions of forest products. As a result, from 1996 to 1997 the tariff rate of plywood dropped to 30 percent and further to 20 percent in 1998. The domestic companies suffered from this policy. The gross profit rate of veneer and plywood produced by them drastically declined to the 2.5 to 5 percent range. If the domestic forest industries are unable to survive as a result of trade liberalization, the economic incentive to plant trees by the private sector will be undermined.

THE CASE OF THAILAND

Forest cover in Thailand was 25.6 percent in 1995, and the domestic forest products have been in short supply. Today the target rate of future forest area is 40 percent, 25 percent of it as protection forest, and the other 15 percent as production forest. The direction of production forests is establishing multipurpose forests for community forestry. The policies aim to improve forest productivity, and they should not be converted to other land uses. In Thailand most of the farmers' plantations have been eucalyptus to provide for the demand for those species, however, eucalyptus has been identified as a species that exhausts ground water resources and accelerates land degradation. Despite this, the private sector has not found any beneficial reasons to plant native species. Accordingly, in Thailand one can discuss the same kind of proposition that in order to establish non-eucalyptus forests, markets will be necessary to buy logs for beneficial prices.

BENEFITS FOR COMPETITIVE COUNTRIES LIKE INDONESIA AND MALAYSIA FROM THE STANDPOINT OF FOREST SUSTAINABILITY

On the other side there are some countries which want to see trade liberalization on imports forest products in other countries. However, since they also face the situation that their natural forests have been degraded by commercial logging, they also need some constraints on log production in order to preserve the sustainability of their forests. In this sense the ceiling of export increment by tariff barriers in other countries will not be necessarily to their disadvantage from the standpoint of forest sustainability.

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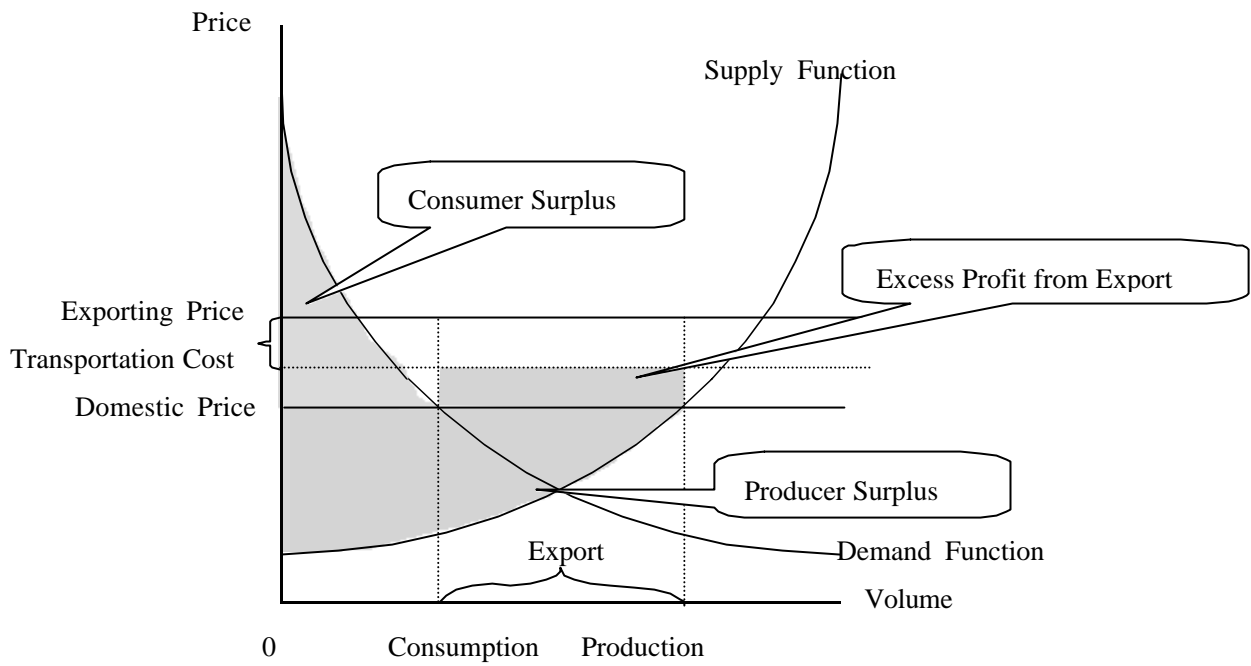


