ECOLABELING OF TROPICAL TIMBER:
Linking Consumer Awareness and Sustainable Forest Utilization

By

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ABSTRACT

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This study examines ecolabeling initiative as an economic instrument to mitigate externality problems in renewable resource extraction. Ecolabeling of tropical timber -- which is based on a third party independent certification system -- is chosen as an application area. With timber certification and ecolabeling, the mitigation of externalities is achieved through the adoption of better logging and forest management practice that will results in sustainable yield and less damage in the forests.

Support from economics literature on the working of ecolabeling can be based on the theory of economics of information. With asymmetry of information between producers and consumers on sustainability characteristics of the wood, product certification and labeling is one way to provide warranty to prevent adverse selection in the market. The certified ecolabel guarantees that the wood product to which it is attached originates from a well-managed forest.

The theoretical and empirical analyses show that market becomes segmented as ecolabeled product is introduced. Taking the total demand in the

market as given, demand for ecolabeled wood, and its share in the total market, become smaller as the price premium increases, and vice versa. The increases in the share of ecolabeled segment become larger as the price premium decreases. At any particular quantity demanded, consumer surplus is higher if consumers buy ecolabeled product instead of the conventional one. This gain in consumer surplus becomes smaller as the price premium for ecolabeled wood increases. Part of the gain in consumer surplus can be attributed to the value of information contained in the ecolabel because it helps consumers make the "pro-sustainability choice" at the time of purchase.

From the business perspective, however, adoption of timber certification and ecolabeling is not always a viable option. Using break-even net present value analyses, the study shows that the viability of the adoption depends largely on: (1) yield of the forest concession area; and (2) the cost of conducting proper silviculture effort to comply with certification and ecolabeling requirements.

Based on the results, two policy implications can be identified. First, there emerges a possibility of selectively promoting timber certification and ecolabeling on a regional basis based on forest condition. Second, potentially large social and environmental benefits of sustainable logging and forest management may justify some public initiative to cover part of the cost borne by the private forest concessionaires when implementing sustainable logging and forest management.

To my beloved wife

Ratna Nurhayati

and children

Tiara, Tisya, and Tania

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LIST OF ABBREVIATIONS

AF&PA	American Forest & Paper Association
AIA	American Institute of Architecture
ASEAN	Association of South East Asian Nations
ASID	American Society of Institutional Designer
ATO	African Timber Organization
BRC	British Retail Consortium
CWP	Name given to companies that purchase certified wood products when referring to them as a group
EPA	Environmental Protection Agency
FAO	Food and Agriculture Organization
FSC	Forest Stewardship Council
GATT	General Agreements on Tariff and Trade
GOI	Government of Indonesia
IBD	Institute of Business Designers
IFBWW	International Federation of Building and Wood Workers
IHPA	International Hardwood Product Association
IHFC	International Home Furnishing Center
INFORMAN	Indonesian Forest Management (name of a spreadsheet model)
INTAG	Inventori dan Tata Guna Hutan (Forest Inventory and Land Use)
ISO	International Standard Organization
ITTO	International Tropical Timber Organization
ITW	Initiative Tropenwald
LEI	Lembaga Ekolabel Indonesia (Indonesian Ecolabeling Institute)
MFN	Most favoured nation
MOF	Ministry of Forestry
NGO	Non Governmental Organization
Non-CWP	Name given to companies that do not purchase certified wood products when refererring to them as a group.
OECD	Organization of Economic Cooperation and Development
SCS	Scientific Certification System
SIC	Standard of Industry Classification
TBT	Technical Barrier to Trade
TC207	Technical Committee 207 (within ISO)
TC/EL	Timber Certification and Ecolabeling
TFF	Tropical Forest Foundation

TPTI	Tebang Pilih Tanam Indonesia (Indonesian Selective Logging System)
TTF	Timber Trade Federation
UNCTAD	United Nation Commission on Trade and Development
UNCED	United Nation Conference on Environment and Development
UNEP	United Nation Environmental Program
WALHI	Wahana Lingkungan Hidup Indonesia (Indonesian Environmental Forum)
WG2	Working Group 2 (within ISO/TC207)
WTO	World Trade Organization
WTP	Willingness To Pay
WWF	World Wildlife Fund

Chapter I

ECOLABELING AS AN ECONOMIC INSTRUMENT

Introduction

This chapter explains the problem studied in this research, the coverage of the study, and the organization of the dissertation.

1.1 Research Problem

This research examines ecolabeling initiative as an alternative economic instrument to mitigate externality problems in renewable natural resource extraction. Ecolabeling of tropical timber is chosen as an application area.

An ecolabel carries information on the degree of "environmental friendliness" or "pro-sustainability" characteristics of the product to which it is attached. From externality theory, the degree of "environmental friendliness" or "pro-sustainability" characteristics of a product is the extent to which the producer has internalized his production externalities toward the efficient level of internalization. The ecolabeling initiative elaborates this concept into a set of standards and criteria to be followed by the producers.

Ecolabeling of tropical timber offers a possible way out to maintain the sustainability of the natural tropical forest by inducing internalization efforts (Organization of Economic Cooperation and Development (OECD) 1991). In this

context, sustainability of the natural forest is defined as its capacity of the forest to continuously supply the constant amount of timber on perpetuity basis while maintaining its ecological and environmental (Forest Stewardship Council (FSC) 1996) functions. The primary objective of the timber ecolabeling is to promote sustainable forest management and to ensure access or entry into the green or eco-sensitive markets (Haji Gazali and Simula 1994). Given this potential, however, there is a gap in the knowledge on the working of ecolabeling as an economic instrument. In this research, theoretical and empirical analyses were conducted to evaluate the economic properties of ecolabeling.

1.2 Objectives and Scope of the Study

The objectives of this study are: (1) to investigate the effects of ecolabeling on the demand, supply and market equilibrium of tropical timber; (2) to evaluate the welfare effects of ecolabeling; and (3) to determine condition(s) under which ecolabeling can be a viable business option to the forest concessionaires.

The scope of this study is to analyze the application of ecolabeling on *dipterocarp* timber *(one species logging)* at the concession level *(logging site)* within the designated *permanent production forest*. This focus saves the analysis from the potential complication of alternative land-use issues. The analysis examines the market for ecolabeled wood products using one primary source of tropical timber products, namely Indonesia, and one major wood product market, namely the United States.

The ecolabel addressed in this research is an instrument based on an internationally negotiated and agreed principles. It is not a self-claimed environmental label. Specifically, the ecolabel analyzed is based on an independent third party certification system under Forest Stewardship Council (FSC).

FSC is an international non governmental organization with a mandate to bring harmonization to many forest product certification programs around the world. The FSC's goals are to promote environmentally sound, socially beneficial and economically viable forest management by providing an internationally consistent framework for the certification and ecolabeling of timber products. As prescribed by FSC's statutes, certification of sustainable forest management operation is based on evaluation of forest management practices against a set of performance standards. Among the consequences of this performance standard is the requirement to use timber production processes that will ensure the long-term economic viability and the sustainability of the resource, as well as the environmental functions it supports (FSC 1996).

1.3 Organization

This dissertation is organized as follows. Chapter two presents a literature review on ecolabeling from economics perspective. This part summarizes existing concepts and views of ecolabeling in general and timber certification and ecolabeling in particular. This chapter also presents support for ecolabeling as an economic instrument from an economics-of-information perspective.

Chapter three provides the setting of the study. The first part analyzes the situation that may necessitate the adoption of timber certification and ecolabeling in the supplying country if it is a viable economic instrument. The second part includes analyses of recent developments in the U.S. intermediate input market of wood products.

Chapter four conceptualizes demand and supply and how ecolabeling effects equilibrium in the wood-product market. This chapter also presents an analysis of the effect of ecolabeling on the welfare of consumers and society as a whole.

Using the U.S. imported plywood market as a case study, Chapter five quantifies the demand, supply, and price at the current market equilibrium. This chapter also presents estimates on the effects of ecolabeling on consumer surplus if a portion of the market becomes an ecolabeled segment. The estimates of gains in consumer surplus are presented for a plausible range of price premium for the ecolabeled product.

Chapter six provides a prospective analysis of the viability of ecolabeling from the interest of individual private timber producers. Several break-even analyses are presented based on a few alternative scenarios to evaluate the feasibility of adopting timber certification and ecolabeling for forest concessions in Indonesia.

Chapter seven summarizes the results of the analyses and provides some conclusions and policy implications of the findings. The limitations on the

applicability of this research are presented along with suggestions for future research.

Chapter II

LITERATURE REVIEW:

ECONOMICS PERSPECTIVE ON ECOLABELING

Introduction

The purpose of this chapter is to analyze ecolabeling using an economics framework which includes existing literature on consumption theory and product information. However, before examining ecolabeling in that framework, this chapter presents a general review of ecolabeling. First is a summary of the development of general ecolabeling initiatives, followed by the development of timber certification and ecolabeling in particular. Subsequently, a description of the existing timber certification and ecolabeling under the FSC is presented. Next is a discussion of the responses and views of various stakeholders to the emergence of timber certification and ecolabeling. Also included in this chapter is a review the existing information on the costs, price premium and willingness to pay for ecolabeled wood products in the market. The last two sections discuss the role of timber certification and ecolabeling from the perspective of consumer utility and asymmetry of information between producers and consumers about the sustainability characteristic of the wood products.

2.1 Development of General Ecolabeling Initiatives

Since early eighties business communities have engaged in labeling products and packaging with environmental attributes. Companies use labels such as "package recyclable," "content 30% of post consumer products," "ozone friendly" and so on (OECD 1991). This wave of self-labeling initiative was then followed by government-sponsored ecolabeling program (Environmental Protection Agency (EPA) 1993). The next stage of ecolabeling development is the third-party independent certification program. In this program, certification of a product to carry ecolabel is based on the assessment by an independent third-party of the producer's performance in environmental management. The latest development of ecolabeling initiatives is the second-party certification program. Second-party certification is based on criteria and standards developed by a trade or industry association. Under the second-party system, certification is provided after an assessment of the producer's environmental management performance by the industry association to which the company belongs. The American Forest & Paper Association (AF&PA) is among the industry associations that have developed and implemented its own environmental certification program (AF&PA 1996).

Currently, two types of ecolabeling programs are used (Scientific Certification System (SCS) 1996): (1) *Comprehensive ecolabel* which is based on life-cycle analysis of the environmental effects of a product from the stage of material input generation to the stage when a product becomes a waste; and (2)

Single-issue ecolabel which is based on the environment or sustainability impact assessment at one particular stage in the life cycle of a product.

EPA (1993) reported that many developed-country governments have started engaging in the policy that applies some environmental standards on the products sold in their domestic markets. Many of them have gone as far as sponsoring the development of institutions as well as standards and procedures to implement ecolabeling programs. Currently, 14 government-sponsored ecolabeling programs are in operation around the world.

Germany, which started the Blue Angel Program as early as 1978, currently has more than 3,600 ecolabeled products under 64 categories. Canada started in 1983 with its ecolabeling program called "Environmental Choice Program" and has so far covered more than 700 products within 30 categories. Japan, which seems to be the most progressive, has approved more than 2,300 products under 49 categories since the establishment of its EcoMark Program in 1989. In the U.S., at least seven ecolabeling programs are currently in operation and run by private organizations, plus nine mandatory labeling programs enforced by EPA or state laws (EPA 1993).

At regional levels, some initiatives establish ecolabeling programs. The Nordic Council granted its first "White Swan" label in 1991. The label is recognized in Sweden, Norway, Finland and Iceland. The African Timber Organization (ATO) expects to build an ecolabel program for all African countries (International Tropical Timber Organization (ITTO) 1994). In 1992, The Economic Council of the European Union adopted a regulation for community-

wide ecolabeling programs. The Council is now preparing applications for six industrial products: timber, wood products, pulp, paper, textile, garments and footwear (Jha and Zarilli 1994).

At the global level, various national ecolabeling programs are developing a Global Ecolabeling Forum chaired by Canada (International Standard Organization/Technical Committee 207 (ISO/TC207) 1994). In February 1994, (United Nations Commission on Trade and Development (UNCTAD) and United Nations Environmental Program (UNEP) jointly launched an initiative to create certification program for environmentally friendly products. The certification program is planned to be based on three elements, i.e.: (1) equivalent environmental standard for all countries, (2) mutual recognition on principles and guidelines, and (3) internationally agreed guidelines for certification procedures.

The ISO is preparing general principles for all types of ecolabeling program under the TC207/Sub-Committee-3. The Sub-Committee is developing terms, definitions, verification methods and guiding principles for the three types of labeling described in Table 2.1. The ISO's ecolabeling program is part of the more comprehensive ISO14000-Environmental Management Standard that is proposed to be adopted by international industries (Tibor and Feldman 1996).

Reactions of producers on the ecolabeling initiative vary from country to country. Producers in developed countries seem to favor the ecolabeling programs more than their counterparts in developing countries. For genuine market incentives or protectionism spirit, industry associations in developed countries continue to suggest additional products to be listed under the program.

In Canada and Germany, for instance, more than 70% of the proposals for new product categories come from the industry (Jha and Zarrilli 1993).

Table 2.1.
ISO Environmental Labeling Program

Types of environmental labeling	Description
Type I	Third party certification program
Type II	Informative environmental self-declaration claims
Type III	Quantitative product information label based upon independent verification using preset indices.

Source: ISO/TC207 (1994)

The main concern of the developing countries' producers is that ecolabeling may become a condition for market access to developed countries. This is certainly a valid concern for countries such as Indonesia and Thailand that ship 40% and 22% of their exports respectively to the markets of U.S., Canada and Western Europe (Wigzell 1994; Ahmad 1994). Many producers in developing countries view the green consumerism as merely a false issue. Consumers' lack of willingness to pay (WTP) and higher costs of production for environmentally friendly products tend to put developing country producers in a disadvantaged position vis-à-vis the competition (Jha and Zarrilli 1993). In addition, hidden protectionism agenda in the developed countries often manifests itself in the form of biased ecolabeling criteria that discriminates against developing countries' exports.

Companies from developing countries may find it difficult to represent their interests in national ecolabeling programs of OECD countries (Jha and Zarrilli, 1993). The selection of product categories for ecolabeling in developed

countries is more easily influenced by their industries' interests as they participate in the process of product selection. Sometimes the rules for ecolabeling eligibility were made in a way that it does not provide a level playing field for similar products coming from different parts of the world. For instance, the Austrian (original) compulsory ecolabeling program for timber excludes temperate woods so that in practice it means discrimination in market access against the tropical woods which are originating mainly from developing countries. In other cases, the criteria are so specific that they may actually mandate a particular technology. The textile labeling proposal in Germany defines environmentally friendly chemical so narrowly that it excludes natural dyes which in most cases are environmentally friendly (UNCTAD 1994; Wigzell 1994). In the proposal prepared by Denmark for European Community's pulp and paper ecolabeling program, criteria for eligibility was primarily based on the use of recycled raw material. No account was given at all toward the use of forest plantation as an alternative 'sustainable' source of pulp raw material. Clearly this rule is disadvantageous to Brazil that produces pulp and paper of wood from forest plantation. If Denmark's proposal is accepted for implementation in all EC countries, then access for Brazil's pulp and paper export to the region will be limited by its non-eligibility for ecolabeling. This case shows how differences in the priority of environmental and resource policy across nations could lead to trade discrimination (da Motta Veiga, et. al. 1994).

Many analyses show that the impact of ecolabeling on developing countries' exports is not significant as only a few products of export interest to

developing countries are affected (Varangis, Prima-Braga and Takeuchi 1994). However, view from developing countries' side would result in a different conclusion. Although small by the world total, export of a particular product may contribute a great deal in a country's export earnings. A developing country could face a significant problem if the bulk of the country's export depends heavily on the so called eco-sensitive products (products whose environmental attributes are under the scrutiny of importing countries). Although ecolabeling may provide challenges for new product niches, the threat of losing the existing markets is the major source of resistance by developing country exporters toward ecolabeling.

2.2 The Emergence of Timber Certification and Ecolabeling Initiative

The emergence of timber certification and ecolabeling initiatives is induced by two situations: (1) the problems in the implementations of the first best economic instruments to solve externality problems associated with timber production; and (2) the rise of green consumerism that has not been appropriately responded to by market institutions. To illustrate these situations, this study uses Indonesia, one of the world's largest producers of tropical timber, and United States and Western Europe as primary international markets of the tropical timber products.

2.2.1 Externalities in Timber Production

Generally in tropical logging operation two main problems are associated with the production process. First, logging of tropical old growth forest tends to have negative stock feedback effect. Commercial volume recovered from a logging operation is always smaller than the total reduction of the timber stock in the forest. Logging waste and damage to the standing residual trees make up the balance of the calculation. Harvest of the mature mahogany trees, for instance, may damage young mahogany trees and other tree species in the neighborhood of the fallen trees. Skidding of the logs from the logging sites to the trucking yard is another cause of damage to the residual trees. If a concessionaire does not internalize this stock feedback effect by conducting proper silviculture efforts, it is imposing an externality on the future production in the form of lower stock growth and potential harvest. Secondly, reduction of timber stock in the forest may lead to deforestation through insufficient regeneration of trees. Deforestation will in turn causes losses of all environmental and resource functions supported by the existence of the tropical forest.

Several authors have analyzed the forest resources by incorporating the value of the resource stocks. Vousden (1974) and Hartman (1976) both studied the optimal depletion of the natural forest if the stock has value. Vousden focused on the amount of optimal depletion while Hartman looked at the optimal timing of the depletion. Berck (1981) analyzed the optimal stock size in steady state. He found that if the forest resource stock has value, it is optimal to

maintain higher stock of the resource at the steady state as compared to the situation in which stock value is not considered. Graham-Tomasi (1984) analyzed the utilization of old growth forest in the light of stock value in its wilderness function and the existence of back-stop technology (i.e. plantation) that serves as an alternative source of wood. He identified the optimal size of old growth forest to be maintained as a wilderness area, the size of land to be converted to plantation, and optimal time to convert the natural forest into plantations.

All the theoretical studies mentioned above shared a set of common characteristics in their analyses. They all assumed that the optimization would happen under the first best market conditions, i.e., property rights are clearly defined and enforced over a significantly long period of time and no distortion exists in the credit market to make the interest rate so high that it discourages long term investment. Unfortunately, empirical analysis to evaluate the consequences of the findings has yet to happen.

2.2.2 Problems in the Implementation of the First Best Economic Policy Instrument

In the developing countries that house tropical natural forests, the externality problem is mainly caused by two situations: (1) insecure property right over the forest resources; and (2) distortion in the credit market (Lopez 1994, Panayotou 1992). Short forest concession period and high interest rate

are often accused as the main sources of short-sightedness of the forestry business (Panayotou 1992).

To correct this kind of externality problem, economic theory offers a series of standard policy instruments to bring the economy toward the Pareto Efficient allocation and to ensure that the social costs equal the social benefits. The common policy prescriptions include: (1) rearrangement of property right *a la* Coase to secure future income; (2) reform of credit market to lower interest rate; and (3) the Pigouvian tax to reduce externality to its Pareto Efficient level. However, all these instruments have problems and are unlikely to be implemented.

Rearrangement of property right is difficult in practice. This rearrangement may involve changing the length of concession period as well as the system of concession allocation. In developing countries such as Indonesia, the delicate webs of political structure affecting economic priority and the use of resources stand behind this difficulty (Ascher 1993; Broad 1995).

Reform in credit markets serves as a precondition to induce the interest rate to decrease. However, it can not guarantee that the interest rate will decline because high interest rates reflect high risk of doing business. It may take decades to remove all the institutional constraints and for all rent dissipated from the economy before the capital market can offer a low interest rate. In Indonesia, for instance, although financial markets (especially banking and credit markets) have been liberalized since 1983, the interest rates and banking spread have not shown significant declines (Woo, Glassburner and Nasution 1994).

Although some experts advocate the application of *Pigouvian tax* to mitigate the externality problems (e.g. Daly and Goodland 1994), it appears as an unfavorable choice for exporting countries. The tax reduces product competitiveness in the market, no matter whether it is implemented by the importing or exporting country (Baumol and Oates 1988).

Pigouvian tax is the tax imposed by government to reduce the externality of an economic activity to the most efficient level in Pareto Optimality sense. Imagine that a country A harvest and use some of the timber (T) from its forest stock, and export some of it to country B. T has negative externality effects from its production and consumption. As the producer and consumer, people in country A receive both the production and consumption externalities of T production. People in country B who import T from A and other sources receive the consumption externalities effect of T (for instance more wood waste in the community). People in country C, which is located next to A, do not import T from A, but received the negative externality effect of T production, for instance, because flood or damaged watershed.

As inferred from Baumol and Oates (1988) arguments, the first best way to tackle this externality problem is to impose an excise tax on the production of T to cover all externalities costs, and costlessly distributes the proceed to the damaged parties. This would guarantee that damages in A, B and C receive the appropriate compensation, and resource would be well maintained. Obviously, this is not an option favored by A, the producer of T, as the policy will likely price it out of the international market if other producers of T are not doing the same. Furthermore, the costless redistribution mechanism is not a conceivable practical solution. An

international institution to implement this externality tax does not seem to be an operational concept so far.

As trading partners, the followings are some tax policy alternatives that the governments of country A and B could do without involving C:

(1) A unilaterally imposes production tax on T. B does not do anything.

(2) A imposes an export tax on T. B does not do anything.

(3) A does not impose any tax on T, B impose import or consumption tax.

(4) A impose export tax to counter the domestic production and consumption externalities and B impose import tariff based on consumption externalities generated by T.

Unfortunately, none of these options provides incentives to generate the efficient level of internalization. Baumol and Oates (1988) showed that the first and second choice do not necessarily reduce employment and foreign exchange earning of country A. However, this is true only if country B does not have an alternative source of T import other than country A. These options are not favored by the T producers and government of country A because these options will jeopardize their competitive position in the market if other producing countries that are exporting to B are not implementing the same policy.

In option 2 and 3, each individual country will only calculate the local damage as the basis for imposing the externality tax on the border price. As a result, over production of T will still be apparent in A because producers do not incorporate all externality costs of their products. For the same reason, even if both country are simultaneously imposing export and import tax based on their own domestic

damages, T would still be over-produced because the total amount does not include necessary compensation for people in country C.

Given the problems of imposing the optimal tax to correct the externality problems, and the impracticality of promoting the community contractual arrangement a la Coase, it is very unlikely that the first best economic instruments alone can be used effectively to deal with externality. However, the first best instruments such as reform of property rights and Pigouvian tax, can complement the incentive for the adoption of ecolabeling.

Ecolabeling offers a way to persuade producers to internalize their production externalities. Ecolabel provides the means for sustainability-concerned consumers to appreciate the producers' effort through the market mechanism, and to exercise their preference toward resource or environmental sustainability. Ecolabel facilitates the creation and transmission of market incentives for producers to internalize the costs of externalities associated with production process. A property right system that guarantees the flow of future benefits to the forest concessionaires will strongly complement the financial incentive of ecolabeling. And as shown in Chapter IV, implementation of ecolabeling under the existence of Pigouvian tax will results in higher welfare than under situation in which only one of these instruments is in place.

2.2.3 The Rise of Green Consumerism

The search for alternative approaches is also progressing on the consumer side of the market. The increasing consumers' awareness about

environment and resource sustainability has resulted in some changes in the consumer's purchasing behavior. Green consumerism exists if consumers are discriminating in favor of pro-sustainability products and/or showing some willingness to pay for this characteristic as a consequences of their preference. Bans and boycotts on the use of tropical timber in several U.S. cities (EPA 1993) are examples of the change in consumers' behavior. However, since bans and boycotts lower the value of the forests as an economic resources, they serve as disincentives for the owners to maintain the resources.

Prior to the ecolabeling initiative, other than bans and boycotts, consumers have almost no instruments for exercising their new preferences. The rise of green consumerism -- which potentially generates some willingness to pay for externalities -- has not been sufficiently recognized and responded to by market institutions. Consumers who care for resource sustainability are left with few or no devices for exercising their concerns through purchasing behavior, i.e. to discriminate in favor of pro-sustainability products.

Some studies reveal that green consumerism does exist and is growing around the world (Cairncross 1995). A survey by Winterhalter and Cassen of Purdue University (Winterhalter and Cassen 1993; Winterhalter 1993) finds that 67% of affluent U.S. households in their sample had avoided certain products for environmental reasons. When it comes to buying furniture, about 93% of consumers would like to know that their furniture originate in a sustainably managed forest, and 82% consumers mentioned that they trust environmental labels when making purchases.

A survey by Gerstman and Meyer in 1991 supportd these results. More than two-thirds (72%) of consumers said that environmental information of a product should be readily available or included with the packaging, and 85% said that currently too little of that information is available. This survey reported WTP for 1-5% premium from 75% consumers (Schwartz and Miller 1991).

Winterhalter (1994a) reported that American Institute of Architecture (AIA), American Society of Institutional Designers (ASID), and Institute of Business Designers (IBD) had campaigned for the use of certified timber products among their members. These groups consist of architects, interior designers and furniture designers as well as other wood specifiers.

A more recent study on the environmentally marketed wooden household furniture were conducted by Ozanne and Smith (1996) to characterize the potential market segments of the products. Using a cluster analysis they found that about 39% of U.S. consumers prefer the environmentally marketed wooden household furniture. Consumers in this segment are characterized as environmentally concerned, moderate to high income levels, Democrats, and quality-conscious.

To respond to the changes in consumer preferences, ecolabeling is emerging as an alternative approach to bans and boycotts to mitigate the externality problems. Ecolabeling creates an economic link between consumer preference and the sustainability objectives of forest utilization. From the perspective, the advantage of ecolabeling is that it allows consumers to make an

informed choice at the time of purchase, and to discriminate in favor of pro-sustainability products.

2.3 Timber Certification and Ecolabeling under FSC System

Timber certification and ecolabeling (TC/EL) is a single issue ecolabeling program. It is based on an independent third party evaluation of sustainability at one particular stage in the life cycle of wood products, namely the stage of input generation at the wood source. Certification is given at the concession level by certifying institution accredited by the FSC.

The FSC was established by the initiative of forest-concerned non governmental organizations (NGOs) from several countries in October 1993. The FSC goal is to promote environmentally appropriate, socially beneficial, and economically viable management of the world forests by providing an internationally consistent framework for the certification and ecolabeling of timber (FSC 1994). In defining the principles and criteria for sustainable forest management, FSC uses the performance standard approach that tends to be more prescriptive and strict compared to the management system standard used by ISO. The FSC formulates and applies its Principles and Criteria for Natural Forest Management, one for each type of forests, temperate, boreal and tropical. The Principles and Criteria will be used by FSC-accredited certifiers to evaluate forest management practices of producers seeking certification. FSC accreditation aims at providing a guarantee for the authenticity of the certifiers' claims.

The Principles state that forest management shall: (1) respect local, national and international laws and treaties and the FSC's Principles and Criteria; (2) legally establish and document long-term tenure and use rights to the land and forest resources; (3) respect indigenous people's use rights, including compensation for applications of indigenous knowledge of forest management or species use ; (4) maintain or enhance the long-term social and economic well-being of forest workers and local communities; (5) encourage the efficient use of the forest's multiple products and services to ensure the economic viability and a wide range of environmental and social benefits; (6) conserve biological diversity and its associated values, water resources, soil, and unique fragile ecosystem and landscapes, and by doing so, maintain the ecological functions and integrity of the forests; (7) write and maintain a management plan; (8) monitor of forest conditions, product yields, chain of custody, management activities and their environmental impacts; (9) conserve primary forests, well-developed secondary forests, and sites of major environmental, social and cultural significance, not replacing them with plantation or other uses; and (10) not replace natural forest with plantations, but should relieve pressure on natural forest.

FSC-accredited certifiers are required to evaluate forest management using detailed forestry standards which take account of specific national or regional forestry issues that meet or exceed FSC Principles and Criteria. The certifiers are also required to remain independent from outside influence, and maintain rigorous evaluation standards and practice. The evaluation for

certification is based on a series of criteria that can be classified into three main groups: (1) long-term economic viability of the timber production; (2) environmental impact of the logging operation; and (3) the benefits of the concessionaires' operation to the welfare of its surrounding community. Due to technical difficulties in defining, measuring, and setting the operational standard for sustainability, the current certification practices aim only at providing certification for "well-managed forest" instead of "sustainable forest".

The FSC machinery includes a general assembly, a board of directors, an executive director and secretariat, a technical committee, and an accreditation appeal committee. The board of directors makes the accreditation decisions. Memberships and officers are divided by north-south category and by social, commercial and environmental interest groups. Votes are divided equally among these three groups.

The FSC's effort to win leadership in TC/EL seems to gain support based on its world-wide coverage of all types of forests and the common rules and norms it has developed. However, the FSC has also been criticized for the lack of participation of governments, timber-based industries and trade associations in the process of preparation of principles and criteria (AF&PA 1997). As of March 1997, 62 forest management companies around the world have been certified as "well managed forest" under FSC system, covering a total area of more than 2.9 million hectares (FSC 1997).

2.4 Views on Timber Certification and Ecolabeling

The TC/EL initiatives emerged from several different backgrounds which may not be mutually exclusive. It might first have appeared as a response and alternative to boycotts and bans of the use of tropical timber products. It could be termed as a more civilized way for discriminating against the tropical timber export. It could also appear as a genuine economic proposal to practice business with environmental consideration. And finally, timber certification proposals were also seen as an effort to create a new business opportunity, i.e. providing the certification service[1] (ITTO 1994).

With all these backgrounds, timber certification initiatives and views toward it vary widely across stakeholder in the business. Importing country governments as well as their timber-based business associations and Non-Governmental Organizations (NGOs) are developing plans regarding the future imports of timber. By the same token, the exporting country governments, NGOs and private sectors have also taken various initiatives to deal with their concerns.

2.4.1 Initiatives and Views of International Organizations

In 1990, **International Tropical Timber Organization (ITTO)** initiated a program to promote that by the year 2000 all tropical timber trade should originate from sustainably managed forest. This "Year 2000 Target" is supported by three guidelines ITTO had developed to be implemented by its member

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[1] As noted by Canadian delegation to ITTO meeting in Cartagena, May 1994, the main supporters of timber certification program are the certifying companies (ITTO 1994).

countries: (1) Guidelines and Criteria for Sustainable Forest Management of Natural Tropical Forest, (2) Guidelines for the Establishment and Sustainable Management of Planted Tropical Forest, and (3) Guidelines for the Conservation of Biodiversity in Tropical Production Forests. All these guidelines have served as a groundwork for an internationally agreed standard and criteria for certification program for tropical forest products. Regarding certification itself, without taking any position, ITTO has explicitly recognized TC/EL as a possible tool toward sustainable forest management (Haji Gazali and Simula 1994). ITTO member countries have expressed that a TC/EL program should be voluntary, based on a transparent system, internationally recognized and harmonized, and compatible with General Agreements on Tariff and Trade/World Trade Organization (GATT/WTO) rules. However, due to its limited mandate to tropical timber, many ITTO member countries stated that timber certification and harmonization of internationally accepted standards should be pursued outside the organization.

Timber certification can be considered as an application of Article 7 of the "Technical Barriers to Trade (TBT) Agreement" within the Uruguay Round of the GATT trade negotiation. The "Code of Good Practice and the Preparation, Adoption and Application of Standards" which is part of the TBT text, requires autonomous body to apply the same principles and rules as are required to be followed by central government bodies. The bottom line of TBT Agreement is that the standard should be applied on non-discriminatory basis, and the adoption of standard by the industry should be left on voluntary basis. TBT

Agreement also indirectly provide recognition to the role of International Standard Organization (ISO) in harmonizing industry standards internationally (Jha and Zarrilli 1993).

ISO/TC207's works on environmental management system has been discussed as the place where all TC/EL initiatives are expected to converge. Many national standard institutions view ISO as the appropriate place to seek international harmonization and mutual recognition for any standardization program. In addition to preparing the ecolabeling guidelines, ISO/TC207 has formed a working group (i.e. WG2) with the specific task to elaborate the guidelines for implementing forest management certification as part of the ISO 14000 initiative. As of June 1997, ISO has begun offering accreditation for the companies interested in providing certification service to forest management operation (Registrar Accreditation Board 1997).

The Tropical Forest Foundation (TFF) is reportedly working to establish "Tropical Forest Recognition Program", designed to allow companies to voluntarily disclose confidential information on environmental friendliness of their products to an Expert Review Committee. The committee will then provide recognition for companies whose supply bases – which is the forest from which the wood originates -- are moving toward sustainability (EPA 1993; TFF 1996).

Food and Agriculture Organization of the United Nations (FAO), whose mandate on forestry issues covers all types of forests, has expressed its willingness to help developing an appropriate timber certification system for all timber in cooperation with ITTO. Another international non governmental

organization, the **International Federation of Building and Wood Workers (IFBWW)** calls for making timber certification a binding precondition for market access over a medium term (ITTO 1994).

2.4.2 Initiatives and Views of Importing Countries

Most developed countries that import timber and timber products are now involved in the debates about timber certification and ecolabeling. Some of the governments of importing countries have taken unilateral initiatives and policies to restrict the import of timber that does not originate from sustainably managed forest. Fourteen importing countries plus the European Union have reported their preparations and views on TC/EL program (Haji Gazali and Simula 1994).

The United States government, has expressed its support for private and voluntary timber certification mechanisms within the existing legal frameworks (ITTO 1994). At the federal level no specific action has been taken. However, within the last few years, some state and municipal level governments have passed or are considering legislation to ban the use of tropical timber in public contracts unless it comes from certified well-managed forest (EPA 1993; United States Department of Agriculture (U.S.DA) Forest Service 1993). New York City and The State of Arizona have adopted the law. The cities of Minneapolis, San Francisco, Santa Monica, Baltimore, Bellingham and Harrisburg, as well as the states of California, New York, and New Jersey are considering similar laws. Campaigns of NGOs and some private companies have raised the awareness among the wood product users about the need for certification. U.S.-based

NGOs and companies have been leading the forest certification business since 1990. Currently, three timber certification programs are operating in the U.S..

More recently, a group of U.S. environmental NGOs have launched a new initiative called the North American Buyers Group. Its objective is to reduce the number of middlemen in the marketing channel and create the closest link possible between the certified forest concessions and the end users. By streamlining the marketing channel, the initiative aims at increasing the incentive for the forest concessionaires to adopt certification and ecolabeling. At the same time, it will not incur a significant increase in the cost of purchasing wood materials to the secondary manufacturers, and hence, the end users of the wood products. The group believes that by cutting the number of middlemen, TC/EL can work even without any willingness to pay for some price premium among the consumers (Crossley and Lent 1996)

Canada, as a major exporter of temperate and boreal timber and importer of tropical timber, takes the view that if certification takes place, it should cover all timber from all forests. Although the Canadian government has not taken any specific position, the Canadian Forest Service has supported the Certification Committee of the Canadian Forest Industry. The Canadian forest industry proposed that a credible certification system should be done only under ISO which can be disciplined under General Agreements on Tariff and Trade/World Trade Organization (GATT/WTO) provisions. The Silva Forest Foundation in British Columbia appeared to be the first forest certifying agency in Canada (Canadian Standard Association (CSA) 1994).

In **Germany** the Initiative Tropenwald (ITW) was founded by timber industry, timber importers and a trade union in 1992 to search for an alternative to boycotts and bans. The initiative has gained support from the NGOs and the government who are against the boycott and bans of tropical timber. While ITW is still developing a voluntary timber certification, major big cities like Cologne, Hamburg, Bremen, Frankfurt and, Munich, as well as a growing numbers of small cities, have effectively dropped the use of tropical timber and timber products in response to the pressures from environmental groups (Haji Gazali and Simula 1994).

In **United Kingdom**, World Wildlife Fund of UK (WWF-UK) developed a partnership with major timber distributors to set up The 1995 Group. This group wants to phase out the sale and use of all timber that does not come from well-managed forests by the end of 1995. After some evaluation on the supply availability and to allow more flexibility in the program, the group changed its name into The 1995 Plus Group. The British Retail Consortium (BRC) that represents 90% of retail industry in UK has publicly declared its support for WFF initiative. The whole group claims to be working in the market that has a combined value of $2.2 billion (WWF-UK 1996).

The UK Timber Trade Federation (TTF) has endorsed timber certification and launched its Forest Forever Campaign which adheres to ITTO Year 2000 target. The TTF has also endorsed its Environmental Purchasing Policy which gives preferential treatment for timber from sustainable sources. The TTF also supports country certification which is backed by a national forest management

plan. The UK government, while recognizing TC/EL as a potential means to promote sustainable forest management, mandates that it should not become any impediment to trade. In the UK two timber certifying companies are now in operation.

In **France,** the government sees that TC/EL can be a desirable or even inevitable instrument if it is implemented in line with the principles of UNCTAD, ITTO and GATT/WTO. The French government had issued a Green Label for Okoume (Eurokoume) which is timber mainly imported from Gabon. At the moment, the French government is providing support for the development of green label for African timber.

Austria was the first country that took an unilateral action to limit import of tropical timber. In 1992, Austrian parliament enacted the Federal Law/BGB1.309 which imposed mandatory ecolabeling for tropical timber import into the country. After Indonesia and Malaysia contested it as non compatible with GATT provision on Technical Barriers to Trade Agreement, the law was amended to become Federal Law/BGB1.228 as to apply on voluntary basis for all timber from all sources. The Austrian government has expressed its support for internationally accepted labels for all timber and timber products (Haji Gazali and Simula 1994).

In June 1993, the government of **Netherlands**, private sectors, and NGOs signed a covenant called The Netherlands Framework Agreement on Tropical Timber. The covenant called for the complete cessation of the use of non certified tropical timber products by the end of 1995. The private sector

signatories of the covenant cover 90% of the tropical timber market, thus posting a significant threat for tropical timber exporting countries. Although the Dutch government had expressed its support for certification under internationally accepted umbrella, no statement was made about the non tropical timber. In practice, this pattern of unequal treatment could place tropical timber products in disadvantageous position in the Netherlands' timber market (the Netherlands Ministry of Environment 1994).

In **Belgium**, the Federation of Timber Importers and WWF-Belgium have agreed to establish certification program for all timber in the forms of roundwood and sawnwood. The voluntary system expects traders to stock sustainably produced timber from January 1997 onwards.

The **Switzerland** government supports voluntary labeling on private basis for sustainably produced timber. Domestically, timber production has been subject to scrutiny from the Committee of Swiss Wood since 1988.

In conjunction with Council Regulation No. 880/1992 on ecolabel award program, **The European Union** has stated that certification is inevitable to respond to the green demand in order to avoid bans and boycotts. The EC commission sees that TC/EL as a first step toward a more comprehensive ecolabeling program based on life cycle analysis. For this reason the commission has said to support the harmonization of TC/EL within the EU ecolabeling system. The commission agreed that the TC/EL should be applied for all timber, based on the principles of non-discriminatory, transparency and acceptability for all concerned parties (Haji Gazali and Simula 1994).

In **Australia,** the National Association of Forest Industry is urging the government to evaluate timber certification as a means to comply with ITTO Year 2000 objective. At this points, timber importers accept ecolabeling programs of producer countries provided it is based on international standard. Currently, in Australian market there are some timber from Malaysia that carries ecolabel certificate issued in the country of origin.

Japan, the world third largest timber importer after the United States and Germany, has not taken any position nor given support specific to the TC/EL initiatives. Although Japan has engaged in EcoMark program since 1989, the Japanese government views TC/EL as part of the general question of how to harmonize trade and environment policies. In the case of TC/EL, the Japanese government awaits for "convincing evidence" that certification and labeling will indeed promote sustainable forest management (ITTO 1994).

2.4.3 Initiatives and Views of Exporting Countries

Reactions from the exporting countries regarding timber certification vary even wider than that of importing countries. The reactions range from suspicion on eco-imperialism (e.g. Liberia) to pro-active efforts trying to preempt the actions of importing countries (e.g. Indonesia). It is conceivable that these views vary a great deal due to: (1) differences in the pressure or threat of loosing the existing export markets; (2) differences in product competitiveness in the market if ecolabeling becomes a condition of entry; and (3) differences in expectation in the future development of the green market.

The **Brazilian** government has expressed strong reservation against timber certification program. Brazil views that TC/EL should not be required before developed countries have fulfilled their commitment to provide sufficient financial resources and necessary technology to enable developing countries to attain sustainable development. Brazil is not convinced that TC/EL will provide incentive for producers due to its high cost of conducting sustainable forest management (ITTO 1994). Although the government support the SBS/Brazilian Silviculture Society to develop the CERFLOR certification system, it is oriented primarily to counter ecolabeling program proposed by European Union on pulp and paper products. The Andean Group (**Peru, Ecuador, Bolivia**) views that TC/EL could play a role for sustainable forest management if it can provide incentives and be arranged to be consistent with ITTO, GATT and UNCTAD's most favored nation (MFN) clause.

The **Malaysian** government voiced its suspicion at the beginning. It suspected that the initiatives that have been developed in the name of sustainability were governed actually by political and business expediency. This view was driven by the fact that most proposals for TC/EL initiatives come from major consuming countries. Malaysia now sees that if there is a credible and workable TC/EL system, it would not be realistic to implement it sooner than the ITTO Year 2000 target (ITTO 1994). In the mean time, with World Wildlife Fund -Malayisa (WWF-Malaysia) support, some Malaysian private producers are involved in experimentation with TC/EL. Malaysian Timber Producer Board Certificates, a purely local certification system, are being granted to some

producers and currently finding acceptance in Australian markets. A more recent publication reported that SGS/Forestry has certified a forest management company in Malaysia (FSC 1997).

Indonesia, a major producer in Asia region, seems to be leading the trend toward timber certification. Indonesia is now in the process of establishing the Indonesian Ecolabeling Institute whose first duty is to prepare a TC/EL program. Indonesia is seeking recognition and accreditation from FSC and other international organizations for its proposed domestic certification system. The program is being prepared to primarily aim at independent domestic inspection and enforcement of sustainable forest management standard and criteria. One major teak producing company has been certified in Indonesia and a few others are being evaluated for certification (SmartWood 1996; Lembaga Ekolabel Indonesia (LEI) 1997).

Philippines and **Papua New Guinea**, other major producers in the region, are both supportive of the TC/EL initiative. In addition to their significant reservations toward the cost and competitiveness impacts of TC/EL, producers in both countries are facing less pressure to implement the initiatives because they are exporting mainly to the non-ecosensitive markets of East Asia. As of March 1997, one forest concessionaire in Papua New Guinea had been certified by SGS Forestry.

The **African Timber Organization (ATO)** announced its preference to have a TC/EL system unique for African countries. Supported by the French government, ATO is now preparing a Green Label for African Timber. Haji Gazali

and Simula (1994) reported that compared to other existing principles and criteria for sustainable forest management, the ATO proposed criteria may be considered as representing the minimum level of sustainability requirements. **Ghana, Cameron, and Ivory Coast** have participated in ATO's program.

In **New Zealand**, timber certification aims more at the issue of sustainability of domestic forest. In June 1990 the Forestry Ministry imposed an interim ban for the export of timber and timber products except those that originate from the area managed under certified sustainable management plan. The Forest Industry Council of New Zealand has adopted the New Zealand Brand as TC/EL-like certificate on sustainable criteria for forest management.

Finland, **Sweden** and **Poland**, whose timber industries are export oriented, view TC/EL as inevitable for maintaining the export market. The Finnish and Swedish governments prefer to have an internationally harmonized system of timber certification. As of mid 1997, these three countries have certified forest management operations (SGS/Forestry 1997; FSC 1997).

2.5 Costs, Price Premium and Willingness to Pay for Ecolabeled Wood

In practice, a TC/EL program entails two types of costs at the company level: (1) the cost for the company to operate in the sustainable manner according to a set of performance standard. It consists of the costs to implement better logging techniques and control as well as conducting proper silviculture and tending for the residual trees in the logged-over area; and (2) the cost of

becoming a certified source that consists of pre-certification assessment and periodical auditing cost.

The cost of sustainable forest management, which is also referred to as compliance cost to TC/EL program, varies widely across types of forests (heterogeneous vs. homogenous, tropical vs. temperate and boreal, and so on). As pointed out by Haji Gazali and Simula (1994), the lack of reliable estimates on the cost of sustainable forest management is mainly caused by the lack of commonly agreed operational definitions of sustainability. Jaakko Poyry Consultants/CINTRAFOR (1993) estimated that the cost of compliance to sustainable forest management standard in the tropic ranges between zero and $13 per cubic meter of logs produced. For a typical forest concession in Indonesia, the cost of conducting proper logging and silviculture is estimated about $5 per hectare per year[2].

For certification costs which consist of assessment and auditing costs, the estimated range is $0.05 - $2.00 per cubic meter log produced. This cost depends mainly on the size of the concession area, availability of information on the forest inventory and adequacy of forest maps. In developed countries where expertise and forest information system have been developed, the cost is estimated to range between U.S. $0.30 - $0.60 per hectare of forest. As for

[2] This estimate is based on the information supplied by an assessor of forestry practices. Due to the proprietary nature of this information and by agreement, the provider's name can not be disclosed. Typical concession in Indonesia has 100,000 hectare area. Proper logging and silviculture refers to the use of methods and care that would result in: (1) higher wood recovery from logging; (2) less damage to the residual trees; (3) replanting in the logged over area to maintain growth potential; and (4) good tending of the logged-over area (World Bank 1994)

Indonesia, the cost is estimated at $0.35 - $0.45 per year per hectare of concession area[3].

The cost of timber tracking, which is also known as chain-of-custody, is another cost that needs be borne by the ecolabeled sellers in the market. Septiani and Eliot (1994) reported that SGS/Indonesia estimated a U.S. $1.30 cost for tracking per cubic meter log. In contrast, SGS/New Zealand came up with $7 per cubic meter estimate.

In order for timber certification and ecolabeling to work, all costs borne by the forest concessionaires and wood product industry would have to be compensated in the market. Currently, demand for ecolabeled or certified wood products is believed to come from the eco-sensitive markets. These are markets in which green consumerism has been manifested into willingness to pay (WTP) for a green premium and/or where the consumers has practiced discrimination in favor of environmentally friendly products (Van Orsdol and Keikens 1993; Ekins 1992). For certified timber products, demand is expected to come from: (1) importers of developed countries who are facing strong local environmental pressures; (2) traders who see the opening of a new market niche and see certified timber as a competitive advantage relative to other similar products in the market; and (3) traders who see the opportunity to exploit consumer surplus by means of differentiating products according to different levels of consumers' environmental awareness (Van Orsdol and Keikens 1992; Ahmad, Hernandez and Nilagupta 1993); (4) public sector projects in accordance with regulations;

and (5) architects, designers and other specifiers. And as pointed out by Crossley, Prima-Braga and Varangis (1994), high value-added products which are also highly visible timber products such as furniture, doors and windows and their frames, would be among the first certified wood product markets to develop. These products is expected to be able to absorb the certification costs.

The preference toward environmentally friendly wood products has been reportedly growing in a number of developed countries. Winterhalter of Purdue University reported that with respect to timber and its products, 60% of the consumers and 93% of direct wood users, i.e., architects and wood product designers, said that they are willing to pay up to additional 10% above the original price for the wood that is certified as coming from sustainably managed forest (Winterhalter 1994a; 1994b). These results come from a survey among the institutional wood specifiers.

Another Purdue University survey that focus on household consumers, found that when buying wood products, in addition to price consideration consumers rank the following features by the order of importance: (1) the finishing: textures, gloss, stain; (2) appropriateness of design; (3) solid wood construction; and (4) sustainable forest origin. Winterhalter and Cassens (1993) reported that 34% of consumers are willing to pay a 6%-10% price premium. Both Purdue University's surveys found that most consumers and wood users share the view that ecolabeling of wood products is important.

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[3] These costs were estimated using information from some forest management companies and their certifiers during the 1996-97 MSU survey of certified wood products.

Together with the result of the previous survey, Table 2.2 illustrates the sense of WTP for certified wood products from U.S. consumers and wood specifiers.

Table 2.2.
Willingness to Pay for Certified Timber Products in the U.S.

Price premium	% of consumers (1993 consumer survey)	% of wood users and specifiers (1994 AIA, ASID and IDB survey)
0%	22%	3%
> 1 - 5%	26%	57%
> 6 -10%	34%	36%
> 11 - 15%	8%	2%
> 16 - 20%	0%	2%

Source: Winterhalter (1994a), *Consumer Perception and WTP: Results of Two National Surveys*, Lafayette, IN, Purdue University.

Results of two surveys in the United Kingdom have also been reported by Haji Gazali and Simula (1994) and WWF-UK (1991). The first survey, conducted by WWF-UK and MORI in 1991 claimed that, on average, the researcher found WTP for 13% green premium for tropical timber products. Half of consumers in the survey find ecolabeling of wood product as important. In contrast, The Timber Merchant survey in 1993 reported that UK consumers have little environmental awareness and low WTP. Almost 90% of the traders interviewed reported that very few consumers ask about the timber source. The survey found that price, and then quality, are the main factors in consumers' decision. The sustainability of resources ranked fourth.

Comparison with the results of a survey on organic food may help put the WTP issue in perspective. Van Ravensway and Hoehn (1991) reported that based on a national survey, the increased price that U.S. consumers are willing

to pay for health and environmental attributes is between 5%-7% on average. A more general survey by Roper Organization in 1990 (Schwartz and Miller 1991) reported that 53% Americans are not willing to pay more for a healthier environment. It also found that about one quarter (26%) of consumers have environmental concerns but do not believe individual actions make a difference. This is precisely the issue faced by all environmentally friendly products: how to convince consumers that their individual atomistic action such as paying for a small price premium could indirectly contribute to the sustainability of world resources and environment.

2.6 Consumer Utility and Product Information

As theorized by Lancaster (1971), consumers derive utility from product characteristics. In this perspective, how much each particular product is purchased within a consumer's consumption bundle is determined by the amount of each characteristic that consumers are willing to consume, their incomes, and the price of the product.

Consumers' preferences for a product are determined by its visible features such as color and package, as well as the information that consumers receive about the intrinsic characteristics of the product. Such information can be the maximum life of a product, the technology used in production, the country where the product is made (which is relevant in the case of boycott), or its environmental impacts and sustainability characteristics. The consumer's preference over particular goods will be determined by the degree of relevance

of such information to the consumer given his or her income, education level, cultural background, tastes and aspirations. Demand for a product may change as consumers receive more information about its characteristics. Schlesinger and von-der Schulenburg (1991) found that consumers whose preferences for certain product characteristics are strong do switch their purchase and are willing to pay higher prices.

Ecolabel conveys to consumers information about the level of environmental friendliness or pro-sustainability characteristics of a product. Ecolabels help remind potential buyers of the characteristics that they are looking for at the time of purchase. Therefore, ecolabeling programs target pro-sustainability consumers who actively discriminate in favor of environmentally or resource friendly products (Van-Orsdol and Kiekens, 1993). While the cradle-to-grave principle would be an idealistic objective of the ecolabeling program, labeling at different stages of production and marketing is viewed as the most realistic practice. It can be viewed as a learning process if labeling is conducted cumulatively starting from the extraction of the natural resource content of a product up to its final packaging stage. OECD (1991) claims that environmental labeling can improve the sales or image of the product, raise consumers' awareness on sustainability issues, provide accurate information, direct manufacturers to account for the environmental impacts of their products, and therefore, help protect the environment.

To consumers, the ecolabel serves as a limited guarantee that the product is environmentally friendly or pro-sustainability at the stage indicated by the

label. The label "package recyclable" does not guarantee that the content of the package is produced in environmentally friendly manner. In similar way, a label on wooden furniture that claims "using wood coming from sustainably managed forest" only guarantees the sustainability of the wood sources. It does not provide any information on the wood-working stage of production, nor on the stage when the used-up furniture becomes a waste.

Firms may view ecolabeling as an advertising instrument which can enhance the marketing appeals of a product. However, without any means of verifying the credibility of the label, the confusion could lead to consumers' mistrust or distrust of the product labels. To be an effective market warranty, a product label needs be credible. With respect to this credibility issue, an independent accreditation system is a way to provide the credibility for the market warranty[4].

To be effective and credible, an ecolabeling system needs to have the following elements: (1) A meaningful label that gives practical information to be used by consumers at the time of purchase (Akerlof 1970); (2) A verifiable certification system that guarantees claims made by producers. A certification system must have an independent third party assessment and objective audit mechanism; (3) Voluntary participation of producers to ensure that the system works based on market incentives; (4) Internationally and nationally agreed principles, standards and criteria for the sustainability performance to be

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[4] Spence (1974) and Kreps (1990) argued that in the case of labor market signaling, accreditation of university system serves as a source of credibility of quality signals carried by graduates of certain universities.

achieved; (5) Accreditation system for certifiers to ensure that the certifiers adhere to the principles, standards and criteria set by the accrediting institutions. The accrediting institution should consist of representatives of all stakeholders (government, consumers, producers, environmentalist) in the business, and (6) GATT/WTO compatibility to ensure that the ecolabel is not being used as a barrier to trade.

In the case of tropical timber, the ultimate objective of the certification program is to maintain the sustainability of the tropical forest, hence the sustainability of the ecological and wilderness functions it supports. The existence and sustainability of the tropical forest and its functions contain a significant notion of public goods. Cornes and Sandler (1986) and Sandler (1992, 1993) argues that if consumers derive utility from a public good, they are willing to provide it to some extent. In this context of private provisions of public goods, by buying the ecolabeled products with some price premium, the consumers are paying a proportion of the costs of internalizing the externalities as a way to provide some level of resource or environmental sustainability -- the public good that they care about. The total amount of the privately provided public goods may not be Pareto Efficient, but some provisions as opposed to none can be considered as a move toward the Pareto Optimum level.