Figure 1. Case of Exporting Country

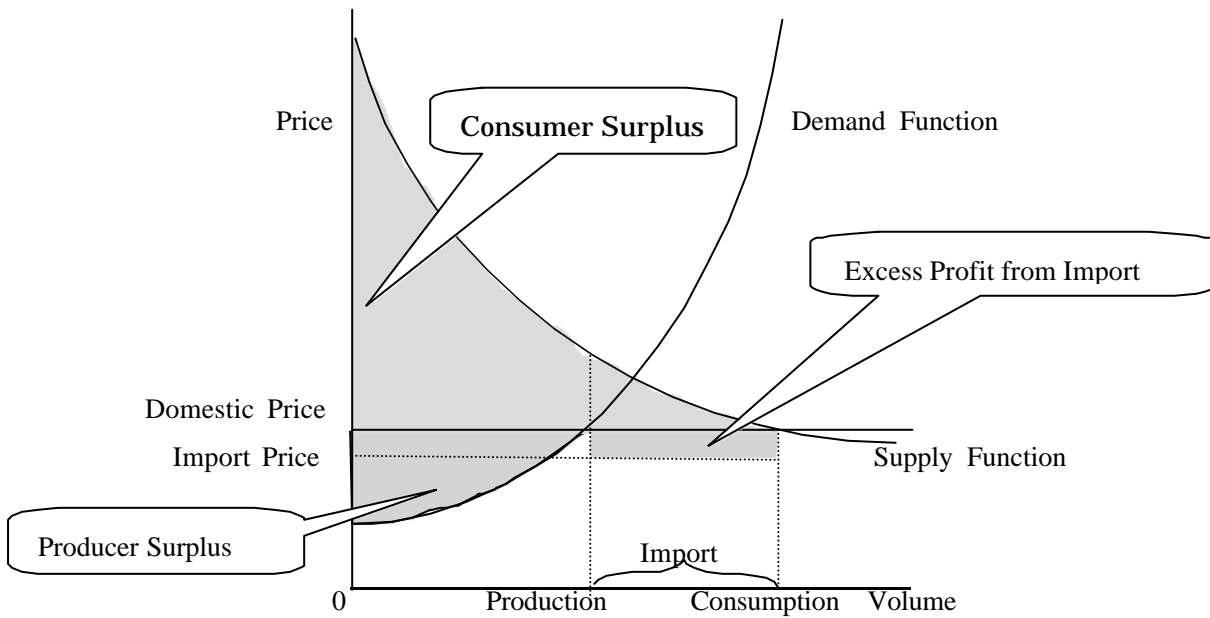
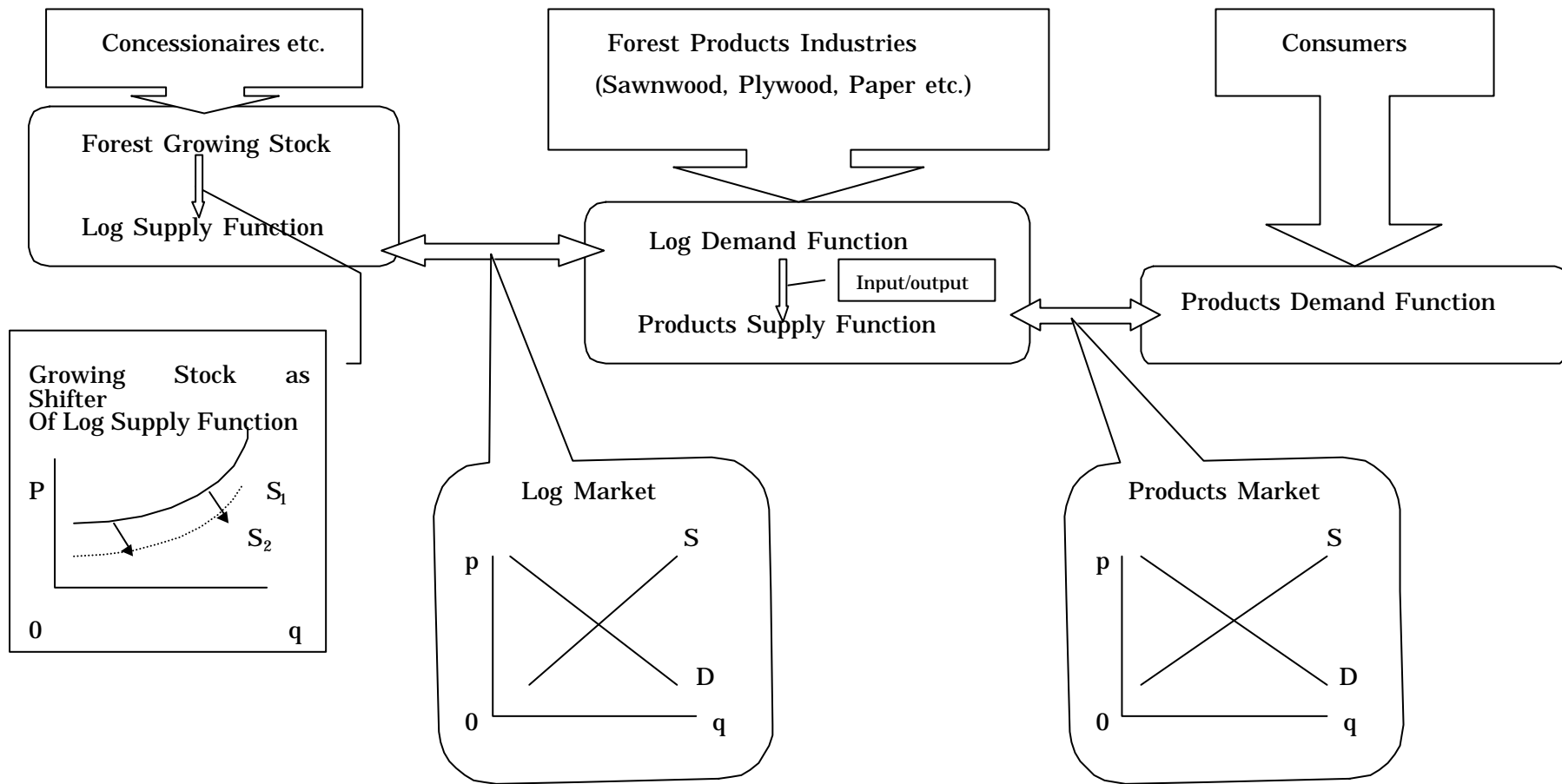


Figure 2. Case of Importing Country

Figure 2. Basic Structure of Spatial Equilibrium Model



Time series inventory of growing Stock or annual growth rate
Production, consumption, export, and import volume
Prices of each forest product
Trade matrix of each forest product
Input /output ratio of material producing 1 unit of each forest product
GNP, population
Situation of domestic market and distribution system of each forest product in each country

Figure 3. Data required in Spatial Equilibrium Model