From an information economics point of view, ecolabel carries warranty and information from the informed party (in this case the sellers or producers) to the uninformed party (buyers or consumers) that the product is made using sustainable production process. Conceivably the producers and sellers know

more about the environmental or pro-sustainability characteristics of the products they sell than the buyers do. In this situation, information is asymmetric between the producers/sellers and the buyers/consumers. Such asymmetry of information about the product characteristics provides the opportunity to use the certified ecolabel as a warranty instrument. The ecolabel carries information that would prevent adverse selection of products in the market. The latter means that in the absence of complete and symmetric information on product quality to sellers and buyers, only low quality products get selected in the market while the high quality ones are driven out (Akerlof 1970).

In the absence of certification mechanism, Spence (1974), Kreps and Wilson (1982), Kreps (1990) and Milgrom and Robert (1986, 1987) showed that under such asymmetry of information, high quality producers will have the incentives to signal to distinguish themselves in the market. The purpose of the signal is to attract potential buyers who are willing to pay for higher quality products. This signaling effort of high quality producers could lead to a separating equilibrium in the market in which each market segment represents a particular level of product quality and a particular level of consumers' awareness and willingness to pay for that level of quality.

Under the existence of a certification mechanism, the same results can be achieved with a greater certainty. Certification and the use of labeling to communicate the characteristics that has been certified would solve most of the asymmetric information problem explained above, provided that the cost for doing so can be justified by the expected return. By engaging in timber

certification and ecolabeling, the wood producers who use sustainable production process could credibly inform consumers about the performance of their product in terms of the pro-sustainability characteristic.

Following Krieger and Hoehn (1991), one could also argue that the information contained in the ecolabel has value because it provides an opportunity to change behavior. In the case of timber ecolabeling, the receipt of new information about the pro-sustainability characteristic of the wood product permits the sustainability-concerned consumers to recognize their past 'mistakes' and engage in sustainability-promoting behavior. The value of he information lies in the increased utility it makes possible over less favorable consumption habit it helps avoid.

2.7 Asymmetry of Information and the Role of Certification and Ecolabeling

The arguments developed in this section were based mainly on the literature on asymmetric information, adverse selection and certification as a warranty institution to avoid the adverse selection (Akerlof 1970; Spence 1974, Kreps 1982, 1990; Campbell 1996; Albano and Lizerri 1997). Akerlof showed that the asymmetry of information could lead to the collapse of the high quality market, or worse, the complete collapse of the market for the commodity as a whole. Spence (1974), Kreps 1990) and Milgrom and Roberts (1986) maintain that quality signaling is a way to prevent the collapse of the market. Campbell (1996) and Albano and Lizerri (1997) suggest that certification is a potential alternative to signaling in the situation of information asymmetry. Signaling the

content of information, issuing warranties, or investing in establishing reputation, all aim at solving the problem of asymmetry of information (Albano and Lizerri 1997).

In the tropical timber market, there is asymmetry of information about the stock feedback effects of timber production between the producers/sellers and the buyers. Under this circumstance, ecolabeling can prevent the collapse of the market of the environmentally friendly or pro-sustainability tropical timber. If an ecolabel is a credible and verifiable market warranty, it will lead to a situation of separating equilibrium in which several equilibrium points are being reached simultaneously at different market segments. Each segment corresponds to one particular level of consumers' willingness to pay that is based on a particular level of consumers' awareness on environmental or resource sustainability. Cooper (1992) and Kennedy, Laplante and Maxwell (1994) shows that in the situation of asymmetric information between sellers and buyers, the government may want to facilitate the provision of information from producers to consumers. The provisions of information can be welfare enhancing if it moves economic allocation toward Pareto Efficient point.

Asymmetry of information means that both parties are not using the same set of information. In our example buyers are the uninformed agents because they do not know the quality (in this case, the degree of pro-sustainability) of the tropical wood offered in the market. Buyers have to rely on some average market statistics or general information to judge the sustainability characteristics of the product. The buyers cannot evaluate the wood as to whether it is a pro-

sustainability product or not. On the other hand, producers/sellers are the informed agent because they know the quality or pro-sustainability characteristics of the wood they produce or sell. Under this circumstance, the sellers can take advantage of this lack of information on the buyers side and sell wood of below average quality at a price justified by the average quality.

This self-selection toward low quality product is what Akerlof (1970) called the "lemon principle" -- low quality goods drive high quality ones out of the market. The market serves as a self-selection device toward adverse selection: only the worst gets selected in the absence of complete information for both sellers and buyers. In other words, only the market for less-than-average pro-sustainability wood exists. Buyers are content by assuming that they are buying wood of average pro-sustainability quality and paying the price accordingly. Markets of high quality goods break down because the buyers cannot accurately judge the quality of the goods offered.

Here is an example: A cubic meter of highly pro-sustainability tropical wood (referred to as "good wood") is worth $600 to a buyer and $500 to a seller. A cubic meter of environmentally unfriendly tropical wood (referred to as "bad wood") is worth $400 to a buyer and $ 200 to a seller. For this example we assume that: (1) the supply of tropical wood is fixed and the market demand is perfectly elastic; (2) that buyers and sellers know that there are twice as many bad woods as the good ones; and (3) the woods are being offered at any price above $200.

Consequently, all bad woods will be offered for sale. Notice that environmentally friendly wood will only be offered if the price is $500 or higher. Hence, at any price below $500 and above $200, the rational buyer will judge that the woods must be the bad ones. Given this, the buyer concludes that the wood is worth only $400. If the price is above $500, the wood has a two-thirds chance of being a bad wood. Therefore, to the buyer, the expected value of the wood is (1/3)(600)+(2/3)(400)=$467. However, there is no demand for the price above $400 because: (1) above $467 there is no demand at all since no buyer is willing to pay that much, (2) below $500 the demand only starts at $ 400 and down since buyers believe they must be getting the bad wood. Equilibrium occurs when only bad woods are offered in the market at a price of $400 per cubic meter.

Under certain conditions[5] the process of degeneration of the quality could lead to the complete collapse of the market -- nobody is willing to buy the tropical wood at the market price because the buyers are sure they are going to get the bad ones. In the above example, when the price is within the $400 - $500 range, absolutely no transaction takes place despite the fact that the produced wood should be sold at some price; there would be someone willing to pay a price for that wood and somebody willing to sell it. However, making the connections for those transactions is prevented by the asymmetry of the

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[5] Akerlof, in his 1970 "lemon paper", showed a mathematical proof. Since this totally collapsed market is of little relevance to us, the reader is referred to the original article. We shall content ourselves by referring to the tropical wood case.

information. This is a situation in which the market collapses due to asymmetry of information: adverse selection by the informed agents who hold off high quality products from the market.

In spite of the potential breakdown, markets for some products whose buyers and sellers do not face a symmetric information set do exist. This is made possible because the party that has superior information will do something to indicate the quality of the goods being sold. In general, one can deal with them in either of the following ways: (1) shifting the cost of asymmetric information onto the informed agent; or (2) providing credible information to the uninformed parties.

Guarantee is an example of the first measure. The informed agents/ sellers guarantee the quality of the products they sell and are willing to replace or refund if the product does not meet consumers expectation about its quality. This puts the cost of asymmetric information onto the informed party. Brand name and company's good reputation is a way of providing such guarantee (Shapiro 1983).

One can also argue that product certification is one way to provide the warranty on certain quality of the product that consumers care about (e.g., Campbell 1996; Albano and Lizerri 1997). Hence, it can be used to prevent the collapse of the market for high quality products. Certification that is based on independent third party assessment contributes positively to the credibility of warranty stated in the product label. The role of the independent third-party assessment is especially important when a company's direct warranty cannot be

sensibly implemented in the market. For instance, distance between the primary wood producers (i.e., the forest concessionaires) and the final consumers of the tropical wood products makes it impossible to use the company's direct warranty. The certified ecolabel provides valuable warranty on pro-sustainability characteristics of the product. This warranty could potentially increase the market efficiency by conveying information to the uninformed agents (Campbell 1996).

In the example of the market for tropical hardwood, the characteristic is only known by the producers/sellers. They are the informed parties. Unless the buyers can become informed of the pro-sustainability level of the timber sooner or later, the price that the sellers offer will have to be the price which reflects the average quality of the product. So, in the market, bad wood sellers have a high incentive to hide the fact because if the buyers pay a uniform price, they are going to be paid above their quality level. On the other hand, sellers of good woods have the incentive to reveal themselves to show that they are selling the pro-sustainability products. They have this incentive because the uniform price they receive is less than the real price for their quality level. Hence, it is in the interest of the good wood producers to provide a warranty that they are selling good wood. The key to such warranty is that the sellers of high quality products are willing to take actions that the sellers of lower quality product do not find worthwhile. To be eligible for certification and ecolabeling, the bad wood producers would have to invest significantly higher than the good wood producers.

Reliability of the certified ecolabel as a warranty means its degree of credibility or whether a warranty is a honest warranty or a false one. This credibility will depend on the existence of mechanisms within the certification system to verify the information conveyed by the label as well as to punish the false label. The potential market power of consumers to boycott or to discriminate against the false ecolabel should be considered as part of the enforcement mechanism to ensure credibility (Klein and Leffler 1981).

Look at the tropical timber market example once again to study the equilibrium of ecolabeled wood. Assume a lot of woods of different levels of qualities or pro-sustainability characteristics are in the market. The market is very remote from the forest where the woods originate so the buyer can not easily keep track of the stock feedback effects of the timber production. The degree of the pro-sustainability of the woods is the information that the producers send to the potential buyers through the ecolabel. The producers/sellers would then choose whether to get certified and ecolabeled to maximize the difference between what they can get from sending the warranty and the cost of generating that warranty. The buyers are going to make their price-bidding decision taking the warranty provided by the sellers as given. Sellers take the anticipated price as given and they make a decision of how much to warranty in order to maximize their profits. If the verifying and punishment and/or retaliation mechanisms exist, at the equilibrium, producers of good wood will spend resources to get certified and ecolabeled to inform consumers credibly that they are pro-sustainability and thus will receive a higher

price. Producers of bad woods will optimally decide not to certify their operation because it does not pay to do so.

In the credible ecolabeling situation, buyers will get perfect information on the pro-sustainability characteristics of the products. Consumers will adjust their bid price so that it will cover the extra marginal costs of using sustainable production process. When the consumers see no ecolabel in the product, they will bid for the price of the bad wood. This example shows a two-level separating equilibrium in the market. Upper level equilibrium prevails for the pro-sustainability product at a higher price; a lower level equilibrium exists for buyers and sellers who are not concerned about resource sustainability.

Chapter III

SITUATION IN INDONESIA AS A MAJOR TIMBER SUPPLIER AND IN THE UNITED STATES INTERMEDIATE WOOD INPUT MARKET

Introduction

Haji Gazali and Simula (1994) and Dauvergne (1997) reported a growing worldwide consensus that timber certification and ecolabeling are now a common interest among many parties. Sustainability concern about timber and timber products are shared by consumers (as they become more aware of environmental impact of their consumption patterns), traders of timber and timber products (to secure their market access as response to consumers' changing behavior), the governments of forest-rich countries as well as the timber-based industry (to ensure continuity or long-term availability of timber input).

This chapter discusses the concern over long-term sustainability of timber production in Indonesia and recent developments in the international and U.S. wood product markets. Sections 3.1 through 3.3 focus on the situation, problems, and issues faced by Indonesia that may necessitate the adoption of timber certification and ecolabeling. Section 3.4 discusses recent developments in the world wood market that is relevant to Indonesia as a major tropical timber

producer. This section serves as a bridge to section 3.5 that analyzes the current situation in the U.S. intermediate wood input market.

3.1 Indonesia's Forest, Timber Production and Deforestation Issue

3.1.1 Forest Land Use Plan and Timber Extraction Policy

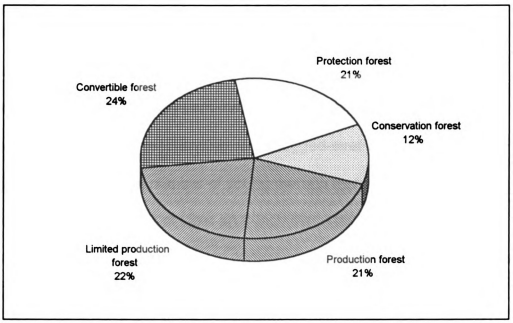
The Forest Resources

Indonesia owns 144 million hectares or about ten percent of the world's tropical natural forest and is one of the biggest tropical timber producers. The government designates 64 million hectares of its total natural rainforest as permanent production forest (GOI-MOF/Dirjen INTAG 1996). The permanent production forest is forest area which is expected to be utilized as timber source on sustainable basis in perpetuity. In this context, the government defines sustainability as constant flow of timber production per year. The rest of the forest area is divided into conversion forest, protected forest, and national parks[1]. Figure 3.1 illustrates the Indonesian forest land use plan. Production forest generates 85-90% of total log production in Indonesia. Timber from conversion forest makes up the rest of the balance. This study focuses on the certification of timber originating from the permanent production forest.

About three quarters of the tree species found in Indonesia's forest are categorized as commercial species. On average, forty percent of the standing

[1] Conversion forests are area designated for conversion for other uses such as agriculture; Protected forests are areas designated for water and soil protection.; and conservation forests and national parks are area designated for nature preservation and genetic conservation (GOI-MOF 1993). No timber exploitation is permitted in the protected as well as in conservation forests and national parks area.

Figure 3.1.
Indonesia's Forest Land Use Plan



Source: GOI-MOF/Dirjen INTAG (1996)

timber stock is considered as having commercial size by the existing timber extraction policy. The major commercial species from the Indonesia's natural forest is meranti (one of dipterocarp species). It makes up to 70% of the volume of commercial species. Meranti has a 35-year rotation period and it grows together with all other tree species in the forest (GOI-MOF/FAO/WB 1991; The World Bank 1994).

The Timber Extraction Policy

Logging of meranti is restricted within the boundary of each forest concessionaire. To maintain the continuous supply of meranti from the permanent production forest, the logging process needs to ensure that the

residual trees remain intact for sustainable growth. For this purpose, the government imposes a selective cutting policy known as Tebang Pilih Tanam Indonesia (TPTI/Indonesian selective logging system). This logging system requires the loggers and forest concession companies to cut meranti trees whose diameter is at least 50 centimeters (20 inches), and to do some silviculture and post harvest tending of the logged-over area. Replanting is required if the remaining number of young meranti trees is less than 25 per hectare. These trees have at least an 8-inch diameter at breast height. The young trees are expected to grow to commercial size for harvest in 35 years. Clear cutting is not allowed in the permanent production forest.

Forest concession is allocated by government discretion under a close system of the patronage circle instead of through an open bidding system (Broad 1995; Ascher 1993). About 61 million hectares of the natural forest is currently allocated into 575 forest concessionaires. The concession costs $1.25 per hectare for 20 years exploitation right. This concession period is shorter than the perceived average tree rotation period which is 35 years (The World Bank 1994). The low concession license fee has induced large ownership of forest area among Indonesia's forest concessionaires[2]. The short concession area relative to the tree rotation, although by law it is renewable subject to the forest management performance, does not provide sufficient warranty for the

[2] Forest concession area ranges from less than 10,000 hectares to about 920,000 hectares (Wahana Lingkungan Hidup indonesia (WALHI) 1991).

concessionaire to be able to harvest for the second time (GOI-MOF/FAO/WB 1991).

After cutting the trees, the concessionaires pay an average amount of $22 per cubic meter log harvested. The amount consists of about $6 timber royalty (which is based on 6% of government's reference price), and an average of $14 reforestation fund. The remaining $2 consists of a few cents from each of the following revenues: property tax, scaling and grading fees, and the concession license fee.

3.1.2 Current Situation and Problems in Timber Production

In 1995, the country exported about $6 billion in value of timber products (excluding pulp and paper) which constituted about one-sixth of the total export value. Plywood and sawnwood make up about three quarters of the total value of timber product exports. More than a quarter of the timber product exports were destined to the eco-sensitive markets of U.S., Canada and Western Europe.

Indonesia's timber processing industry (sawmills and plymills) commands an effective demand of 53 million cubic meter of logs (raw timber) per year. In sharp contrast, the country's production forest can only sustain the supply of 22 million cubic meter of logs on recurrent annual basis without inhibiting the growth of timber stock in the logged-over area[3] (The World Bank 1994).

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[3] The 53 million cubic meter effective demand estimate differs significantly from the official government log production figures. The officially reported production in 1994 is 24.7 million cubic meter from production forest plus 3.5 million cubic meter from the conversion forest. Government holds that the sustainable production rate is 22.5 million cubic meter per year which is based on 39.9 million hectares area of undamaged production forest in 1990 and about 1 cubic meter stock growth per hectare per year.

Currently, no meranti production comes out of plantation forest. And it is very unlikely that any production of meranti will come out of plantation forest at all within the next 35 years. The reason is that the processing industry does not have enough incentive to develop alternative source of input under the currently depressed domestic log price. The huge effective demand relative to the forest supplying capacity has made the over cutting inevitable (Ramli and Ahmad 1993). Table 3.1 illustrates the extent of over cutting in 1994 due to excessively high investment in the wood processing industry. The estimated logs consumed by the industry in 1994 is 19 million cubic meter above the concessionaires' supplying capacity, and it is almost double the official sustainable cutting rate.

In addition to the problem of over harvesting, few concessionaires have complied with the regulation that requires concessions to conduct post harvest silviculture and to tend the logged-over area. As announced by the Ministry of Forestry, less than 20% of the concessionaires can be considered as having good forest management practice. Although sanctioned with fines and threat to revoke the concession license, enforcement of the required custodianship of the concession area has not been effective. Lack of professional and institutional capacity in the part of Ministry of Forestry is one reason. The delicate patrimonial relationship between the owner of forest concessions and the ruling elite is a more significant reason that blocks the effort to enforce the required forest management practices (Sunderlin and Resosudarmo 1996).

Table 3.1.
Demand and Supply of Timber for Wood Industry in 1994

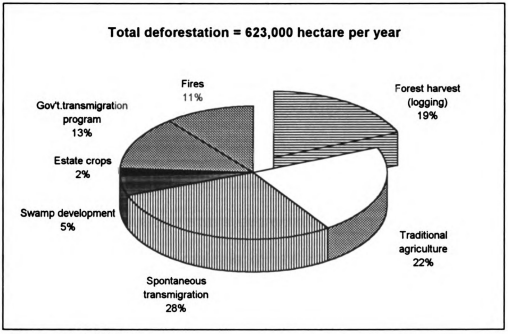
A. Demand from wood processing industry	
A1. Number of establishment	2,438 units
- sawmills	2,321
- plymills	117
A2. Output production capacity	29.6 million cubic meter
- sawnwood	17.8
- plywood	11.8
A3. Log intake capacity [1]	59.1 million cubic meter
- sawmills	35.6
- plymills	23.5
A4. Effective demand for logs[2]	53.2 million cubic meter
B. Supply capacity	
B1. Number of forest concessionaires	575 establishments
B2. Total concession area	61.1 million hectares
B3. Log supplying capacity[3]	34.2 million cubic meter
C. Official log production figure	28.2 million cubic meter
D. Official sustainable cutting rate	22.5 million cubic meter
E. Excess demand	
E1. Above forest supplying capacity (A4-B3)	19.0 million cubic meter
E2. Above official sustainable cutting rate (A4-D)	30.7 million cubic meter
E3. Under reporting / Illegal logging estimate (A4-C)	25.0 million cubic meter

[1] Conversion factor used: 2 cubic meter logs for 1 cubic meter output (MOF 1993)
[2] 90% capacity utilization is assumed in this table. Actual utilization ranges between 85-110%.
[3] Estimated based on annual cutting area and average yield per hectare.
Source: Calculated based on Ministry of Forestry data (The World Bank 1994).

As a consequence of the over cutting and the lack of silviculture efforts, the stock externality effects and the associated loss in forest environmental functions have become threatening externality problems. Estimates of Indonesia's deforestation rate ranges from 623,000 hectares (Dick 1991) to 2,400,000 hectares (Hasanuddin 1996) per year during the eighties and early nineties (Sunderlin and Resosudarmo 1996). However, not all of these losses are attributed to the timber harvest. Using Dick (1991) analysis that provides the

most conservative estimate of the annual deforestation rate, at least one-fifth of the 623,000 hectare loss in forest cover per year can be attributable directly to the logging operation. The indirect effects of logging to deforestation materializes through the entry of shifting cultivators and spontaneous transmigrants to the logged-over area which is left unmaintained after harvest. Figure 3.2 depicts the agents responsible for the deforestation according to Dick's analysis.

Figure 3.2.
Indonesia's Annual Deforestation Rate and Causes



Source: Dick (1991)

Maintaining logged-over area to remain intact for harvest potential in 35 years time poses its own problems to the forest concessionaires. First, uncertainty of concession renewals. Although rules have been specified for concession renewal, rent seeking behavior in the bureaucracy tends to

undermine any written procedure (WALHI 1991). Secondly, maintenance of the logged-over area requires some investment. Although the amount necessary is relatively small in nominal term and in proportion of log price, the myopic business practices prevent the concessionaires from investing for the future benefits of the forest. This situation is caused by high interest rates in the capital market.

Despite the continuous financial sector deregulation since 1983, the domestic credit markets offer a persistently high nominal interest rate in the neighborhood of 24% per annum. Deducting it with 9% average annual inflation in Indonesia during the last 10 years, the real interest rate is 15%. Taking into account depreciation of domestic currency (i.e., Rupiah) the entrepreneurs are used to discounting future benefits at 20% real effective interest rate as a measure of opportunity cost of their Rupiah-denominated investment (The World Bank 1994). With 6% average annual depreciation rate of Rupiah, the 20% interest rate is equivalent to a real rate of 14% if the investment values are denominated in U.S. Dollar.

Given the extent of deforestation problem in Indonesia, many have suggested a series of policy reforms to improve the situation. These include:

(1) Improve the pricing of the forest resource resources through substantial increase in rent captured by the government (WALHI 1991; The World Bank 1992, 1995; Thiele 1994). Inclusive in this category are suggestions:

a. to increase timber concession fee and annual property tax (which are area-based charges) to discourage large ownership of concession right.

b. increase the timber royalty and reforestation fund which are volume-based charges.

(2) Improve the tenure security by extending the length of concession period to cover at least one harvest cycle (The World Bank 1994; Thiele 1994)

(3) Change the concession allocation system from closed and patrimonial toward an open bidding system (WALHI 1991; Thiele 1994)

(4) Rationalize the wood industry by stopping the expansion of the processing facility and revoking the log export ban (WALHI 1991).

One can argue that these policies will encourage improved management of the production forest as well as increase government revenue substantially (Sunderlin and Resosudarmo 1996). However, there is not enough interest within the government circle to realize the reforms. No significant changes have been made except rationalizing the wood industry as suggested in point (4) above (Hasanuddin1996).

Many commentators argue that the reason for this resistance to change lies in the political system. Ascher (1993) suggests that the government, including the Ministry of Forestry, sees forest as an asset to be liquidated to diversify the economy; rent capture is kept low to facilitate that process. Forest concessions are allocated as a form of political patronage to influential people

around the ruling elite (Ross 1996). King (1996) sees that efforts toward improvement in the forest sector are blocked by the patrimonial characteristics of the government elite. He concludes that significant reform will require "*a regime change, a critical shortage of timber supply, or external threats to Indonesia's exports of forest products.*" The rise of green consumerism and ecolabeling initiative as a way to face the threat of dwindling forest resources come forward in line with this conclusion. The threats of loosing a significant portion of export market will create some pressures to improve forest management in Indonesia.

3.2 The Emergence of Ecolabeling Issue In Indonesia

Ecolabeling and timber certification issue emerged in Indonesia in 1992 as the Austrian parliament enacted the law to impose mandatory ecolabeling for tropical timber imported into the country. Lack of information and understanding on the effects of ecolabeling had generated a wide range of reaction from various parts of the society. The timber-related businesses have succeeded in voicing their concerns that eco-labeling of timber and timber products will limit market access of Indonesia products into developed countries and reduce their international competitiveness. Indonesia, supported by other Association of South East Asian Nations (ASEAN) countries questioned the legality of Austrian ecolabeling law in GATT forum since it discriminates against the tropical timber. In response to the latter criticism, the law was finally amended in 1993 to cover all timber and to be implemented on voluntary basis.

The experience with Austria and the growing number of boycotts from several German and U.S. cities and state governments have induced Indonesian government to realize the potential threat to the succession of Indonesia's forest product exports in the future. The incidence with the Austrian law was also used by the Indonesia's pressure groups to persuade the government to look into the possibility of using ecolabeling to improve forest management practices.

In response to the potential market pressures and the growing concerns over poor forest management practices, plus the official commitment to achieve the ITTO Year 2000 objective, the Indonesian government initiated the preparation for establishing the Indonesian Ecolabeling Institute (LEI/Lembaga Ekolabel Indonesia) in late 1993. As of June 1997, the preparatory works are still in progress to establish the institute.

Haji Gazali and Simula (1994) maintain that the primary objectives of timber certification and ecolabeling (TC/EL) are to improve forest management and to ensure access into eco-sensitive markets. Additional objectives of TC/EL which seem to fit to Indonesia situations are: (1) to internalize the externalities costs caused by timber production; (2) to improve control over illegal logging; (3) to rationalize the existing over-investment in timber-based industry; and (4) to improve efficiency of the timber-based industry if the TC/EL is to include product certification. All these additional objectives are particularly relevant to Indonesia because of the existing excess capacity in Indonesia's timber processing industry and the related problem of illegal logging.

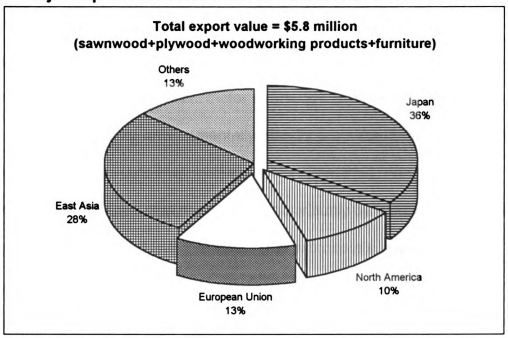
3.3 Exposures of Indonesia's Wood Product Exports to the Green Market

The threats to Indonesia's exports come primarily from developed countries to which Indonesia depends a great deal for marketing its forest products. Many developed countries have slowly turned into eco-sensitive or green market as the awareness of their society toward resource and environmental sustainability increases. Eco-sensitive markets are countries in which the pressure for the green products seem to be high. In terms of world, Septiani and Eliot (1994) reported that North American and Western European countries appeared as origin of green consumerism. The U.S., Canada, Germany, Netherlands and the UK can be ranked on the top of the layers on consumers environmental awareness by looking at various NGOs' campaigns and boycott toward the tropical timber products.

In Japan, which is the primary market of Indonesia's wood products, the Association of Building and Construction Industry announced the target of 35% reduction in the use of panel made wholly of tropical hardwood. Furthermore, they also announced ITTO's Year 2000 target as the compliance target for its membership. The primary reason behind this action is the uncertainty about the sustainability status of tropical forest management (The World Bank 1994, Harago 1994).

As Figure 3.3 shows, more than half of Indonesia's wood product exports are currently exposed to these markets. About U.S. $1.3 billion or 23% of Indonesia's total wood product export value in 1995 (exluding fuelwood, charcoal pulp and paper products) was destined to eco-sensitive North America and

Figure 3.3.
Major Export Markets of Indonesia's Wood Products in 1995



Source: Biro Pusat Statistik (1996)

European markets. Another 36% of the export value was shipped to Japan where tropical forest sustainability is becoming a sensitive issue. In terms of commodity, North America and Japan each absorbs about one-quarter of plywood and sawnwood exports from Indonesia. For the growing exports of woodworking products and furniture, the shares are even more significant. About one-third of the U.S. $833 million worked-wood (e.g. joinery, moulding, window/door's frame, grill and panels) exported in 1995 was directed to U.S., Canada and European market. The same proportion of the U.S. $864 million wooden furniture exports went to the same market. Japan, which is on the brink of eco-sensitivity, absorbs about one quarter of Indonesia's exports of woodworking products, as well as furniture.

Volume wise, about one-fifth of plywood exports and close to 30% of sawnwood exports depend upon the eco-sensitive market of North America and Europe. Japan absorbed 30% of Indonesia's 8.3 million cubic meter plywood export and 20% of 640,000 cubic meter sawnwood exports.

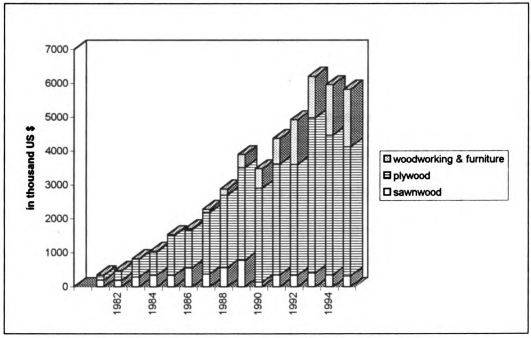
The pressures for environmentally friendly products primarily comes from the increasingly eco-sensitive markets of North America, Western Europe and Japan. These pressures also need be taken seriously by Indonesia as the share of high value-added products is increasing in Indonesia's exports. These products are expected to pave the way for the developments of ecolabeled wood product markets. Figure 3.4 shows that since 1992, the wood-working products and furniture have contributed more than 20% of the revenues from the wood products export. The majority of furniture and woodworking products are exported to the eco-sensitive market of North America and Western Europe, as well as to Japan whose awareness for environmental sustainability is rising.

From Indonesia's wood industry perspective, another interest is to maintain the existing market shares within the primary export markets. The size of the stakes that Indonesia's industry needs to maintain is summarized in Table 3.2. Indonesia supplies 52% of the U.S. tropical plywood import market, and 78% of the Japan's.

With all these pressures and interests, it seems inevitable for Indonesia's producers to start engaging in timber certification and eco-labeling. The head start will also put Indonesia in an advantaged position as other importing

countries join the green consumerism trend, and as other timber producing countries start positioning themselves in the green market later.

Figure 3.4.
Trend of Indonesia's Timber Product Exports, 1981-95



Source: Biro Pusat Statistik, *Statistik Ekspor Indonesia*, various issues.

Table 3.2.
Share of Indonesia in The Foreign Country Import Markets

Importer Markets	Plywood (tropical + non tropical)	Sawnwood (tropical wood only)
North America	52%	15%
Western Europe	8%	25%
Japan	16%	78%

Source: Calculated from FAO (1996), *Forest Product Yearbook 1994*.

3.4 Recent Developments in the World Wood Market

In relation to the growing adoption of timber certification and ecolabeling world wide, certain characteristics of world timber market are relevant to Indonesia's situation. These include the issues of competition, market share,

and potential benefits and losses from embracing the timber certification and ecolabeling.

First, in the world tropical timber market, Indonesia is competing with other countries that also have high proportions of export relative to their timber production volumes. Indonesia exports two-third of its timber (in round-wood equivalent) which made it the largest exporter in 1992 followed by Malaysia who exports about 75% of its production. Other countries that have high export shares in their production are Congo (62%), Ivory Coast (57%), Gabon (57%), Ghana (49%), Liberia (64%), and PNG (64%) (Crossley, Primo Braga and Varangis 1994). All of these countries with highly export-oriented or export-dependent timber production can be potential competitors for Indonesia to win the currently small niche ecolabeled timber market. Or, they can also be an alternative sources of importing countries if ecolabeling program diverts trade away from Indonesia. Malaysia appears to be the main competitor of Indonesia in almost all markets of tropical timber products, especially plywood and sawnwood. Brazil, the largest tropical timber producer in Latin America, only compete in the U.S. sawnwood market.

Second, competition of tropical and non tropical woods is expected to limit increases in the international prices of tropical timber products (Vincent 1992). This is believed to limit the chance to seize the green premium from certified timber products. Increases in the production of temperate and boreal timber have contributed to this situation. Technological advancement in making reconstituted wood products had also helped slacken the scarcity of timber

supply. Although the prices of timber are still increasing in nominal and real terms, the increase has been steadily diminished. However, recent evidence from the U.S. certified intermediate wood market suggests possibly a different trend. A Survey of the MSU Forestry Department reveals that the existing sellers of certified wood products have been able to pay some price premium for their inputs and pass this extra costs down to the next buyer in the processing stages (please see section 3.5 for more elaboration on this survey).

Third, most tropical timber currently has commodity end use for which many substitutes are available. Tropical timber is believed to have high price elasticity of demand. Tropical plywood, which is mainly used for concrete formation and other structural purposes, faces strong competition from temperate softwood plywood. Sawnwood, which is the main input for furniture, woodworking products and building decorative, is competing with both temperate softwood and hardwood. But, the U.S. market data used in various study reveal a different story about the elasticity of demand in the market. GOI-MOF/FAO/WB (1991), Smith, Haas and Luppold (1982, 1996), Ahmad (1995) and Suprapto (1995) all found that the demand for tropical wood in general, and for Indonesia's export to the U.S. in particular, tend to be inelastic in terms of price. Luppold (1982) found that the price elasticity of demand is about 0.9 for tropical wood in general, while studies by GOI-MOF/FAO/WB (1991) and Suprapto (1995) found the elasticity in the neighborhood of 0.6. These studies suggest that there exist little possibility of substitution between tropical hardwood and temperate softwood in the U.S. market.

Fourth, opportunities exist to increase the revenue from the small premium of ecolabeled wood products. The opportunities exist because: (1) the price elasticity of demand for Indonesian plywood and sawnwood in U.S. market is low (GOI-MOF/FAO/WB 1991; Suprapto 1995); and (2) the elasticity of substitution between tropical and temperate wood in most northern countries is also low (Barbier 1996; Smith, Haas and Luppold 1996). The introduction of ecolabeled wood products into a market with such characteristics will likely increase the market share of the exporting country. In addition, as discussed in chapter II, the existence of market segments that will buy environmentally marketed wood products in the U.S. market (Ozanne and Smith 1996), and Western Europe (The WWF-UK 1995 Group 1996) provides new opportunities for Indonesia's wood product industry.

Finally, recent developments in timber certification movement suggest that competition in certified wood markets may be increasing in the future. Currently, 62 forest concessions around the world have certified their operations under FSC system. Table 3.3 presents the global estimates of total certified area and total log productions. As of March 1997, close to 6 million hectares of forest lands with total estimated production about 7.4 million cubic meter. Table 3.3 includes only 51 operations and productions of timber for solid wood purposes (instead of for charcoal or pulpwood). Seven of these companies are located in the U.S.. This trend may reflect the strategy of U.S. companies to deal with their tropical competitors either to protect their own traditional domestic markets or to seize new marketing opportunities in the high-valued ecolabeled wood markets.

Table 3.3.
Number of Companies and Volumes of Production in Certified Forest Area Around The World

Country	Number of establishment	Total area (hectares)	Total estimated production (m3)	Wood species
Belgium	1	66,915	285,600	Oak, Beech
Bolivia	1	52,000	1,720	Hardwood
Brazil	2	60,734	30,000	Hardwood
Costa Rica	1	3,900	2,000	Hardwood
Honduras	1	25,000	2,800	Hardwood
Indonesia	1	3,028,000	866,600	90% hardwood, 10% softwood
Malaysia	1	251	7,000	Rubber wood
Mexico	2	110,316	35,800	Hardwood
Papua New Guinea	1	12,500	2,000	Hardwood
Poland	3	1,551,563	4,588,800	Pine, Spruce, Beech, Oak
Solomon Island	13	4,296	2,230	Hardwood
South Africa	1	51,922	500,000	Pine, Eucalyptus
Sri Lanka	3	12,726	33,700	Rubber wood
Sweden	1	309,000	80,000	Softwood (?)
United Kingdom	6	664	700	Hardwood
United States	12	620,906	920000	25% hard, 75% softwood
Zimbabwe	1	24,850	4,200	Teak (hardwood)
Total	51	5,935,543	7,363,150	

Source: Good Wood Alliance (1996); FSC (1997); SGS/Forestry (1997)

3.5 Recent Developments in the U.S. Intermediate Input Market for Certified Wood

Many parties questioned whether the commercial benefits can support timber certification. The views range from the non existence of opportunity to gain a price premium (Vincent 1992), to the smallness of the world market for certified wood (Crossley, Primo Braga and Varangis 1994), and to the

impracticality and costliness of the implementation of timber certification and ecolabeling (IHPA 1996). This section explores these issues.

As more companies have adopted timber certification within the last few years, more can be learned from the certified wood products markets. Many people in the wood product business have not been convinced about the commercial benefits of engaging in certification. However, entrepreneurs who are selling certified wood products have been enjoying some benefits. Although many adopted certification programs with a view to increase market access, most of them have also been able to appropriate some price premium. Most sellers of certified wood products are able to pass the extra costs to their buyers.

This section reports the main findings of the "Wood Product Certification" survey that was conducted by MSU Department of Forestry in two stages: August-December 1996, and March - June 1997 (Stevens, Ahmad and Ruddell 1997). The objectives of the survey were: (1) to determine the extent of and motivation for wood product companies for adopting timber certification and labeling; (2) to estimate the increase in the costs incurred by the companies to implement this new instrument; and (3) to estimate the existing willingness to pay for the price premium for ecolabeled wood among the wood industry at various stages of processing and marketing.

In the following subsections, analyses of the U.S. intermediate wood input market will be presented in two forms. The first is the general comparisons between the groups of companies that are currently selling certified wood

products and those that are not. Otherwise, discussions will be focused on the segment of certified wood product sellers.

3.5.1 The Survey

In the survey, a certified wood product company is defined as a company that has been certified by an FSC-accredited independent third party as selling wood products that originate from well managed forests.

The analyses classify the wood product sellers into 10 business types based on the way the companies identified themselves. The sample base, however, is taken from the following sources. The wood product importers information were taken from *"1996 Directory of United States Importers"* (The Journal of Commerce 1996). Only companies that import more than $1 million in the values of wood products are included. These companies import one or more of the following: lumber, panel, furniture, furniture parts and moulding products. The sellers of certified wood products were taken from the directories issued by the two U.S. certifying companies, namely the Scientific Certification System and the SmartWood Program of The Rainforest Alliance (SCS 1996; SmartWood 1996). The rest of the samples were taken from *"1996 Ward's Directory of U.S. Private and Public Companies"* based on SIC (Standard of Industry Classification) codes that cover hardwood industry at various stages (Gale Research 1996). The 1996 Resource Guide of International Home Furnishing

Center supplements the sample base for the household wooden furniture manufacturer group (IHFC 1996).

In total, researchers mailed 1290 questionnaires to wood product companies in the U.S.. Twenty-nine of them went to companies that have been certified by FSC-accredited organizations as sellers of wood products originating from well-managed forests. This covers 100% of the certified wood companies that are located in the U.S., seven of which are forest management firms. In addition to the questionnaires, 26 company visits were made during the first stage of the survey to discuss a broader issue of timber certification and ecolabeling with the wood product companies.

3.5.2 Characteristics of the Sellers and Non Sellers of Certified Wood Products

In return, we received 154 usable questionnaires; 22 of them came from the certified companies. This constitutes 76% of total certified-wood-product companies in the U.S.. In addition to these 22 companies, we found six companies that are selling certified or ecolabeled wood products although they have not been certified by FSC-accredited certifiers. As a whole, the 28 companies that sell certified wood products account for 52% of the total 54 sellers of certified wood products in the U.S. (Good Wood Alliance 1996). It is acknowledged that the 126 companies that do not sell certified wood products comprise a small proportion of its population in the U.S.. Hence, the answers

and numbers generated from this group can only be taken for indicative comparison. In the following paragraphs, the companies that sell certified wood products are called CWP groups; those that do not sell are called Non CWP groups. Table 3.4 summarizes the distribution of the wood product companies in the sample. In terms of business type, the wood products importers/brokers/ wholesalers constitute 25% of the total 154 company in the data set.

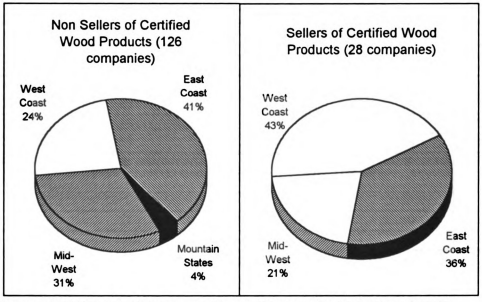
Table 3.4.
Number of Companies in the Data Set by Business Type

Business type	Do not sell CWP	Sell CWP	Total	%
Lumber mill	7	0	7	4.5%
Wholesaler/broker/importer	30	8	38	24.7%
Dimension & Flooring	8	1	9	5.8%
Veneer & Plywood manufacturer	9	3	12	7.8%
Millwork manufacturer	15	1	16	10.4%
Household Furniture	16	1	17	11.0%
Kitchen Cabinets	11	0	11	7.1%
Furniture Retailer	15	3	18	11.7%
Forest Management	0	7	7	4.5%
Others	15	4	19	12.3%
Total	126	28	154	100.0%
	81.8%	18.2%	100%	

Source: MSU Forestry Department Survey (Stevens, Ahmad and Ruddell 1997)

Figure 3.5 illustrates the geographical distribution of the companies in the data set. More than 40% of non CWP are located in East Coast states. About the same proportion of CWP group, however, are located in the West Coast. Companies in the Mountain States constitutes only 4% of the non CWP group and none in the CWP group.

Figure 3.5.
Geographical Distribution of Companies in the Data Set



Source: MSU Forestry Department Survey (Stevens, Ruddell, Ahmad 1997)

Table 3.5 presents companies distribution by sales range and whether they sell certified wood products. A majority of the companies have sales that range from $1 million to $10 million per year. The medium-sized companies, namely those in the $10 million to $50 million, account for about one-third of the total sample. Distribution of companies within each group, non CWP and CWP, closely follows the pattern of general distribution. Among the 11 companies whose sales are higher than $100 million, four are in the wood product wholesaler/ importer category. Four others are from household furniture and cabinet manufacturers.

Table 3.5.
Number of Companies by Sales Range
and Whether They Sell Certified Wood Products

Sales range	# of companies not selling CWP	# of companies selling CWP	Total # of companies	%
< $1M	5	1	6	3.9%
$1-9.9M	55	10	65	42.2%
$10-19.9M	20	4	24	15.6%
$20-49.9M	19	6	25	16.2%
$50-99.9M	11	2	13	8.4%
$100-499.9M	5	3	8	5.2%
$500M-1B	1	0	1	0.6%
>$1 B	1	1	2	1.3%
No Answer	9	1	10	6.5%
Total	126	28	154	100.0%

Source: MSU Forestry Department Survey (Stevens, Ahmad and Ruddell 1997)

Of the existing proportion of certified wood products in the total sales value of the CWP companies, only seven fully specialize in certified wood product markets. These include five forest management companies that have 100% of their inputs originate from certified forest area. The other two companies are furniture retailers that specialized in teak wood furniture. Table 3.6 summarizes the distribution of companies by business type and the proportion of certified wood products in their sales in the U.S.. The majority of companies have 5% to 15% of certified wood products in the total values of their domestic sales.

All of the non forest management companies in CWP group said that they will be able to increase their sales of certified wood products if there is more supply. All of them believe that currently there is a supply constraint in promoting

the markets for certified wood products. Some certified mills have not been able to acquire more certified logs in spite of the fact that they are willing to compensate for the increased costs due to certification. At the same time, some certified land owners are hesitating to switch completely to the new certified log market despite the existence of a price premium. They choose to maintain their traditional market (where certification is not recognized and no price premium is involved) as an insurance against uncertainty in the new market. One company's view is that the current premium is not sufficient to cover that risk.

Table 3.6.
Companies by Proportion of Certified Wood Products in U.S. Sales

Business type	< 5%	5-9.9%	10-14.9%	15-20%	>20%	Total
Wholesaler/broker/importer	2	4	0	0	2	8
Dimension & Flooring	0	1	0	0	0	1
Veneer & Plywood manufacturer	2	0	1	0	0	3
Millwork manufacturer	0	1	0	0	0	1
Household Furniture	1	0	0	0	0	1
Furniture Retailer	0	1	0	0	2	3
Others	1	0	0	1	2	4
Forest Management company	0	0	2	0	5	7
Grand Total	6	7	3	1	11	28
	21.4%	25.0%	10.7%	3.6%	39.3%	100.0%

Source: MSU Forestry Department Survey (Stevens, Ahmad and Ruddell 1997)

Interviews with certified companies revealed that the certified products currently in demand are: (1) flooring materials for domestic and Western European markets. Most certified lumber in the U.S. market ends up as flooring; (2) furniture, especially garden and patio furniture; (3) doors and windows' grills and components; (4) architectural moulding such as joinery, and panels with decorative veneers.

3. 5.3 Company Familiarity and Buyers Interest for Certified Wood Products

The survey asked the companies specifically if they are familiar with wood product certification under the FSC system. Among 126 non CWP companies in the data set, 44 (35%) are familiar with it. When asked about the meaning of the certified label on the wood products in the interviews, about two-thirds of the companies interviewed mentioned that the certification assessment at the forest level is based on selective periodical cutting and sustained yield principles. Regionally, 55% of the companies that are familiar with timber certification and labeling are located in the East Coast, 30% in the Mid West, and the rest in the West Coast.

Forty-five companies, or 23%, of the total 154 companies have actually received inquiries and interests from their customer bases to purchase certified wood products if they are available. Nineteen of the companies that have received requests for certified wood products are from the non CWP group. Regarding the level of interest among the potential buyers, on average, this group said that they have received inquiries for certified wood from about 4% of their customer base. Within the CWP group, the companies said that on average, they have received inquiries from about one-fifth of their customer bases. Among this group, about two-thirds see that the trend of the requests has been increasing within the last two years while about 20% said that the requests have stayed the same. Three groups report significantly high requests in terms

of the proportion of customer bases. Millwork manufacturers receive request from 65% of their customer bases, while wholesalers and furniture retailers receive request from about one-fifth of their potential customers.

Regionally, the West Coast is the primary area where potential customers ask for certified wood products. CWP companies on the West Coast receive requests from about 28% of their customer bases. Table 3.7 summarizes the distribution of companies that have and have not received request for certified wood products by region. Consistently, more companies on the West Coast than in other region reported that their customers are interested in purchasing certified wood products.

Table 3.7.
Number of Companies by Request for Certified Wood Products

	CWP Group		Non-CWP-Group	
Region	# of companies receiving requests	# of companies not receiving requests	# of companies receiving requests	# of companies not receiving requests
East Coast	9	1	13	39
Mid West	6	0	0	5
Mountain States	0	0	1	38
West Coast	11	1	5	25
Total	26 (93%)	2 (7%)	19 (15%)	107 (85%)

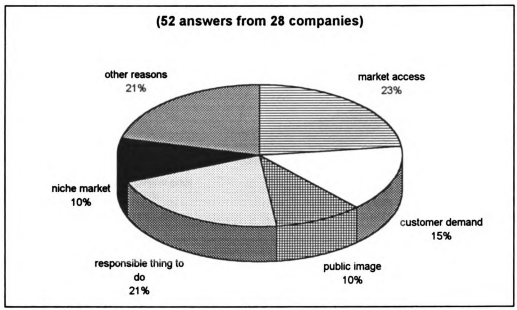
Source: MSU Forestry Department Survey (Stevens, Ahmad and Ruddell 1997)

3.5.4 Company Motivation

When asked about their reasons to sell or not to sell certified wood products, most companies checked more than one answer. From the 28 companies that are currently selling certified wood products we have 52

answers. The five top answers from this group are summarized in Figure 3.6 along with the "other reasons" category. The primary motive for the companies to embrace timber certification and ecolabeling is to gain market access (23% of total answer). The second most important reason is related to the companies' philosophy. They see it is an environmentally responsible thing to do. Fifteen percent referred to customer demand. Improving public image does not seem to be a very compelling reason for these CWP companies.

Figure 3.6.
Reasons for Selling Certified Wood Products

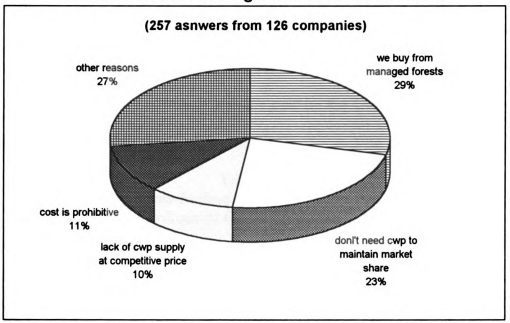


Source: MSU Forestry Department Survey (Stevens, Ahmad and Ahmad 1997)

Among the 126 companies that are NOT currently selling certified wood products, the number one reason for not selling them is that the companies are confident that they are buying wood products that originate from well-managed forests (29% of 257 answers). Figure 3.7 illustrates the answers from this group.

Another important answer is that these companies do not need to sell certified wood products to maintain market share. About 11% said the cost of adopting timber certification and labeling is so high that it prohibits them from doing it. One-tenth of the answers refer to the lack of supply of certified wood products at competitive prices.

Figure 3.7.
Reasons for NOT Selling Certified Wood Products



Source: MSU Forestry Department Survey (Stevens, Ahmad and Ahmad 1997)

3.5.5 The Cost and Price Premium of Certified Wood Products

We asked companies two questions regarding the increase in the cost of certified wood products. First, what was their estimate of the increase in their cost of goods sold due to certification. Second, if they purchased certified wood products, what percentage of the price premium did they actually pay to their suppliers. Table 3.8 presents answers to the first question. Three quarters of

companies that provided estimates of the increase in their cost of goods sold due to certification said that the increase is less than 10%. About half of them said that the increase is less than 3%. Eight companies responded that their costs of goods sold increased between 3 and 4.9% due to becoming the sellers of certified wood products. Only four of 28 companies said that the increase in costs is more than 10%. The average increase in the cost of goods sold is estimated roughly about 4%[1].

Among the 28 companies that sell certified wood products, 21 companies purchase their materials from other sources. On average, based on answers from 20 companies, *the premium actually paid* by the CWP group is 6.6% above the price of comparable non-certified products.

Table 3.8.
Companies Selling Certified Wood Products
by Increase in Cost of Good Sold Due to Certification

Business type	< 3%	3-4.9%	5-9.9%	10-14.9%	15-20%	>20%	No answer	Total
Wholesaler/broker/importer	2	3	2	0	0	1	0	8
Dimension & Flooring	0	0	0	0	0	0	1	1
Veneer & Plywood manufacturer	0	2	0	1	0	0	0	3
Millwork manufacturer	1	0	0	0	0	0	0	1
Household Furniture	1	0	0	0	0	0	0	1
Furniture Retailer	1	0	0	0	0	0	2	3
Others	2	1	0	0	1	0	0	4
Forest Management company	3	2	1	1	0	0	0	7
Grand Total	10	8	3	2	1	1	3	28
	35.7%	28.6%	10.7%	7.1%	3.6%	3.6%	10.7%	100%

Source: MSU Forestry Department Survey (Stevens, Ahmad and Ruddell 1997)

[1] This is a weighted average figure estimated using the mid point of the range and number of companies within each range as weights.

Table 3.9 provides a comparison between the premium paid and charged by the companies that are currently selling certified wood products. It shows that more than 30% of the companies paid less than 3% premium for the certified wood products they purchased. One-fifth of these companies paid their suppliers a premium between 3% and 4.9%.

Table 3.9.
Number of Companies Selling Certified Wood Products by Premium Paid to Suppliers and Charged to Buyers

Premium range	Range mid-point	Dist. of companies by premium paid		Dist. of companies by premium charged	
		# of company	%	# of company	%
Zero	0%	1	5.0	2	7.7
0 - 2.9%	1.5%	6	30.0	9	34.6
3 - 4.9%	4.0%	4	20.0	7	26.9
5 - 9.9%	7.5%	3	15.0	5	19.2
10 - 14.9%	12.5%	4	20.0	2	7.7
15 - 20%	17.5%	2	10.0	1	3.8
Total		20	100	26	100
Weighted average premium (weight = number of companies)		avg. premium paid = 6.6%		avg. premium charged = 4.7%	

Source: MSU Forestry Department Survey (Stevens, Ahmad and Ruddell 1997)

On the selling side, based on answers from 26 companies, about 35% of the sellers charged price premiums between zero and three percent. More than one-quarter, or a total of five companies charge between 3% and 5%. Another fifth of the companies charge between 5% to 10%. None of the companies in the CWP group paid or charged more than 20% price premium. The *average premium charged to the buyers* is 4.7%. This sales premium average looks significantly (i.e. 29%) lower than the average of the premium that these companies actually paid, which is 6.6%. The situation raises the question of

whether the companies that sell certified wood products are suffering some financial losses. The answer is: most probably not ! From a cost accounting point of view, based on the averages of the cost and sales premiums, *the sellers of the certified wood product only lose if their cost of the purchased wood is more than 71% of their sales prices.* This figure was obtained from the following calculations:

$P_0 + V_0 = S_0$ and $P_1 + V_1 = S_1$

P = purchase price of wood material

S = selling price

V = company's value added

Subscripts "0" denote uncertified wood

Subscripts "1" denote certified wood of the same characteristics.

With the purchase and sale price premium

$P_1 = 1.066\ P_0$ and $S_1 = 1.047\ S_0$

To find the indifference condition for the firm whether or not to sell certified wood products, $V_0 = V_1$. By substitution we get:

$S_0 - P_0 = S_1 - P_1$

$S_0 - P_0 = 1.047\ S_0 - 1.066\ P_0$

$0.66\ P_0 = 0.47\ S_0$

$(P_0 / S_0) = (0.47)/(0.66) = 0.712 = 71\%$

In reality, it is unlikely that the cost of the purchased wood materials will exceed that threshold at any stage along the processing and marketing channel.

The survey found that, on average, the proportion of wood materials in the selling price of the CWP companies in the U.S. is about 60%.

In Table 3.10 we look at the type of buyers to which the sellers of certified wood products are charging some premiums. The table suggests that the premium of more than 3% has been charged primarily to secondary manufacturer groups, then to end users, and finally to architectural/construction companies. Eight of the eleven secondary manufacturers in the data set are being charged more than 3% by their wood suppliers. Two other companies in this group of primary buyers are charged between 0% and 3%.

Table 3.10.
Number of Companies Selling Certified Wood Products by Premium Charged and Primary Buyers

Primary buyers	< 3%	3-4.9%	5-9.9%	10-4.9%	15-20%	>20%	No answer	Total
Wholesaler/broker/importer	4	1	1	0	0	0	0	6
Primary manufacturers	1	0	0	0	0	0	0	1
Secondary manufacturers	3	3	2	2	1	0	0	11
Architectural/Building Construct.	0	1	1	0	0	0	0	2
Retailer	1	0	0	0	0	0	0	1
End users	2	2	0	0	0	0	1	5
Others	0	0	1	0	0	0	1	2
Grand Total	11	7	5	2	1	0	2	28
	39.3%	25.0%	17.9%	7.1%	3.6%	0.0%	7.1%	100.0%

Source: MSU Forestry Department Survey (Stevens, Ahmad and Ruddell 1997)

Table 3.11 illustrates the extent to which the sellers of certified wood products have been able to pass the cost increase to their buyers. The eight companies in the diagonal (shaded) cells in the table charge their buyers the same premium as they pay their suppliers. Four of the 20 sellers that answer this

question are above the diagonal cells. It indicates that they charge a higher premium rate than the rate they pay. Seven timberland companies in the sample are not included in this table. Five companies below the diagonal cells can only charge between 0% and 3% premium despite a higher rate they pay to their suppliers. Three other companies, including one that pays between 15% and 20% premium, can only charge between 3% and 4.9% premium to their buyers. On a product basis, secondary manufacturers and wholesalers have been able to charge their buyers a higher premium than the percentage they pay to their suppliers.

Table 3.11.
Passing the Extra Costs to the Buyers

Premium charged ==>	< 3%	3-4.9%	5-9.9%	10-14.9%	15-20%	No answer	Total	%
Premium paid								
< 3%	4	1	1	0	0	1	7	33.3%
3-4.9%	1	1	2	0	0	0	4	19.0%
5-9.9%	1	1	1	0	0	0	3	14.3%
10-14.9%	3	1	0	0	0	0	4	19.0%
15-20%	0	1	0	0	1	0	2	9.5%
No answer	0	0	0	0	0	1	1	4.8%
Total	9	5	4	0	1	2	21	100.0%
%	42.9%	23.8%	19.0%	0.0%	4.8%	9.5%	100.0%	

Source: MSU Forestry Department Survey (Stevens, Ahmad and Ruddell 1997)

3.5.6 Buyers' Willingness to Pay

Table 3.12 summarizes answers to the question on the estimate of willingness to pay (WTP) among the primary buyers of the CWP companies. It shows that the secondary manufacturers are the group of primary buyers that are willing to pay higher prices for the certified wood products. This table

reflects a strong consistency with table 3.10 which shows that this group is also the one that are being charged higher premiums. Four of the seven secondary manufacturers in this group are willing to pay more than 3% premium. The consistency is also reflected by the architectural/construction company group. This group is estimated to be willing to pay between 10-15% premium.

Table 3.12.
Willingness to Pay for Price Premium Among the Primary Buyers

Primary buyers	< 3%	3-4.9%	5-9.9%	10-14.9%	15-20%	>20%	No answer	Total
Wholesaler/broker/importer	3	0	1	0	0	0	2	6
Primary manufacturers	0	0	0	0	0	0	1	1
Secondary manufacturers	3	2	1	0	1	0	4	11
Architectural/Building Construction	0	0	0	2	0	0	0	2
Retailer	1	0	0	0	0	0	0	1
End users	4	1	0	0	0	0	0	5
Others	1	0	1	0	0	0	0	2
Grand Total	12	3	3	2	1	0	7	28
	42.9%	10.7%	10.7%	7.1%	3.6%	0.0%	25.0%	100.0%

Source: MSU Forestry Department Survey (Stevens, Ahmad and Ruddell 1997)

Using the same simple method as applied to calculating the average premium, overall, the estimated average of the existing willingness to pay of the companies in the intermediate wood product market is 4.2%. Forty-two percent (12 out of 22 companies) believe that the WTP for a price premium is only in the range of 0% to 3%. Eleven percent of the companies estimated the WTP for premium in the range 3%-5%. The same proportion said that the WTP premium is between 5% and 10%. Four companies stated that there is no WTP at all among the end users. On the other hand, three companies estimate the WTP to be higher than 10%. Regarding the trend of the WTP, 38% of the CWP

companies think that the WTP will increase. However, 57% others responded that WTP will stay the same as it is now.

In conclusion, judging from the information collected from the survey, some new developments are occurring in the U.S. intermediate wood input market. These new developments may provide support for the commercial case of timber certification and labeling. Companies that have adopted the certification initiative (ones that have become the certified sellers of wood products, or simply sell certified wood products without getting themselves certified) do it primarily to increase market access. Some have succeeded in getting access to additional markets.

Strong evidence of the existence of price premiums was also found. Most of the sellers of certified wood products in the sample are currently paying a certain premium above the price of uncertified comparable products. At the same time, they have been able to pass the extra costs of certified wood products to their buyers. Although the average price premium charged by all companies in the sample (4.7%) is lower than the average premium they pay to their suppliers, (6.6%) there is no reason to believe that the sellers are experiencing financial losses. Based on these averages, the company will lose only if their costs of purchased wood materials is more than 71% of their selling price. In reality, the average proportion of purchased material costs is about 60%.

The survey found that a WTP the price premium among wood product industries in the intermediate input market is in the order of 4.2%. This figure

was based primarily on the responses of the companies that actually sell certified wood products. While a few companies maintained that the demand for certified wood products is a temporary market fashion, some others are more optimistic and believe that WTP will still increase.

Chapter IV

EFFECTS OF ECOLABELING ON MARKET EQUILIBRIUM AND WELFARE

Introduction

The first objective of this chapter is to conceptualize the demand, supply and equilibrium in the market of ecolabeled timber products. The analysis presented here is a simplification of the aggregate demand and the aggregate supply discussed in chapter III. In the analysis we examine how the market becomes segmented as a result of introduction of ecolabeling.

The second purpose is to present diagrammatic analysis of the welfare effects of timber ecolabeling. It uses the concepts of consumer surplus, producer surplus, and damage cost induced by the externality of timber production. First, we discuss the welfare situation under conventional market without ecolabeling. This analysis serves as point of comparison in the subsequent sections. Secondly, we introduce the ecolabeling and see how the welfare changes. Next, we look at the welfare effect of Pigouvian Tax as the first best alternative instrument to deal with externality instead of ecolabeling. Then, we consider the welfare effect of ecolabeling under the existence of Pigouvian Tax. Finally, we make comparisons among the three situations.

Throughout this chapter, we assume that the ecolabeled wood has identical characteristics with the conventional wood, except in one aspect,

namely the pro-sustainability characteristics of the woods. Pro-sustainability characteristic reflects whether the wood was produced using sustainable production process. The certified ecolabel confirms that the producer of the wood has been verified for doing so.

4.1 Demand for Ecolabeled Wood Product

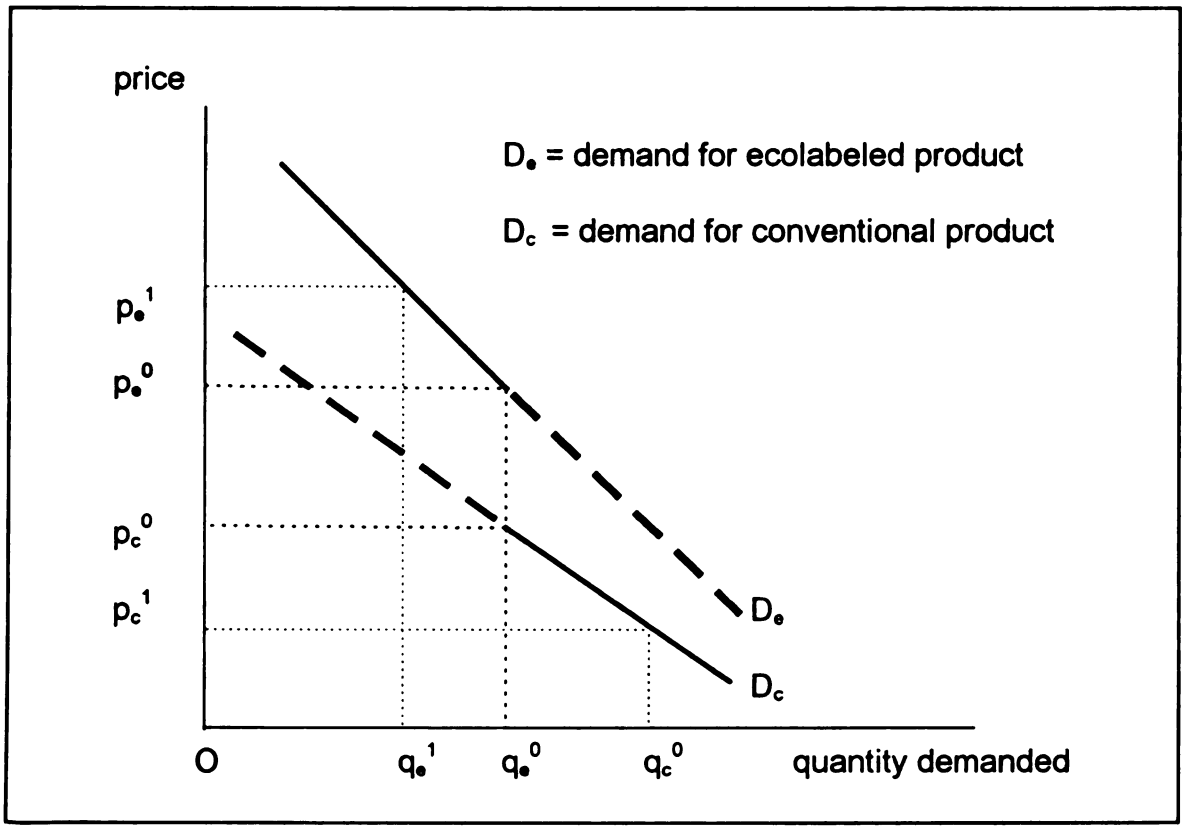
Consumers (as a group of buyers in the market) are assumed to have two demand functions, one for conventional wood, one for ecolabeled wood. Total demand in the market is fixed. It consists of demand for conventional wood and demand for ecolabeled wood. When purchasing the wood products, consumers choose the one that provides the largest extra surplus. The extra surplus for consumers is defined as the positive difference between the total willingness to pay for a product and the actual price of the product.

With these assumptions, the conditional demand schedules for conventional and ecolabeled wood products can be illustrated as in Figure 4.1. The demand schedules in Figure 4.1 are conditional in the sense that they are conditional upon certain range of price levels to be effective.

If $p_e^0 - p_c^0$ is the minimum increase in the marginal cost to produce the ecolabeled wood, for any price levels at and above p_e^0, the effective demand schedule would be the solid segment of line D_e. Only demand for ecolabeled wood exists at the price p_e^0 or higher. Within this price range, the consumers' marginal WTP for the wood's sustainability characteristics equals or is greater

than the amount needed to compensate the extra cost of the producer for using sustainable production process.

Figure 4.1.
Demand for Conventional and Ecolabeled Wood

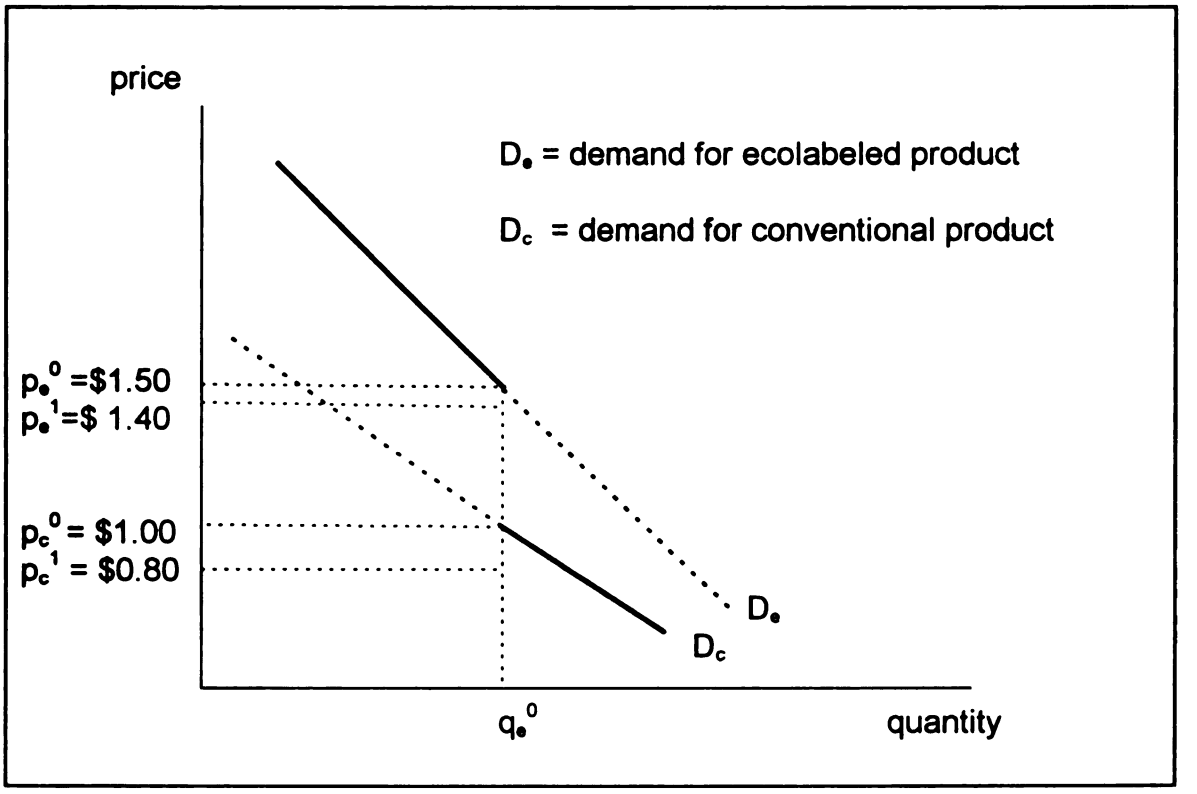


For the price levels below p_c^0, the effective demand schedule would be the solid segment of line D_c, and only demand for conventional wood prevails within this price range. If quantity demanded is higher than q_e^0, for instance q_c^o, the amount between q_e^0 and q_c^0 will be supplied by conventional producer because the consumers' marginal WTP to pay for the sustainability characteristics is not sufficient to compensate producer for the extra cost of using sustainable production process.

The vertical distance between the schedules of demand for conventional and ecolabeled wood represents the extra (or marginal) WTP of consumers for sustainability characteristics at each point of quantity demanded. All segments of D_c is effective if there is no supply of ecolabeled wood in the market (or if the extra cost of using sustainable production process is so high that makes it prohibitive to do so). And all segments of D_e will be effective if all markets become the ecolabel market at all levels of quantity demanded.

The determination of the effective part of the demand schedules can be illustrated by the following example and Figure 4.2. Suppose q_e^0 is the amount of wood that a consumer wants to buy. At this amount of quantity demanded, if the price of the conventional wood equals p_c^0 = \$1.00 and the price of the ecolabeled wood equals p_e^0 = \$1.50, the consumer is in indifferent position between buying the conventional and ecolabeled wood in terms of price. The reason is that the consumer can not enjoy extra surplus or saving from either type of the wood. The actual prices of both choices are the same with their total willingness to pay for each type. Notice, however, that the total consumer surplus will be higher if they choose the ecolabeled wood. Graphically speaking, this is because the distance between D_e and D_c is increasing as price increases. In reality, demand functions that represent $(dq_c/dp) > (dq_e/dp)$ are sufficient for this outcome. The consumer's extra marginal willingness to pay for the certified wood (if they do buy the certified one) is enough to buy the extra utility they derives from the sustainability characteristics of the wood.

Figure 4.2.
Separation of Demand for Ecolabeled and Conventional Wood



If the price of the conventional wood is $0.80 and the price of the ecolabeled one is $1.50, then the consumer would choose to buy the conventional wood because of a $0.20 saving or extra surplus per unit purchased. The same type of argument applies if the price of the conventional wood is $1.00 and the price of the ecolabeled one is $1.40. The consumer would choose the ecolabeled one to gain a $0.10 extra surplus per unit wood they consumes. Table 4.1 provides some possible cases in which the consumer decides which type of wood to buy based on the extra surplus that they could enjoy. The quantity demanded is the same across all cases.

Table 4.1.
Consumer Choices of Wood under Various Price Differences

	Case-1	Case-2	Case-3	Case-4	Case-5
p_e ($/unit)	1.50	1.50	1.40	1.40	1.55
p_c ($/unit)	1.00	0.80	1.00	0.80	1.10
Extra consumer surplus from E (ecolabeled)	0	0	+0.10	+0.10	-0.05
Extra consumer surplus from C (conventional)	0	+0.20	0	+0.20	-0.10
Buy "E" or "C"	indifferent	C	E	C	E

From Table 4.1 we can infer that consumers make decision using the following rule: they would choose E (ecolabeled wood) over C (conventional wood) if

Total WTP for E - Actual price of E >= Total WTP for C - Actual price of C

Total WTP for E - Total WTP for C >= $p_e - p_c$

marginal WTP for E >= price premium for E

In the market, a consumer would exercise their marginal willingness to pay in maximizing utility from consumption. Thus, at the optimum consumption point, they would purchase ecolabeled wood up to the point where their *marginal willingness to pay for sustainability characteristic of the wood equals the price premium.*

4.2 Cost and Supply of Ecolabeled and Conventional Wood

This part discusses the costs of wood production and supply at the forest concession level, where the wood logs are produced. It is assumed that all firms have *the same level of constant marginal cost* if producing conventionally, that

is, without using the sustainable production process. However, when switching toward sustainable production process, the extra cost per unit product varies widely across firms. This is due to differences in the historical logging practices and management of the logged-over area of the concessions. Product differentiation through partial ecolabeling of total wood production is not allowed at the forest concession level[1] .

From a representative firm's point of view, if the unit cost of producing conventional product is c_c, the unit cost of producing ecolabeled wood would be

$$c_e = c_c + s$$

where s is the extra cost of using sustainable production process. Profit per unit product can be expressed in the following equations

conventional product $\Pi_c = p_c - c_c$

ecolabeled product $\Pi_e = p_e - c_e$

The firm would switch into using sustainable production process and get certified ecolabel if $\Pi_e > \Pi_c$. This implies $p_e - c_e > p_c - c_c$ and $p_e - p_c > c_e - c_c$. It means that the firm would use sustainable production process if the price premium is greater than the extra cost that the firm needs to absorb to get its product certified as sustainably produced wood.

[1] This is in line with the most commonly adapted principles and criteria for timber certification under the FSC (Forest Stewardship Council). FSC provides accreditation for certifying institutions who are offering certification services to the primary wood industry (forest management or concessionaires).

Assuming that producers are facing competitive market where price equals marginal cost equals average cost, then our representative producer maximizes profit per unit product until their marginal benefits from ecolabeling equals marginal cost of doing so. Since their marginal benefit equals the price premium they can receive from the market, at the optimum they will produce at the quantity where the *price premium equals the extra cost of using sustainable production process,* or where $p_e - p_c = c_e - c_c$.

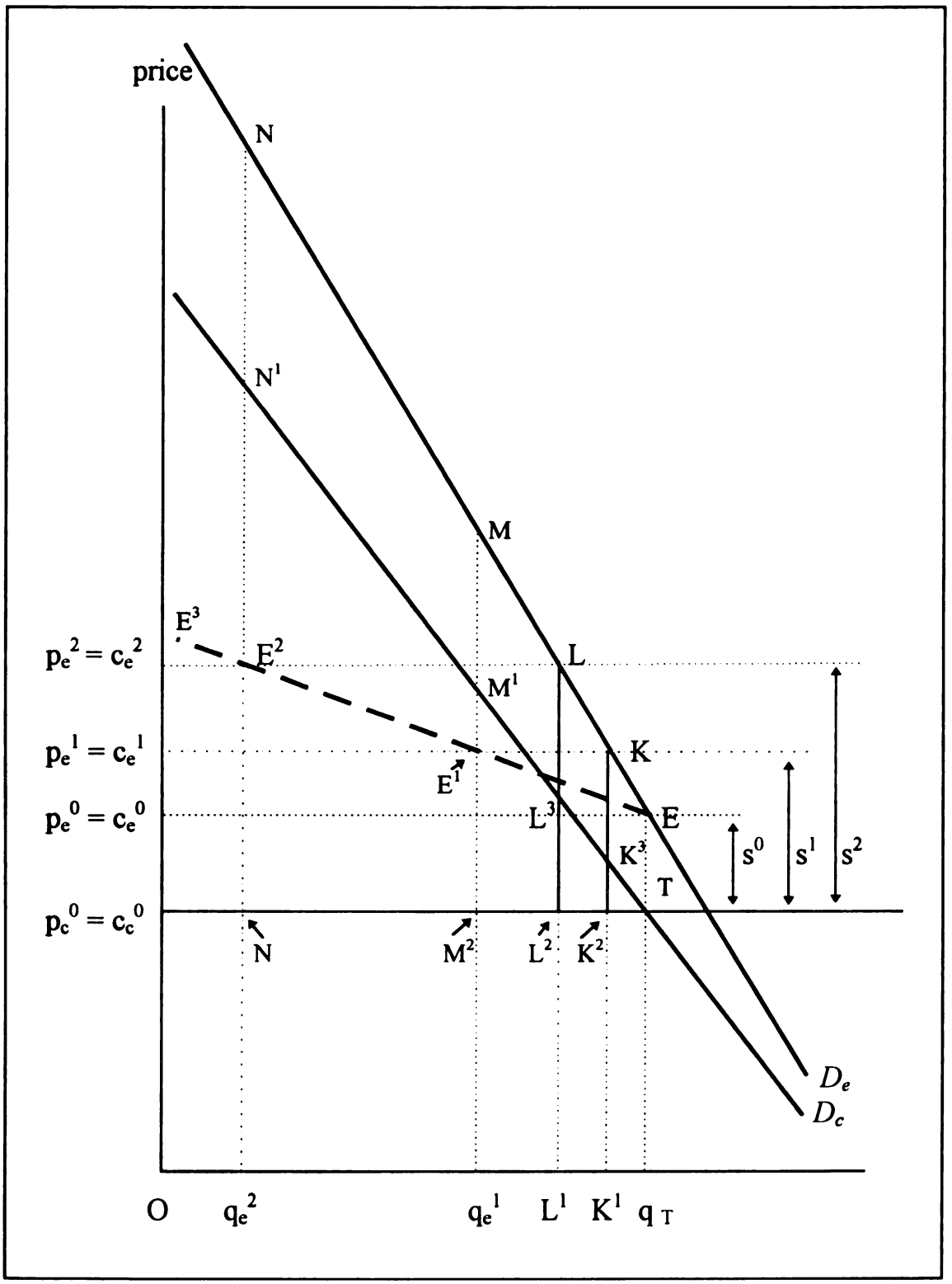
4.3 Market Equilibrium of Ecolabeled and Conventional Wood

From consumers' optimization problem we have that the consumer would purchase ecolabeled wood to the point where marginal WTP equals the price premium. At this point the consumers have already used up all extra surplus that they can get from the market.

From the representative producer's optimization problem, we have that the producer would produce ecolabeled wood up to the point where the price premium they can get from the market equals the extra cost they needs to bear. At this point the producer has extracted all consumers' marginal willingness to pay for the sustainability characteristic of the wood.

Thus, at the equilibrium point, the consumer's marginal WTP for sustainability characteristic *equals* the price premium of ecolabeled product. This also *equals* the marginal cost of using the sustainable production process. Figure 4.3 illustrates the equilibrium in the wood market under the existence of ecolabeled wood and marginal WTP among some consumers in the market.

Figure 4.3.
Equilibrium in Wood Market under Existence of Ecolabel



Suppose we have a competitive equilibrium represented by point T before ecolabeled wood is introduced in the market. The total wood quantity demanded is q_T and the price per unit is p_c. This price level equals the constant marginal cost of producing wood in conventional way which is depicted as c_c^0.

Assuming the total quantity of wood demanded as fixed, now we introduce the ecolabeled wood. We will see how the market splits into ecolabeled and conventional segments.

Some extra cost would be inevitably incurred in using sustainable production process to produce the ecolabeled wood. Assume that this extra cost is a fixed amount above the marginal cost of producing in conventional way. In Figure 4.3, if the extra cost equals s^0, the marginal cost to produce the ecolabeled wood is c_e^0, and its price will be $p_e^0 = c_e^0$. If this is the case, the market equilibrium will be point E. The whole market will become ecolabeled wood market at q_T level of total quantity demanded. The consumers choose to buy the ecolabeled wood because the total consumer surplus will be bigger. This will be the case even though, price wise, consumers cannot enjoy any extra surplus from the difference between their total willingness to pay and the actual unit price of the ecolabeled wood. The bigger consumer surplus is a reflection of the increased utility enjoyed by the consumers from knowing that the wood they purchase has been produced using sustainable production process or in environmentally friendly way.

If the extra cost is greater than s^0, for instance, if it equals $s^1 = c_e^1 - c_c^0$, then producers could only sell q_e^1 amount of the ecolabeled wood at the price per unit equals p_e^1. Although the line $p_e^1 = c_e^1$ crosses the ecolabeled demand schedule at point K, the producers can not sell OK^1 amount of the ecolabeled wood. The reason is, at this level of quantity demanded, if the price of ecolabeled wood is p_e^1, the consumers would rather buy the conventional wood that is available at the price p_c^0. By purchasing the conventional wood, the consumers enjoy an extra surplus of K^2K^3 per unit wood. At OK^1 amount of quantity demanded, the ecolabeled wood does not offer any extra surplus or saving to consumers.

To find the equilibrium in the ecolabeled market segment we need to look for a level of quantity demanded that corresponds to the condition where the marginal willingness to pay of consumers equals the price premium equals the extra cost of using sustainable production process. We found that the extra cost of s^1 matches the height of the line MM^1 which represents the vertical distance between the D_e and D_c (which equals the marginal WTP) at the level of quantity demanded equals q_e^1. Hence, equilibrium in the ecolabeled wood market segment is represented by point $[q_e^1, p_e^1]$. At this point, the price premium $p_e^1 - p_c^0$ matches the extra marginal cost $c_e^1 - c_c^0$ and also matches the consumers' marginal WTP of MM^1. If at q_e^1 amount of quantity demanded the price of the ecolabeled wood is higher than p_e^1, the consumers will switch to buying

conventional wood. This happens because the consumers will receive negative surplus if they buy the ecolabeled wood. In this case, the price of the ecolabeled wood is higher than consumers' total WTP for it.

Considering that the total quantity demanded for wood equals q_T, and that only q_e^1 amount is being served in the ecolabeled segment, then the portion $q_T - q_e^1$ will be served in the conventional market. The price in the conventional market remains p_c^0.

By the same argument it can be shown that if the extra cost of producing ecolabeled wood equals $s^2 = c_e^2 - c_c^0$, then the equilibrium in the ecolabeled wood market segments will occur at point E^2. The quantity demanded will be q_e^2 at the price per unit equals p_e^2. Compared to point E^1, at this higher level of extra cost, the portion of total demand served in the ecolabeled market is smaller. A larger portion of the market, i.e. $q_T - q_e^2$ is served in the conventional segment.

Connecting points E, E^1, E^2 and E^3 (by the dashed line) we get the equilibrium path of the ecolabeled wood market. This path reflects the common intuition that the higher the extra cost of producing the ecolabeled wood, the smaller the portion of the market that will be able to purchase it. Along this path we see that the equilibrium for the ecolabeled wood is determined by the extra cost of using sustainable production process and the existence of marginal willingness to pay above the conventional wood price for that level of required

premium. This path also reflects how the market splits into two segments as voluntary certification and ecolabeling of wood is introduced in the market.

Given the existence of marginal WTP for any level of the price premium $w^i = p_e^i - p_c^0$, the equilibrium points for each market segments can be stated as follow:

Equilibrium for ecolabeled wood = $[q_e^i, p_e^i = c_e^i]$, and

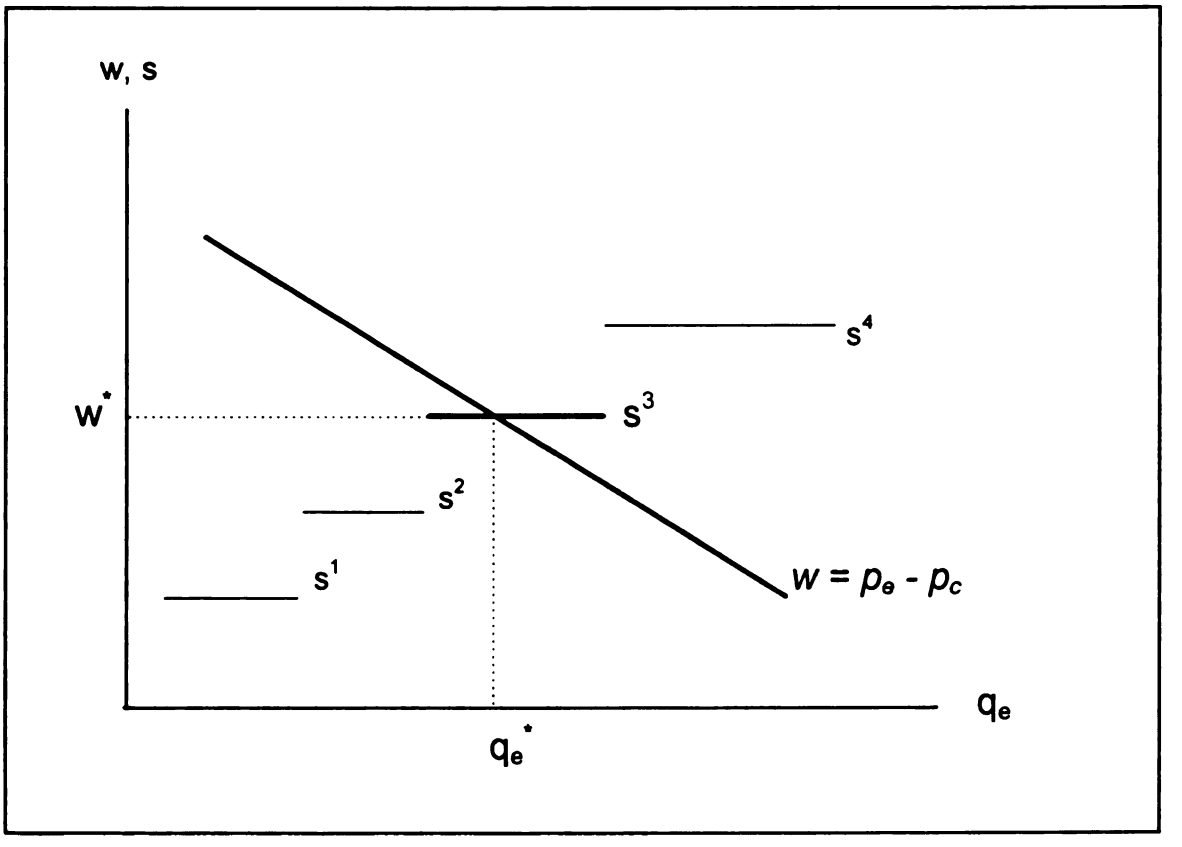
Equilibrium for conventional wood = $[q_T - q_e^i, p_c^0 = c_c^0]$

Equilibrium quantity demanded for ecolabeled wood, q_e^i, and its corresponding price level, $p_e^i = c_e^i$, become a demarcation point that separates the markets for the ecolabeled wood and the conventional one. On and above this price level, only demand for ecolabeled wood exists. The rest of the demand in the market, i.e., the one to the right of point q_e^i, is the demand for the conventional wood. However, the demand for the conventional wood exists only at the price below p_c^0. If q_T is the total quantity demanded for wood in the market, q_e^0 is the portion served in the ecolabeled segment and $q_T - q_e^i$ is the portion served in the conventional market segment. Point q_e^i on the x-axis is the quantity demanded for ecolabeled wood that corresponds to $p_e^i - p_c = c_e^i - c_c$.

To the right of q_e^i, the size of the premium that producer can capture is smaller than the extra cost they has to bear when switching toward using sustainable production process. To the left of q_e^i the premium is greater than this extra cost.

Using the consumers' marginal WTP and the producer's extra cost of using sustainable production process, market equilibrium of ecolabeled wood segment can also be illustrated as in Figure 4.4. Y-axis measures the price premium or the extra cost of producing of ecolabeled wood above the conventional one.

Figure 4.4.
Marginal Willingness to Pay, Extra Cost and Equilibrium of Ecolabeled Wood Market



The curve for consumers' marginal WTP, $w = p_e - p_c$ will be downward sloping. The step function pictured in Figure 4.4 represents several possibilities of extra cost of using sustainable production process and get certified to carry ecolabel. If w^* represents the prevailing WTP for ecolabeled wood above the

conventional one in the market, each segment of the step function (i.e. s^1, s^2, s^3, and s^4) represent relative competitiveness of different wood producers in the ecolabeled wood market. If the level of willingness to pay for the price premium equals w^*, companies that need to spend less than s^3 as extra cost to produce ecolabeled wood (such as companies whose extra cost is represented by s^1 and s^2) will have a lot of incentive to switch into using sustainable production process. These companies will be rewarded more than the extra expense they have to bear for producing the ecolabeled wood. Certainly, concession with s^4 cost level will not be able to compete in the ecolabeled wood market. Company that needs to bear s^3 extra cost to produce sustainably represents a typical firm at the market equilibrium where the extra cost of producing ecolabeled wood equals the marginal willingness to pay for that product above the conventional one. As depicted, with w^* level of WTP for the price premium, the corresponding quantity demanded for ecolabeled wood will equal q_e^* at the equilibrium.

4.4 Welfare Effect of Ecolabeling in the Absence of Pigouvian Tax

Toward the end of this chapter, the producer surplus is always zero due to the competitive market assumption. Therefore, leaving out the producer surplus from the analysis will not affect the conclusion on the direction of the welfare changes. As discussed in Chapter II, the conventional production process in logging activities imposes some negative stock feedback effects for future production as well as non-timber externalities. Hence, the use of this

technology is always associated with some damage cost that is borne by the society as a whole. In this section, it is assumed that if producers are using the sustainable production process, the marginal damage costs associated with logging operation are zero.

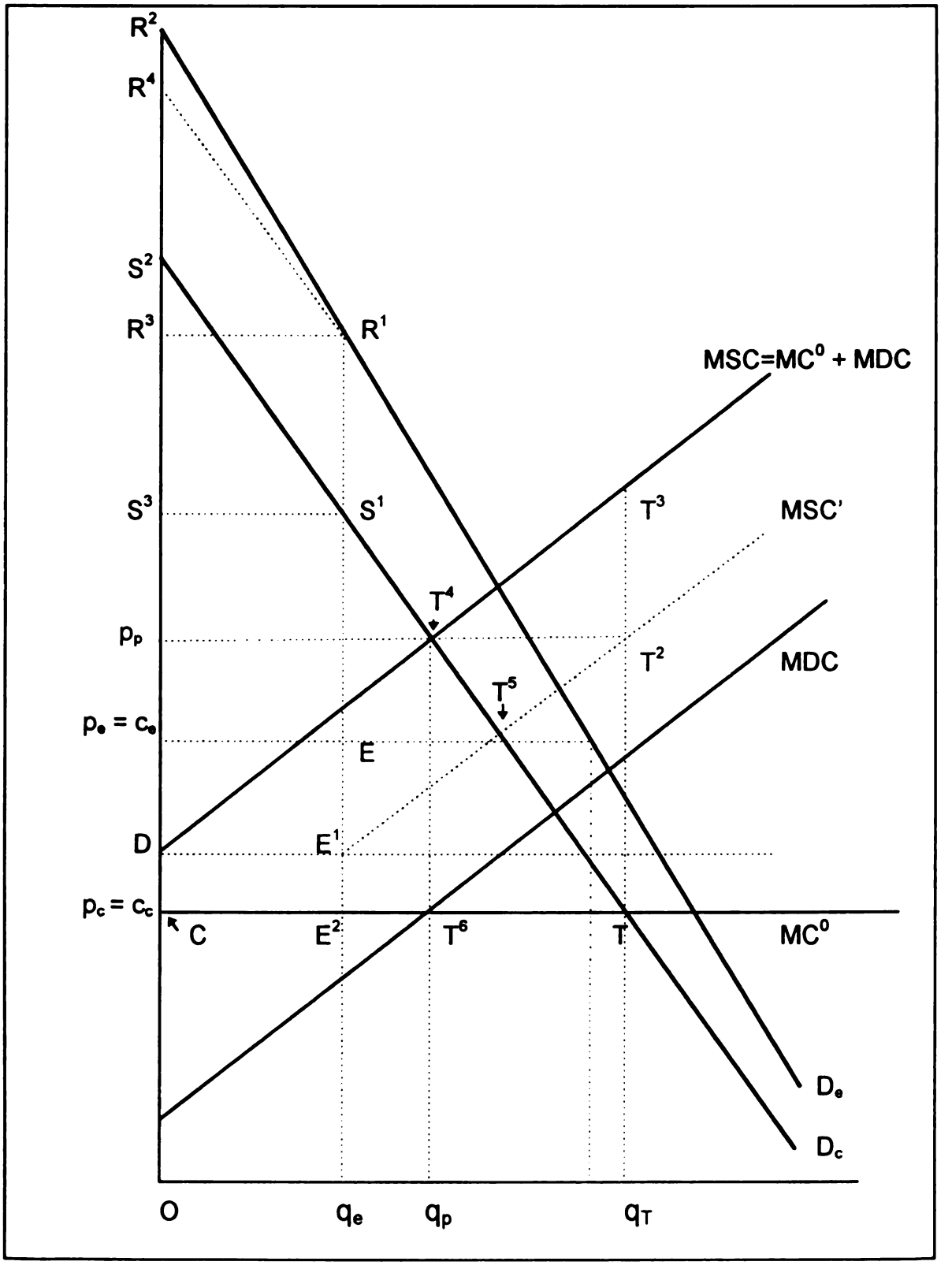
Before ecolabeling is introduced in the market, suppose we have an equilibrium that is represented by point [q_T , p_c] in Figure 4.5 Total quantity of wood demanded equals q_T at the price p_c . This price equals c_c , the constant marginal cost of producing the wood conventionally. The damage cost caused by the externality of the timber production is represented by curve MDC. Hence, the marginal social cost (MSC) is represented by the vertical summation of MC^0 and MDC. The total damage cost is reflected by the area between the MSC and MC^0 curves.

At the equilibrium, consumer surplus equals the size of the area of the triangle S^2TC , and the total damage cost is the area $DCTT^3$. The net welfare under this purely conventional market is represented by the difference between these two areas. In other words,

Net welfare = $W_c = S^2T^4D - TT^3T^4$ ..... (1)

The later triangle represents the part of social cost that does not get compensated in anybody's income. This is the dead weight loss borne by the society due to the externality of producing and consuming wood in the amount of q_T .

Figure 4.5.
Welfare Changes Due to the Introduction of Ecolabeled Wood in the Absence of Pigouvian Tax



When we introduce the ecolabeled wood, the market will split into two segments. Equilibrium in the ecolabeled segment is $[q_e, p_e = c_e]$. Equilibrium in the conventional market segment is $[q_T - q_e, p_c = c_c]$.

To see changes in consumers' welfare, we compare the consumer surplus at q_e amount of quantity demanded under both demand curves, given the existing price premium and cost differences at that level of demand. At q_e level of quantity demanded, if a consumer buys the conventional wood, his consumer surplus will be the triangle area $S^1S^2S^3$. If he buys the ecolabeled wood, his consumer surplus is the triangle $R^1R^2R^3$. Since the distance between D_c and D_e increases as price rises, we can see that the area $R^1R^2R^3$ is larger than that of $S^1S^2S^3$. By taking a parallel line with D_c at point R^1, we can find the difference in the size of the triangle areas. The triangle $R^1R^2R^4$ is the gain in consumer surplus from switching into consuming ecolabeled wood.

To see changes in the social cost, we shift the MSC curve horizontally to point E^1. The new total social cost with the introduction of ecolabeled wood is $TT^2E^1E^2$. Please note that the new social cost that is not compensated by any income is the triangle area TT^2T^5. This loss is significantly smaller than the triangle area TT^3T^4 that occurs under purely conventional market. The difference, i.e. the area of trapezoid $T^2T^3T^4T^5$ represents the welfare gain of introducing the ecolabeled wood into the market.

Under simultaneous equilibria in conventional and ecolabeled market as depicted by [q_e , $p_e = c_e$] and [$q_T - q_e$, $p_c = c_c$] , the welfare calculation can be presented as follows:

Consumer surplus $= p_e E R^1 R^2 + S^1 T E^2$

$= p_c E^2 T T^2 + R^1 R^2 R^4 + S^1 T E^2$

$= S^2 T p_c + R^1 R^2 R^4$

Damage cost $= E^1 E^2 T T^2 = D p_c T^6 T^4$

Net welfare = W_e $= S^2 T p_c + R^1 R^2 R^4 - E^1 E^2 T T^2$

$= S^2 T p_c + R^1 R^2 R^4 - D p_c T^6 T^4$

$= S^2 T^4 D + R^1 R^2 R^4$ ..... (2)

Comparing the net welfare before and after ecolabeling is introduced in the market, i.e. comparing W_c from equation (1) with W_e from equation (2), we find that the benefit from introducing the ecolabeling in the wood market is

Welfare gain = $W_c - W_e$

$= T T^3 T^4 + R^1 R^2 R^4$ ..... (3)

The first term in equation (3) is the unrealized damage cost because some producers switch to using sustainable production process to produce the ecolabeled wood, hence reducing the total damage. The second term is the additional consumer surplus due to the positive value of information carried by the certified ecolabel.

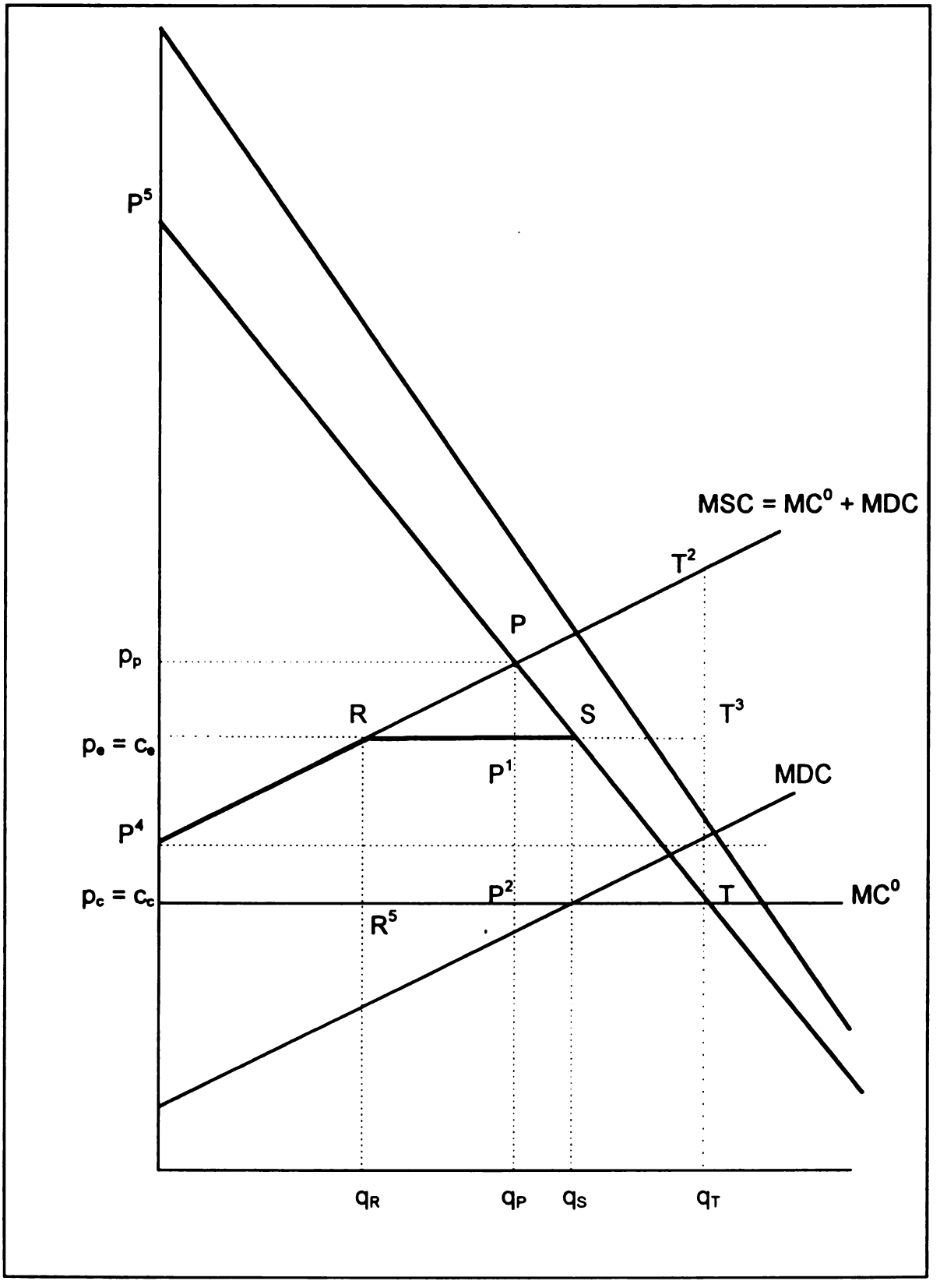
4.5 Welfare Effects of Pigouvian Tax in the Absence of Ecolabeling

In this section we use all set up explained previously. Here we assume the technology or process to produce wood in sustainable way is always available for every producer at some extra cost. This is the same technology that is used to get certified and acquire the right to use ecolabel.

Suppose now the government imposes a Pigouvian tax on producers who are inducing some externality and damage cost. The tax is imposed in order to force the producers to bear the total social cost of their activities, not just the direct marginal cost when producing the wood. The tax rate equals the marginal damage cost per unit output at the corresponding level of production. In Figure 4.6, if the technology of sustainable production process were not available, the new equilibrium will occur at point $[q_p , p_p]$. Triangle TT^2P represents the welfare gain under Pigouvian tax compared to the original conventional market equilibrium. This is the value of unrealized damage because of the reduction in production.

Since the technology of sustainable production process is always available to every producer, the equilibrium will be reached at a different point other than P. Notice that in Figure 4.6, the cost curve of using sustainable production process, c_e, crosses the marginal social cost curve (MSC), at point R. Under this situation, as long as c_e is above MSC, it is cheaper for the producer to produce conventionally and pay the Pigouvian tax accordingly. However, when the quantity produced reaches q_R, it is no longer the cheapest

Figure 4.6.
Welfare Effect of Pigouvian Tax in the Absence of Ecolabeling



strategy to follow. Switching to sustainable production process becomes cheaper than producing in conventional way and paying the Pigouvian tax. In this scenario, producers switch to using sustainable production process merely to avoid paying tax, not to let people know that they are producing in sustainably or environmentally friendly way. The new equilibrium will occur at point $[q_s , p_e]$. The quantity produced and demanded equals q_s which is bigger than q_p (the efficient level of production implied by the Pigouvian tax), but smaller than q_T, the original equilibrium.

At equilibrium point $[q_s , p_e]$, q_R portion of the total quantity is produced by conventional production process while producer paying the tax at the rate of RR^5 per unit output. Under the assumption of Pigouvian tax system, the government would use the proceed to neutralize the damage cost of the size $p_cR^5RP^4$. The $q_s - q_R$ portion of the total supply is produced using sustainable production process. No damage is done under this range of production. With this Pigouvian tax, we can calculate the welfare as follows:

Consumer surplus = p_eSP^5

Government tax revenue = $p_cR^5Rp_e$

Damage cost = $p_cR^5RP_4$

Government surplus = p_eRP^4

Net welfare = W_P = consumer surplus + government surplus

= $p_pSP^5 + p_eRP^4$

= $PP^4P^5 + PRS$ ..... (4)

In Figure 4.6 we also see that the original equilibrium (i.e. before Pigouvian tax or Ecolabeling is introduced) is represented by point [q_T , p_c] and net welfare equals $W_c = PP4P5 - TT^2P$. Compared to the net welfare in the original equilibrium, the Pigouvian tax clearly brings the benefits in the amount of

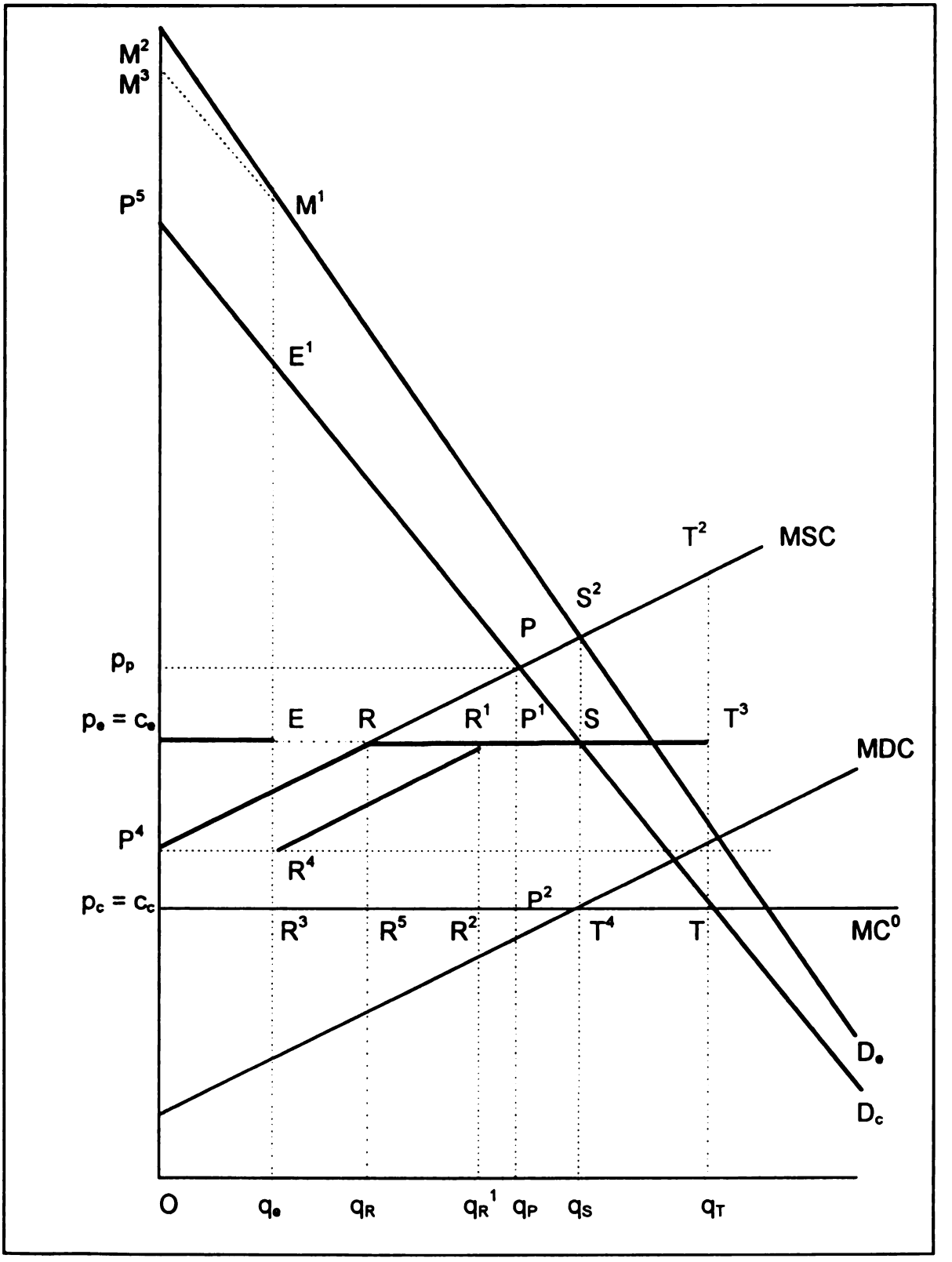
$$W_p - W_c = TT^2P + PRS \quad \ldots\ldots (5)$$

The first term reflects the unrealized damages cost due to the decrease in production from q_T to q_S . The second term is the increased consumer welfare due to the reduction of the damage cost compared to the situation under original equilibrium.

4.6 Welfare Effect of Ecolabeling under Existence of Pigouvian Tax

If timber certification and ecolabeling are introduced under the existence of Pigouvian tax and cost structures depicted in Figure 4.6, equilibrium and welfare level will be different. Figure 4.7, which is essentially a combination of Figures 4.5 and 4.6, shows this different equilibrium point. The cost of producing ecolabeled wood is the same as the cost of using sustainable production process. The only difference is that under ecolabeling the producers adopt sustainable production process to get certification as a sustainable wood source and acquire the right to use the certified ecolabel to let the consumers know that, indeed, they are producing in a sustainable manner. Based on the labels that function as a discriminating instrument in the market, consumers may purchase

Figure 4.7.
Welfare Changes Due to the Introduction of Ecolabeled Wood in the Existence of Pigouvian Tax



the ecolabeled wood and derive utility from knowing about the pro-sustainability characteristic of the wood.

If $s = c_e - c_c$ is the extra cost of using the sustainable production process over the conventional one, the equilibrium in the ecolabeled market segment will occur at point $[q_e , p_e]$. At the quantity demanded = q_e and price = p_e consumer would choose ecolabeled product. Price wise, both choices give zero extra surplus of total WTP above their actual prices. However, the consumer would choose the ecolabeled wood because they will gain an increase in consumer surplus represented by area $M^1M^2M^3$. This welfare gain in the ecolabeled segment in the wood market can be attributed to the value of information conveyed by the ecolabel. Consumers value the information carried by the label positively because it provides them with the opportunity to exercise their preference toward pro-sustainability products.

To look at what happens in the conventional market segment where the Pigouvian tax is in effect, we shift the social marginal cost curve MSC = MC^0 + MDC horizontally to the point R^4. Equilibrium in the conventional market will happen at point $[q_S - q_e , p_e]$. In the range $q_R^1 - q_e$, the producers who have not certified and ecolabeled their products continue using the conventional production process and pay the Pigouvian tax to compensate for the damage induced by their productions. But, after q_R^1, it will be more profitable for them to switch into using sustainable production process. The quantity $q_s - q_r^1$ is the portion of the wood produced through sustainable production process but does not get ecolabeled.

Under the existence of both Pigouvian tax as well as ecolabeling, the welfare calculation will comprise of the followings:

Welfare in the conventional market segment:

Consumer surplus = ESE^1

Government tax revenue = $R^3R^2R^3E = p_cR^5Rp_e$

Damage cost = $R^3R^2R^1R^4 = p_cR^5RP^4$

Net welfare = $ESE^1 + P^4Rp_e$

Welfare in the ecolabeled market segment :

Consumer surplus = $p_eEE^1P^5 + M^1M^2M^3$

Total net welfare = $W_{p,E}$ = $ESE^1 + P^4Rp_e + p_eEE^1P^5 + M^1M^2M^3$

= $p_eSP^5 + P^4Rp_e + M^1M^2M^3$

= $PP^4P^5 + PRS + M^1M^2M^3$ ..... (6)

If we compare the situation of having both Pigouvian tax and ecolabeling simultaneously in place with the original equilibrium, the advantage we have is

Net welfare gain = $TT^2P + PRS + M^1M^2M^3$ ..... (7)

It indicates that the combination of policies reduces the damage cost by the size of TT^2P and increases the consumer surplus in two ways. One is through reduction in damage from using the sustainable production process (i.e., PRS), the other is through the increased utility attributed to the value of information conveyed by the ecolabel (i.e., $M^1M^2M^3$).

Please note, however, that the analysis that combines the existence of Pigouvian tax and ecolabeling blurs the idea of price premium which was originally defined as the difference between the prices of conventional and

ecolabeled products. Under the existence of Pigouvian tax, with a competitive market assumption, the producers would always have to sell at the price

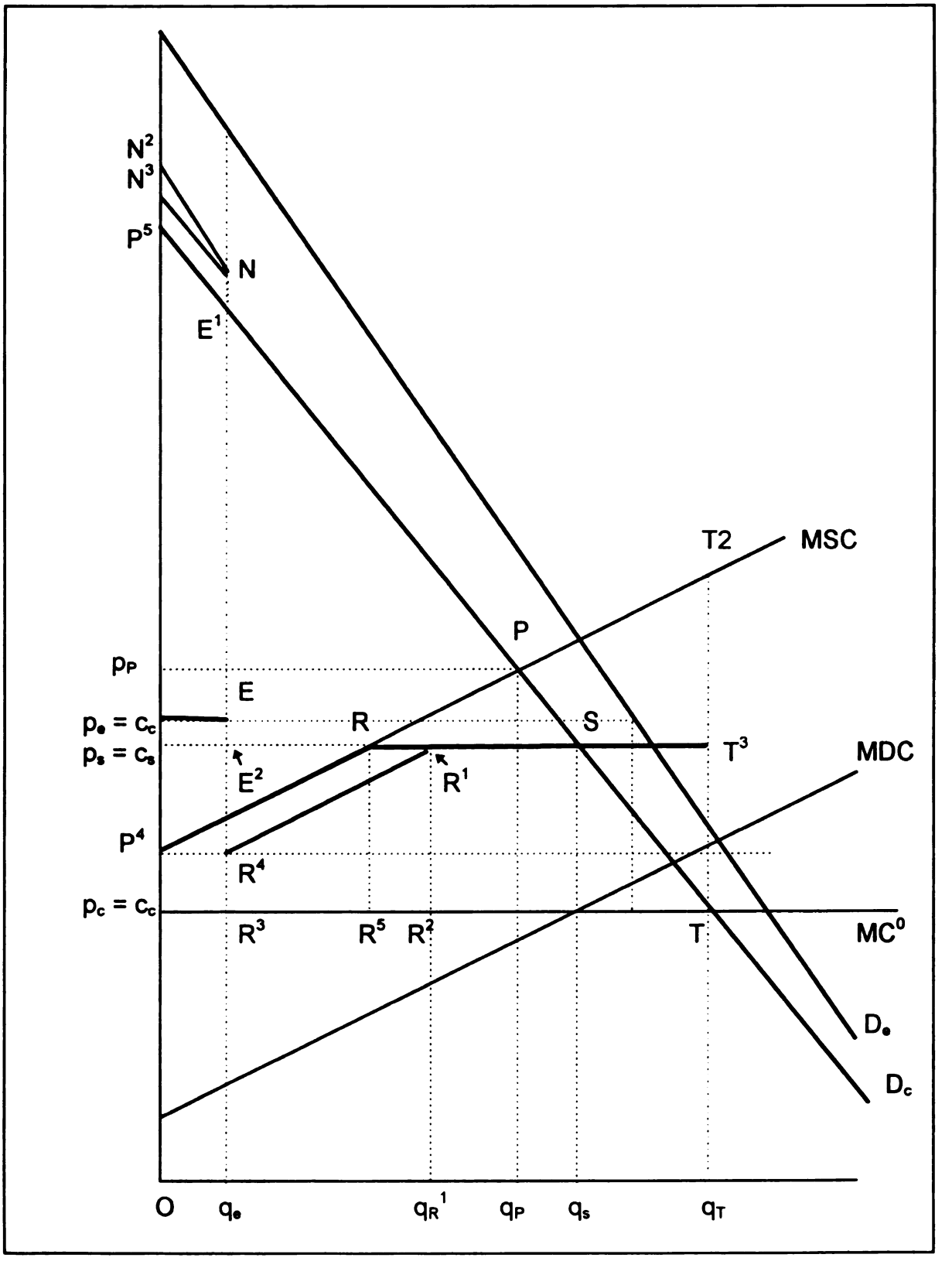
$p_e = p_c$ + *optimal tax rate* = *price of ecolabeled products.*

In this situation, we could imagine that the administrative cost of timber certification and ecolabeling is 'another' extra cost above c_e . Under this scenario, we should question whether the 'pure' benefit of ecolabeling represented by the triangle $M^1M^2M^3$ could justify any additional expense beyond c_e, the cost of using sustainable production process.

Alternatively, we could illustrate the situation by having $p_e = c_e$ higher than $p_s = c_s$ to capture the administrative cost of ecolabeling on top of the cost of using sustainable production process. This is depicted in Figure 4.8. Here we define a new or "effective" price premium as the vertical difference between p_e and p_s . This is because, with Pigouvian tax in place, the new base price or point of price comparison would be p_s . When measuring the consumer surplus in the ecolabeled market segment, we also need to use this "new" price premium as the effective distance of demand schedules.

In Figure 4.8, a smaller portion of the market is served in the ecolabeled segment due to the higher price or higher required premium necessary to cover the cost. Although the increase in consumer surplus attributable to the information value of ecolabeling will be smaller, the same concept still applies in measuring the total welfare under both Pigouvian tax and ecolabeling.

Figure 4.8.
Welfare Changes with Administrative Cost of Ecolabeling in the Existence of Pigouvian Tax



In the conventional market segment, the equilibrium would be $[q_s - q_e, p_s]$, and the welfare calculations are as follow:

Consumer surplus = E^2SE^1

Government tax revenue = $R^3R^2R^1E = p_cR^5Rp_s$

Damage cost = $R^3R^2R^1R^4 = p_cR^5RP^4$

Net welfare = $E^2SE^1 + p_sRP^4$

And in the ecolabeled market segment:

Consumer surplus = $p_eENN^2 = p_sE^2E^1P^5 + N^1N^2N^3$

So, we have

Net total welfare = $p_sSP^5 + p_sRP^4 + N^1N^2N^3$ ..... (8)

Again, equation (8) shows that the combination of Pigouvian tax and ecolabeling brings about the three benefits compared to the original equilibrium. They are: (1) unrealized damage due to lower total production; (2) increase in consumer surplus due to lower damage attributable to the technology of sustainable production process; and (3) increase in consumer surplus attributable to the value of information conveyed by the ecolabel.

In Chapter V, the demand for ecolabeled and conventional products, as well as the changes in consumer surplus due to ecolabeling is quantified. The gain in consumer surplus is calculated as the difference between consumer surpluses under ecolabeling and original equilibrium in the absence of other policies. Estimations of changes in consumer surplus under the existence of Pigouvian tax and changes in society welfare in producing country will be left out due to unavailability of information on these matters.

Chapter V

QUANTIFYING ECOLABELED MARKET SEGMENT AND CHANGES IN CONSUMER SURPLUS

Introduction

The empirical analysis employs a simple spreadsheet simulation to examine the effects of the introduction of timber ecolabeling on market equilibrium and consumer surplus in the consuming country. In this chapter we quantify demand in the conventional and ecolabeled wood product markets, as well as the changes in the consumer surplus if consumers purchase the ecolabeled instead of conventional product at any particular level of quantity demanded. The imported plywood in the U.S. intermediate input is chosen as a case study. Section 5.1 covers the demand function for imported plywood based on previous studies on the U.S. hardwood markets. Section 5.2 discusses the procedures for estimating demand function, ecolabeled market segment and the changes in consumer surplus. Section 5.3 describes the results of the quantification of demand and changes in consumer surplus.

5. 1 Characteristics of the Demand Functions

With reference to the empirical studies by GOI-MOF/FAO (1991), Luppold (1982) and Suprapto (1995), demand function for the plywood takes the form of constant elasticity demand which is

$$q = Ap^{-\alpha} \quad \text{..... (1)}$$

where q = quantity of wood demanded, A = constant, α = price elasticity of demand. Assume that the market is competitive and price elasticities of demand are the same for both conventional and ecolabeled woods.

Based on this set up, the demand functions for ecolabeled and conventional products can be characterized further as follows:

(1) Demand schedule for ecolabeled wood will always be above demand schedule for conventional wood.

This can be shown by rearranging the demand function to become $A = q / (p^{-\alpha})$. Then, for each product category we have

$$A_e = q_e / (p_e)^{-\alpha} \quad \text{for ecolabeled wood ..... (2)}$$

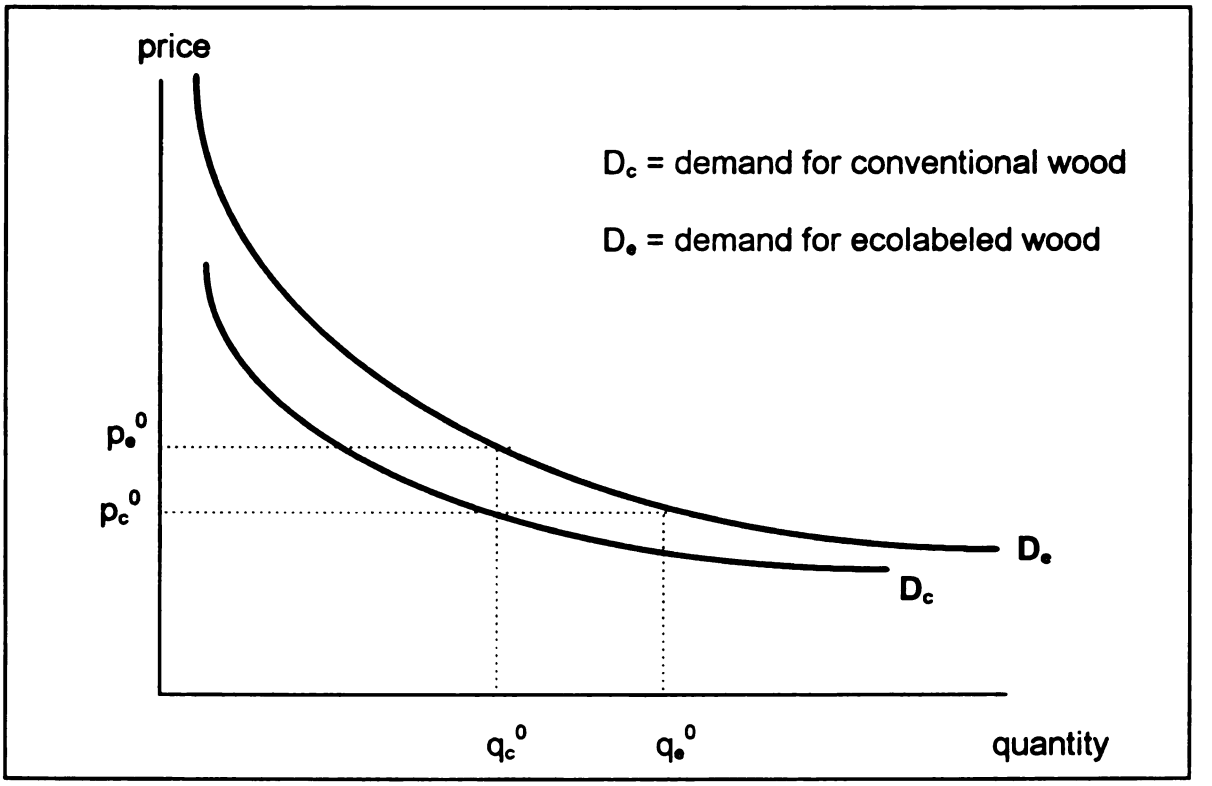
and $$A_c = q_c / (p_c)^{-\alpha} \quad \text{for conventional wood..... (3)}$$

Using Figure 5.1 we could evaluate A_e and A_c either at the same level of quantity demanded (i.e., q_c^0) or the same price level (i.e., p_c^0). Evaluated at q_c^0, we get $q_c^0 / (p_c^0)^{-\alpha} = A_c < A_e = q_c^0 / (p_e^0)^{-\alpha}$ ..... (4)

because $p_e > p_c$ and $a > 0$. If evaluated at p_c^0, we get

$$q_c^0 / (p_c^0)^{-\alpha} = A_c < A_e = q_e^0 / (p_c^0)^{-\alpha} \quad \text{..... (5)}$$

Figure 5.1.
Evaluating D_e and D_c at the Same Price or Quantity Demanded



These relations consistently show that A_e is always greater than A_c. This further implies that D_e schedule is always situated above and to the right of D_c schedule.

(2) The distance between the two demand schedules increases with price level, but decreases with quantity demanded.

From the 'intercepts' of the demand functions,

$$\frac{A_e}{A_c} = \left[q_e^0/(p_e^0)^{-\alpha}\right] \Big/ \left[q_c^0/(p_c^0)^{-\alpha}\right]$$

evaluated at $q_e^0 = q_c^0$, this expression gives us

$$\frac{A_e}{A_c} = (p_c)^{-\alpha} \Big/ (p_e)^{-\alpha}$$

$$\frac{A_e}{A_c} = \left(p_e / p_c\right)^{\alpha} \quad \text{.....(6)}$$

$$\frac{A_e}{A_c} = \gamma$$

$$A_e = \gamma A_c \quad \text{.....(7)}$$

Since $g > 1$ for all $a > 0$, this tells us that distance between D_e and D_c is increasing with higher price, and decreasing with higher quantity demanded. The relation reflects the intuition that the bigger the market for the ecolabeled products, the smaller the price premium that can be seized by the producers. If $w = p_e - p_c$, its curve will have a negative slope in the price-quantity diagram.

From the basic form of demand function stated in equation (1), we can state the form of inverse demand function for each product group as follows:

Inverse demand for conventional product

$$p_c = \left[q_c / A_c\right]^{-\left(\frac{1}{\alpha}\right)} \quad \text{.....(8)}$$

Inverse demand for ecolabeled product

$$p_e = \left[q_e / A_e\right]^{-\left(\frac{1}{\alpha}\right)} \quad \text{.....(9)}$$

Using (7) we can substitute γA_c for A_e, and get the expression

$$p_e = \left[q_e / (\gamma A_c\right]^{-\left(\frac{1}{\alpha}\right)} \quad \text{.....(10)}$$

Evaluating this expression at $q_e = q_c$ and substituting further we get

$$p_e = \left[\frac{q_c}{\gamma A_c}\right]^{-\left(\frac{1}{\alpha}\right)} = \left[\frac{1}{\gamma}\right]^{-\left(\frac{1}{\alpha}\right)}\left[\frac{q_c}{A_c}\right]^{-\left(\frac{1}{\alpha}\right)} = \left[\frac{1}{\gamma}\right]^{-\left(\frac{1}{\alpha}\right)}[p_c]$$

$$p_e = [\gamma]^{[1/\alpha]}[p_c] \quad \ldots\ldots (11)$$

Since $g > 1$ and $a > 0$, we have $p_e > p_c$. That is, the price of ecolabeled wood is consistently higher than the conventional one.

Using these notations, the equilibrium points in the wood market for ecolabeled wood can be expressed as:

$$p_e = \left[q_e^0 / \gamma A_c\right]^{-\frac{1}{\alpha}} = c_e \quad \ldots\ldots (12)$$

where c_e is the marginal cost of producing in ecolabeled wood. Equilibrium in conventional wood market is represented by:

$$q_T(p_c) - q_e^0 = q_c(p_c) \quad \ldots\ldots (13)$$

5.2 Descriptions of Simulation Procedures

The quantification of demand and changes in consumer surplus are conducted with a reference to Figure 4.3 of chapter IV that describe the effects of the introduction of the ecolabeled products on the market equilibrium. This exercise uses the U.S. imported plywood market as a case. First, we estimate the demand function conventional product. Current equilibrium price and 99% of total quantity in the imported plywood market in the U.S. are the bases of this

estimation. Next, the demand function for ecolabeled is estimated based on the 4.7% average premium currently charged (Stevens, Ahmad and Ruddell 1997), and 1% estimated size of the current segment in the U.S. intermediate certified wood market[1]. Then, calculations of the quantity demanded of ecolabeled products, its market share, as well as the changes in consumer surplus are based on these estimated demand functions.

As discusses previously, the demand functions to be estimated have the form $q = Ap^{-\alpha}$ where q is quantity demanded, A is a constant, p is the price and α represents the price elasticity of demand which takes the value of 0.6 throughout this exercise. The statistics used for demand function estimations is the average price and quantity of U.S. imported plywood during 1992-96 period. These averages are calculated based on the ITTO market data (ITTO 1997). Ninety-nine percent of current quantity of 1,547,000 cubic meter plywood annually imported into the U.S. and sold at $689.34 per cubic meter in the wholesale market are taken as starting equilibrium point in the conventional market. This equilibrium point corresponds to point T in Figure 4.3. Based on this information we calculate the value of constant A_c for the conventional plywood demand function. Hence, we get the demand function for conventional market.

[1] 1% is the estimated size of the existing ecolabeled segment in the U.S. market for intermediate wood products. This estimate is based on interviews with major wood product importers on the West Coast during the 1996-97 MSU Department of Forestry Survey of Wood Product Sertification (Stevens, Ahmad and Ruddell 1997).

Next, we calculate the dollar value of premium for ecolabeled plywood using the 4.7% average premium currently charged in the U.S. intermediate certified wood input market. Based on this premium value and quantity demanded that represents 1% of the total demand in the imported plywood market, we calculate the value A_e for the ecolabeled demand function. Now, we have all components of demand function for ecolabeled wood. To illustrate the demand functions in graphical form, several hypothetical points in the neighborhood of existing equilibrium quantity are applied to the demand functions.

To calculate quantity demanded in the ecolabeled market segment, several values of price premiums in the 3% - 20% range above the price of conventional products are applied. Then, based on the quantity demanded at each level of price premium, the share of the ecolabeled segment in the total market is calculated. The researcher focuses on price premium in the range of 3% -20% to reflect the current situation in the U.S. intermediate input market for certified wood[2] (Stevens, Ahmad and Ruddell 1997).

To calculate the changes in consumer surplus we take the difference between the area under the two demand curves, each defined by the following integral value:

$$Consumer\ Surplus = \int_0^{Q} [q / A]^{-(1/\alpha)}\, dq \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (14)$$

[2] The MSU Forestry Department Survey found the majority of premium charged and paid in the intermediate wood input market for certified products are within 3%-20% range. No companies in the sample charges or pays more than 20%.

However, since the value of consumer surplus can not be defined at q=0, we use a *lower bound* in the quantity from which we can measure the value of the integral. The size of consumer surplus between q=0 and q_L= X (L for lower bound, X for the quantity) is proxied as X times the value of integral between X and X+1. The lower bound of quantity chosen for this exercise is the quantity demanded where price in the ecolabeled segment is twice as the price as in the conventional segment[3]. Point E^2 in figure 4.3 resembles this situation. At that point $p_e^2 = 2\ p_c^0$.

5.3.3 Results of Simulations

5.3.4 Demand Functions

Based on the approach explained in subsection 5.2 we can specify the demand for plywood in the conventional market as:

$$q_c = 77{,}301\ (p_c)^{-0.6} \quad \ldots\ldots (15)$$

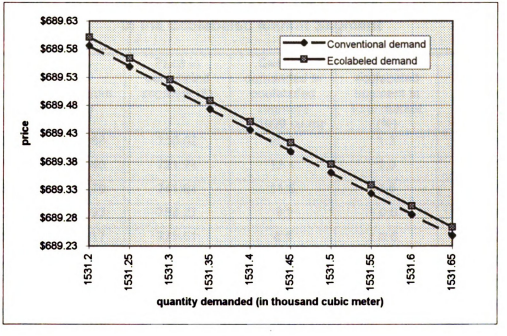
and in the ecolabeled market segment as

$$q_e = 77{,}302\ (p_e)^{-0.6} \quad \ldots\ldots (16)$$

Figure 5.2 illustrates some points on the demand curves based on these two demand functions. The figure provides exposure only to a small range of quantity in the whole demand curves. The quantities depicted are points in the neighborhood of current equilibrium quantity in the conventional imported plywood market. Due to exposure within this small range, the demand curves

look like they are linear rather than like the ones that represent constant elasticity demand functions. The range depicted falls within the range of total quantity imported into the U.S. in the nineties which is between 1,300 to 1,650 thousand cubic meter per year.

Figure 5.2.
Conventional and Ecolabeled Plywood Demand Schedules



5.3.2 Ecolabeled Product Segment: Quantity Demanded and Market Share

To find several points of quantity demanded in the ecolabeled segment and its share, we apply some price premiums in the range of 3% - 20% above the conventional product price to the estimated demand functions. The percentage premium is converted into dollar value. Then we find a quantity that

[3] Please note that premium is always defined with reference to the price in the conventional market segment at original equilibrium. Hence, $p_e = 2p_c^0$ does NOT refer to the point where the price in ecolabeled demand curve is twice as high as the price in conventional demand curve.

corresponds to points, one on conventional demand curve, one on ecolabeled demand curve, where the vertical distance between the two points equals the dollar amount of the premium. Table 5.1 presents the results of this calculation. The table also contains the estimates of the changes in consumer surplus for each level of price premium that will be discussed in the next subsection.

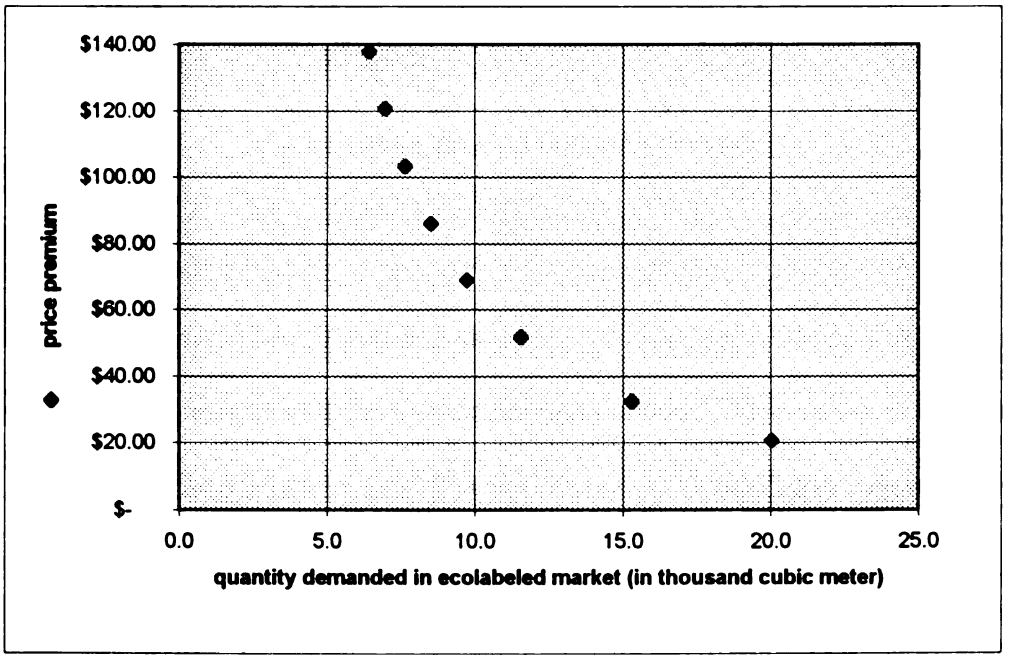
Table 5.1.
Price Premium, Market Share and Gain in Consumer Surplus in the Ecolabeled Market Segment

% Premium	Premium ($)	Price in ecolabeled segment ($)	Quantity demanded in ecolabeled segment (x 1000 cu.m)	Proportion of ecolabeled segment in total market (%)	Gain in Consumer Surplus (x $1,000)
3.0%	20.68	710.02	20.1	1.3	2,864
4.7%	32.40	721.74	15.4	1.0	2,660
7.5%	51.70	741.04	11.6	0.8	2,406
10.0%	68.93	758.27	9.7	0.6	2,224
12.5%	86.17	775.51	8.5	0.6	2,067
15.0%	103.40	792.74	7.6	0.5	1,929
17.5%	120.63	809.97	7.0	0.5	1,803
20.0%	137.87	827.21	6.4	0.4	1,688

The 4.7% price premium in the table represents the average premium currently charged by sellers of ecolabeled wood products in the U.S. intermediate wood input market, which is one of the results found in the MSU Forestry Department Survey. This existing level of premium, if applied in the imported plywood market, corresponds to 15.4 thousand cubic meter demand for ecolabeled product. This quantity accounts for 1% of total demand for plywood in the market.

Figure 5.3 illustrates the relationship between the price premium and the demand for the ecolabeled product. The higher the premium above the conventional product price, the lower is the demand for the ecolabeled product. In line with this observation, the size of the ecolabeled segment in the total market will also decline as the premium above the conventional product price increases (Figure 5.4).

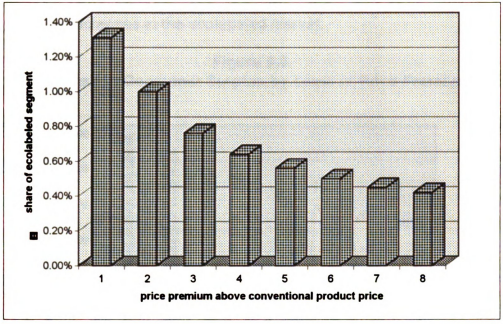
Figure 5.3.
Premium and Quantity in Ecolabeled Market Segment



5.3.3 Gain in Consumer Surplus

As explained in Section 5.2, the quantity that corresponds to the point where $p_e = 2p_c^0$ on the demand curves is chosen as a lower bound from which part of the value of consumer surplus can be measured as the area under the demand curve between that point and the market equilibrium quantity. Based on

Figure 5.4.
Price Premium and Market Share of Ecolabeled Product

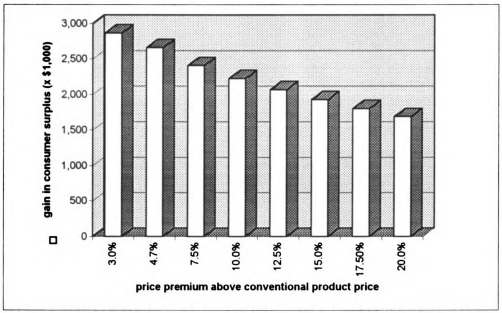


the estimated demand functions, the quantity that corresponds to the point where $p_e = 2p_c^0$ is found at 2 (in thousand cubic meter). The value of consumer surplus between zero quantity and 2 is estimated as 2 times the value of the integral in equation (14) between q=2 and q=3.

Using this approach, the value of consumer surplus is calculated for each quantity point that corresponds to each level of hypothetical price premium listed in table 5.1. These quantities are used to calculate the consumer surpluses for each demand function. The difference between the value of consumer surplus under ecolabeled and conventional demand function is the increase in the consumer surplus if at each particular level of quantity, consumers are buying ecolabeled instead of conventional wood product. The results of these

calculations are presented in Figure 5.5 and the last column of Table 5.1. The figure intuitively illustrates that the gain in consumer surplus decreases as the price premium increases in the ecolabeled market.

Figure 5.5.
Increase in Consumer Surplus by Level of Price Premium



The gains in consumer surplus when the market share is small (i.e., when the premium is high) are higher than when market share is high (i.e., when the premium is small). For instance, the difference between consumer surplus gain when market share is 1.3% (= when premium is 3%) and when market share is 1% (=when premium is 4.7%), is about $ 204 thousand. This is smaller compared to consumer gains between when the market share is 0.45% (at 17.5% price premium) and when it is 0.42% (=when premium is 20%), which is about $ 535 thousand. This differences in the gains in consumer surplus

suggests that consumers who purchase ecolabeled wood at high price premium (when the share of ecolabeled segment is small) are willing to do that because they enjoy a significant increase in their consumer surplus that can be attributed to the increased utility from knowing that they are consuming the environmentally friendly product.

Chapter VI

VIABILITY OF TIMBER CERTIFICATION AND ECOLABELING FOR INDONESIA'S FOREST CONCESSIONAIRES

Introduction

The objective of this chapter is to evaluate the prospective profitability for Indonesia's forest concessionaire to adopt timber certification and ecolabeling given the existence of ecolabeled market segment in the importing countries such as the United States.

In this chapter, the prospects for adopting timber certification is analyzed using an approach that combines investment analysis and comparative break-even methods. Break-even net present value analyses is conducted for national and regional data of Indonesia's forest concessions to answer the following question: *given the concessionaires' cost structure and timber yield as well as the level of premium in the plywood market, what is the minimum proportion of the timber logs from the concessions that must receive price premium in order to be break-even if the concessionaires adopt timber certification and ecolabeling?* The wood origins considered in this exercise represent Indonesia's permanent production forests in the low land area (i.e., area with altitude 1000 meter or lower above the sea level), excluding the swamp and mangrove forests.

Section 6.1 provides a summary of the break-even NPV method. In section 6.2, after the baseline break-even analyses, some sensitivity analyses with respect to changes in the silviculture cost, as well as with respect to changes in price premium, are presented. At the end of this chapter we discuss the results of this company-level prospective analyses.

6.1 Break-Even Net Present Value Method

Evaluation of the concessionaires' prospects to adopt timber certification and ecolabeling is conducted using the combined approach of investment analysis and break-even analysis. The approach involves investment analysis because the benefits of switching from conventional to sustainable logging practice materializes over many years after the decision is made. Standard investment analysis is done by projecting future cash flow of costs and revenues due to undertaking the new investment. Net present value (NPV) is the most common measure used in investment analysis.[1]

Break-even net present value method is a special case of NPV analysis. The evaluation of the concessionaires' prospects involves comparative break-even method (which is commonly used for one period cost-benefit

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[1] The equation below illustrates how to compute the NPV of an investment by summing up net cash flows that vary from the time of the investment (year 0) until the end of the investor's planning horizon (in year T).

$$NPV_T = (R_0 - C_0) + (1+r)^{-1}(R_1 - C_1) + \ldots\ldots\ldots\ldots\ldots\ldots + (1+r)^{-T}(R_T - C_T)$$

R_t represents revenue cash flows while C_t represents cost flows that vary due to the investment. The term $(1+r)^{-t}$ represents discount rate which is based on interest rate r.

analysis, which is also known as partial budget analyses), because we are comparing the returns (in our case: the NPV of benefits) of two mutually exclusive alternative business decisions (Hilker, Black and Hesterman 1987). Break-even situation is achieved when the NPV under the new sustainable regime is the same as the NPV under the conventional practice.

In the break-even NPV analyses we are comparing the basic benefits of the two alternative logging and forest management regimes. The basic benefits of sustainable practice over the conventional one are: (1) the sustainable yield, which is simply defined as the amount of timber recovered in the second harvest cycle is the same as in the first one; and (2) the price premium that can be enjoyed in the ecolabeled market.

Any other benefits of regime switching, such as possible higher timber recovery, would be an extra advantage that will improve the profitability of the sustainable regime. However, these extra benefits will be left out from the NPV calculations because the purpose of the comparative break-even analysis is to provide the bottom line comparison, i.e., to find the minimum requirements of the new regime that will make its NPV the same as that of the old one.

6.2 Data Used in Break-Even Net Present Value Analyses

6.2.1 Physical Timber Yield

Two sets of information were used for timber yield data. The first set of information was adopted from the data set in the model of Indonesian Forest

Management (INFORMAN) originally developed by a World Bank team (The World Bank 1994). This model provides a way to simulate the quantitative benefits of changes in the forest management regime in Indonesia. The second set of information comes from the report titled "National Forest Inventory of Indonesia: Final Forest Statistics Report" (GOI-MOF/ Dirjen INTAG 1996)[2]. This report will be referred to as INTAG report in this chapter. The INFORMAN data differs from INTAG data set in the estimates of the timber stock in the forest. The two data sets represent a more optimistic view and a more pessimistic view of the timber yield and could be interpreted as a plausible range of yield scenarios. Table 6.1 summarizes the information about the average stock of timber per hectare in the forest and the potential amount that can be harvested for logs within the two data sets.

Table 6.1.
Volume of Stocks and Potential Harvests of Timber, National Average (in cubic meter per hectare)

DESCRIPTION	INFORMAN DATA		INTAG DATA	
	Unlogged Area	Logged-over Area	Unlogged Area	Logged-over Area
Stock of timber, all species, >=20 cm diameter at breast height	286	201	152	107
Stock of commercial species	212	149	62	57
Stock of commercial size	85	60	41	36
Potential volume recovered:				
- at the first harvest	55	39	26	23
- at the second harvest	39	27	23	21

Source: The World Bank (1994); GOI-MOF/Dirjen INTAG (1996)

[2] Both these data sets, the one used in INFORMAN model and the one produced by the GOI-MOF/Dirjen. INTAG, do not have any relationship with the emergence of ecolabeling issue in Indonesia. The INFORMAN model, which is hardly known by Indonesian forestry circle, is simply a tool of analysis in the World Bank's 1994 report (which is not yet made public as of August 1997). The INTAG data set was produced as an output of the first ever national forest inventory project that was administered by Dirjen INTAG. The latter stands for Direktorat Jenderal Inventori dan Tata Guna Hutan that translates into *'Directorate General of Forest Inventory and Land Use Planning'*, a unit within the Indonesia's Ministry of Forestry.

Taking the INFORMAN and INTAG data sets as two different basic scenarios, comparison can be made across the empirical results generated from them. Within the INTAG data set, comparisons can also be made among major timber producing regions by island group. Breakdown of stock and yield data by island group is available only for the unlogged area. Hence, no comparison with the logged-over area can be done on an island by island basis. Table 6.2 summarizes the stock and yield data in five major timber producing islands in Indonesia. Kalimantan (Borneo) appears to be the most productive forest area in Indonesia. The logged-over area refers to the area that has been harvested within a concession area. The area is still under the concessionaire's control and should be ready for the second harvest 35 years after the first one provided that the concession license is renewed at the end of the first 20 year licensing period.

Table 6.2.
Volume of Stocks and Potential Harvests of Timber from Unlogged Area, Regional Average (in cubic meter per hectare)

DESCRIPTION	Sumatera	Kalimantan	Sulawesi	Maluku	Irian Jaya
Stock of timber, all species, >=20 cm diameter at breast height	151	164	178	229	135
Stock of commercial species	74	95	39	71	21
Stock of commercial size	49	64	22	42	13
Potential volume recovered:					
- at the first harvest	32	41	14	27	9
- at the second harvest	23	25	12	24	7

Source: GOI-MOF/Dirjen INTAG (1996)

6.2.2 Market and Financial Information

Table 6.3 presents a summary of prices and costs that are used as parameters in the break-even analysis. In the baseline analysis, these values are taken as given when calculating the minimum percentage of sales of ecolabeled logs that must receive a price premium to generate the break-even NPV from the sustainable production process. Subsequently, in the sensitivity analysis, the researcher use several alternative values of the silviculture cost to evaluate its effects on the required minimum percentage of sales that must receive price premium in the ecolabeled market segment.

Table 6.3.
Price and Cost Parameters Used in Break-Even Analysis

PARAMETERS	VALUE
Domestic price of logs per cubic meter	$ 100.00
Logging cost per cubic meter logs	$ 45.00
Timber royalty per cubic meter logs	$ 22.00
Silviculture cost per hectare per year (for 10 years after logging)	$ 5.00
Certification and audit cost per year	$ 0.40
Price of plywood in the US intermediate wood input market (per cubic meter)	$ 689.34
Premium received by ecolabeled plywood per cubic meter in US market[1]	$ 32.40
Premium transmitted back to the log price at concession (per cubic meter)[2]	$ 4.67

[1] Estimated using 4.7% average premium found in MSU Forestry Department Survey of the US intermediate wood market.
[2] Estimated using 14.4% proportion of 1 cubic meter logs in the U.S. wholesale plywood price.
Source: The World Bank (1994); Djalin (1996); Stevens, Ahmad and Ruddell (1997); ITTO (1997)

Prices of timber logs in Indonesia and plywood in the US intermediate wood market are crucial price information in the NPV calculations. The price of plywood in the US intermediate input market is linked to the price of logs in Indonesia by the proportion of cost of purchased logs in the cost of good sold of

the product at every stage of production and distribution. In Indonesia's case, the channel from the wood origin to the market is relatively short due to vertical integration in the wood industry. Companies that own the forest concession also own the plymills. The plymills export their products directly to importers in foreign countries.

The information on the cost structure of Indonesia's plywood industry comes from the study done by Djalin (1996). This study found that the cost of logs accounts for 44% of plywood export price from Indonesia. In the US, due to the wholesale nature of purchasing in the intermediate input markets, assume that the plywood only goes through one more wholesaler before it reaches the users. Based on the MSU Forestry Department Survey of intermediate wood product market, the proportion of Indonesia's export price in the US wholesale price is about 65%. Based on these two ratios, and the conversion factor that 2 cubic meter logs is needed to make 1 cubic meter of plywood, the proportion of log cost in the US wholesale price is estimated to be 14.4%. This is the percentage used for calculating the amount of dollar premium per cubic meter logs that can be transferred back from the U.S. plywood market to Indonesia's forest concessionaires.

Throughout the simulations, the cost of logging per cubic meter log is $45 per cubic meter log produced. Another volume-based cost that the concessionaires need to pay is the $22 timber royalty.

In the baseline break-even NPV analysis, the costs of adopting sustainable production process are taken as the same across all concessions.

Later, we will do sensitivity analyses with respect to these cost differences in order to account for the current status of sustainability (the extent to which logging had caused damages to the standing tree) which is the result of logging and the management practices in the past. The cost of adopting the timber certification/ecolabeling program comes from:

(1) The cost incurred as consequences of adopting the sustainable production process. This process includes:

a. the use of better logging techniques and control

b. increased silviculture (doing replanting as necessary)

c. tending to the standing trees in post-logging period.

Silviculture and tending for sustainable forest management practice is required during the 10-year period after logging (The World Bank 1994). An estimate which is based on evaluation of a typical forest concession in Indonesia, suggests that the extra cost for using sustainable production process is about $5 per hectare per year[3].

(2) The costs of certification, re-certification every 5 years and annual auditing. Based on the data provided by an evaluator on a typical concession in Indonesia, the total certification and auditing costs will be $0.40 per hectare per year throughout the 35-year period covered in the analysis[4].

In the NPV calculations, a 14% interest rate is applied to represent the rate at which Indonesian entrepreneurs are accustomed to in discounting future

[3] Due to proprietary nature of this information, and by agreement with the provider, the data source can not be disclosed.

[4] Data is provided by the same source as in footnote 3.

benefits. This rate is used because the costs and benefits are denominated in US dollar. With 6% average annual depreciation rate for the Rupiah (Indonesian currency), the 14% interest rate for US dollar is equivalent to 20% interest rate for Rupiah, which is the rate commonly used to evaluate private investment denominated in local currency.

6.3 Results of the Break-Even Net Present Value Analyses

In Subsection 6.3.1 we first analyze the baseline break-even requirements applied to both data sets for the national average. Then the results generated from INTAG's data set for unlogged area of five island groups is presented.

Subsections 6.3.2 presents sensitivity of break-even requirements to the changes in the costs of conducting better logging and silviculture efforts as required under timber certification and ecolabeling.

6.3.1 Baseline Break-Even Net Present Value Results

This section is aiming at answering the following question: given the cost and price parameters values stated in Table 6.3 and the timber yield provided in Tables 6.1 and 6.2, *what is the proportion of logs produced under sustainable practice that must be sold in ecolabeled market segment in order to generate the same NPV as generated by the conventional practice ? The break-even proportion of sales in ecolabeled market segment* are computed on per hectare basis. This break-even proportion is also referred to as *the required minimum*

proportion of sales in ecolabeled market' or *the minimum proportion of sales that must receive price premium.*

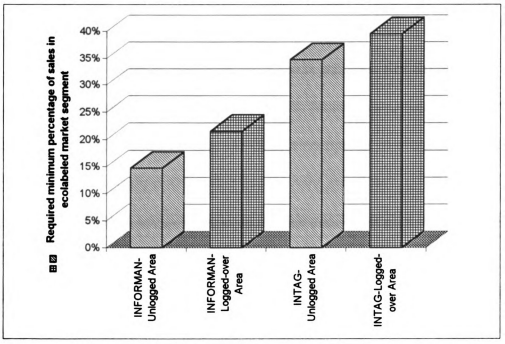
The premium that may be received on top of the regular plywood price in the intermediate input market is assumed to be transmitted back to the concessionaire in prorated fashion based on 14.4% proportion of log cost in the U.S. plywood wholesale price. Using 4.7% average premium charged for certified wood products in the US intermediate wood input market, the premium of ecolabeled plywood is estimated at $32.40 per cubic meter. Based on discussion in Section 6.2.2, the amount of premium that can be received by forest concessionaires is $4.67 per cubic mete logs, or 14.4% of the $32.40 premium in per cubic meter plywood in the U.S. market..

Figure 6.1 illustrates the comparison of the required minimum percentages of sales in ecolabeled market in order to break-even if the concessionaire adopts the timber certification and ecolabeling. Comparisons are provided between the results from unlogged and logged over forest area within as well as across each of the INFORMAN and INTAG data sets. These comparisons are based on national average yields from each data set.

The comparison suggests that, given the yield suggested by INFORMAN data set, the concessionaire has a strong incentive to use sustainable practice rather than the current practice. This is true whether the concessionaire is operating on previously unlogged or on logged-over areas because the proportion of sales that must receive the price premium is relatively small. If the timber is harvested from the unlogged area, the certified concessionaire only

needs to sell 14.7% of its logs in the ecolabeled wood market. If the timber is harvested from the logged-over area which has lower yield, the required minimum percentage of sales that must be sold in ecolabeled market is 21.5%. The INTAG data show that there is still incentive to switch into sustainable practice under baseline values of the experimental variables. However, the advantage is much less significant compared to INFORMAN-based estimate. Under INTAG yield scenarios, for the unlogged forest area, the proportion of timber that needs to be sold in ecolabeled market is 34.7% while for the logged-over area, the proportion is close to 40%.

Figure 6.1.
Break-Even Proportion of Sales in Ecolabeled Market, National Average



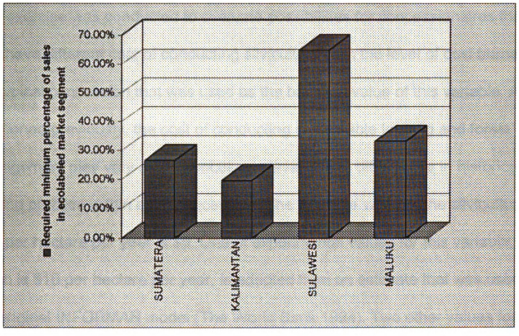
In these baseline results, over all, INFORMAN data set produces a more optimistic picture than INTAG data set does on the prospects of using sustainable management as an alternative for the current (unsustainable) practice. The difference is caused by higher estimate of timber stocks and yield potentials in the INFORMAN data set than that in INTAG's.

Figure 6.2 displays the required minimum percentage of sales in the ecolabeled market by island groups for unlogged area which are based on yield estimates from the INTAG data set. Sumatera and Kalimantan show profitable prospects for switching from conventional to sustainable logging and forest management practice. Kalimantan, which currently produces about 60% of timber in the country, appears to be the most prospective region to adopt timber certification and ecolabeling. This region requires only 19.8% of its timber from unlogged forest area to be sold in ecolabeled market in order to break-even when switching into using sustainable production process. For Sumatera, the break-even proportion of sales would be 26.9%. Maluku requires more than one-third of its timber production be sold in ecolabeled market in order to be able to adopt sustainable logging and forest management practice.

At the lower end, concessionaires in Sulawesi have little incentive to switch because this region requires 65% break-even proportion of sales in ecolabeled market segment. Concessionaires operating in Irian Jaya do not have any incentive to switch into using the sustainable production process. At its level of productivity and a $5 annual silviculture cost per hectare, the NPV generated under sustainable practice is smaller than that under conventional

even if all timber produced in this region is sold in ecolabeled market and getting the price premium.

Figure 6.2.
Break-Even Proportion of Sales in Ecolabeled Market, Major Producing Regions



Analyses in this section clearly suggests that productivity of forest area determines the viability of the adoption of timber certification and ecolabeling among Indonesia's forest concessionaires. The higher the yield of the forest land, the smaller the required proportion of sales in the ecolabeled market segment in order to break even when switching from conventional logging and forest management practice to using sustainable process.

6.3.2 Effects of the Changes in the Silviculture Cost on Break-Even Sales Proportion Requirement

This section includes an analysis of sensitivity of the break-even proportion of sales in ecolabeled market toward the changes in silviculture costs. This exercise was conducted to evaluate possibilities for concessionaires that may have different cost of conducting silviculture than the level of cost borne by the typical concession that was used as the baseline value of this variable. As mentioned previously, the cost of conducting sustainable logging and forest management may vary at the concession level due to differences in historical logging practice within each concession. The baseline value of the silviculture cost per hectare per year is $5. One of experimental values for this variable, which is $10 per hectare per year, is adopted from an estimate that was used in the original INFORMAN model (The World Bank 1994). Two other values for the silviculture cost in the exercise are $2.50 and $7.50 per hectare per year. All the silviculture costs apply only for the first ten years after logging is conducted. The effects of the changes in silviculture cost are presented in Table 6.4 and Figures 6.3 and 6.4.

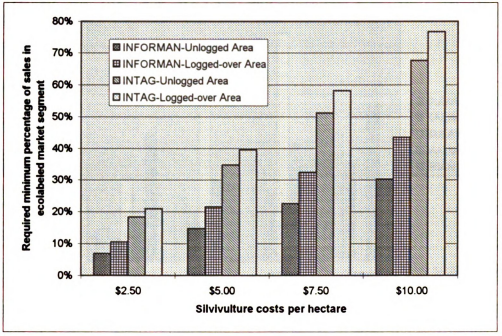
Table 6.4.
Break-Even Proportion of Sales in Ecolabeled Market under Various Silviculture Cost Scenarios

YIELD SCENARIOS	ANNUAL SILVICULTURE COST PER HECTARE			
	$ 2.50	$ 5.00 (baseline)	$ 7.50	$ 10.00
INFORMAN - unlogged area	6.9%	14.7%	22.5%	30.28%
INFORMAN - logged-over area	10.5%	21.5%	32.5%	43.4%
INTAG - unlogged area	18.3%	34.7%	51.2%	67.6%
INTAG - logged-over area	20.9%	39.6%	58.1%	76.7%
UNLOGGED AREA OF:				
Sumatera	13.5%	26.9%	40.2%	53.6%
Kalimantan	9.3%	19.8%	30.2%	40.6%
Sulawesi	34.4%	65.0%	95.5%	negative return
Maluku	17.6%	33.4%	49.3%	65.1%
Irian Jaya	53.5%	negative return	negative return	negative return

Figure 6.3 and the upper portion of Table 6.4, show comparisons of the break-even proportion of sales in an ecolabeled market based national average yield scenarios for each value of experimental silviculture cost. If the annual silviculture cost is $2.50 per hectare, then all forest areas that produce within the range of yields represented by INFORMAN and INTAG data sets become prospective areas to adopt timber certification and ecolabeling. The break-even proportions of sales in ecolabeled market segment range from 6.9% to 20.9%. The upper limit of this range is the proportion required by the most pessimistic yield scenario represented by INTAG Logged-over area.

As the annual silviculture cost rises above $5.00 per hectare, the prospects of adopting timber certification and ecolabeling decline for concession areas whose yield is represented by INTAG data set. Even the more productive

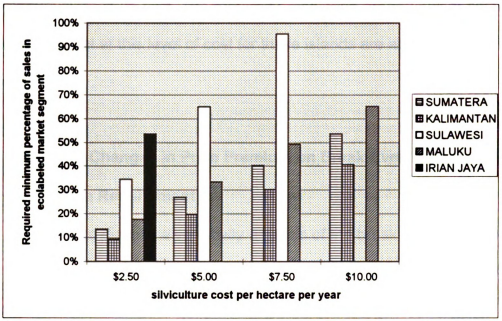
Figure 6.3.
Break-Even Proportion of Sales in Ecolabeled Market at Various Level of Annual Silviculture Cost, National Average



unlogged forest area in INTAG yield scenario requires 51.2% break-even proportion of sales in ecolabeled market. Using the yield in INTAG data set, at $10.00 annual silviculture cost, the concessionaires would have to sell more than two-thirds of their logs in the ecolabeled market in order to break-even.

Figure 6.4 and lower portion of Table 6.4 provide comparisons of required minimum percentage sales in ecolabeled market across major island group. The breakdown by island group only covers unlogged area from INTAG data base.

Figure 6.4.
Break-Even Proportion of Sales in Ecolabeled Market at Various Level of Annual Silviculture Cost by Region



At $ 2.50 annual silviculture cost per hectare, sustainable logging and forest management can be a viable option for most of the regions. Concessionaires in Irian Jaya, who cannot participate in timber certification and ecolabeling if the silviculture cost is $ 5.00 or higher, will be able to participate at $ 2.50 silviculture cost if they can sell 53.5% of their logs in ecolabeled segment. For concessionaires in Sulawesi, the break-even proportion of sales at $2.50 silviculture cost is 34.4%. At $7.50 silviculture cost, these concessionaires would have to sell more than 95% of their products in ecolabeled market in order to be profitably able to adopt timber certification and ecolabeling.

As the most productive region, Kalimantan seem able to absorb the annual silviculture cost up to $10.00 per hectare. At this level of cost, the

required break-even proportion for concessionaires on this island is about two-fifths. Concessionaires in Sumatera and Maluku can probably absorb up to $7.50 annual silviculture cost. The required break-even proportions of sales in ecolabeled market at this level of cost for these islands are about 40% and 50% respectively.

6.3.3 Effects of Changes in Price Premium on Break-Even Sales Proportion Requirement

This section discuss a sensitivity analysis of the break-even proportion of sales in ecolabeled market with respect to the changes in price premium in the U.S. intermediate wood market. The baseline value of the price premium in this analysis is 4.7%, which is the average premium found through the MSU Forestry Department Survey of the U.S. intermediate wood input market (Stevens, Ahmad and Ruddell 1997). When calculating the break-even sales proportion in ecolabeled market segment, the value of annual silviculture cost is kept constant at $5 per hectare. Results of the simulations are presented in Table 6.5 and Figures 6.5 and 6.6.

Figure 6.5 and the upper portion of Table 6.5, show comparisons of the break-even proportion of sales in an ecolabeled market based national average yield scenarios for each value of price premium in the U.S intermediate wood input market. At 3% price premium in the plywood market, the concessionaires would have sell high proportion of their timber production in the ecolabeled

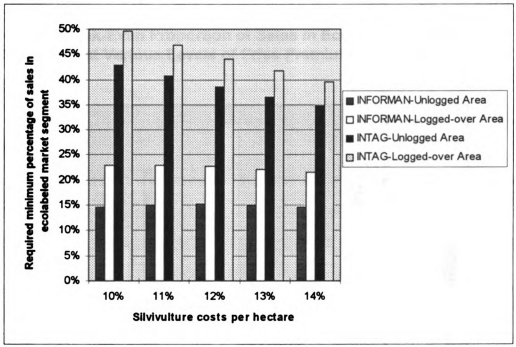
Table 6.5.
Break-Even Proportion of Sales in Ecolabeled Market under Various Price Premium Scenarios

	PRICE PREMIUM SCENARIOS			
Premium in plywood market	3%	4.7% (baseline)	10%	15%
Plywood premium in $	$20.68	$32.40	$68.93	$103.40
Premium received by concessionaire	$2.98	$4.67	$9.93	$14.89
YIELD SCENARIOS				
INFORMAN - unlogged area	23.1%	14.7%	6.9%	4.7%
INFORMAN - logged-over area	33.7%	21.5%	10.1%	6.8%
INTAG - unlogged area	54.5%	34.7%	16.4%	10.9%
INTAG - logged-over area	62.0%	39.6%	18.6%	12.4%
UNLOGGED AREA OF:				
Sumatera	42.2%	26.9%	12.7%	8.5%
Kalimantan	31.0%	19.8%	9.3%	6.2%
Sulawesi	negative return	65.0%	30.6%	20.5%
Maluku	52.5%	33.4%	15.8%	10.5%
Irian Jaya	negative return	negative return	47.6%	31.7%

segment in order to be break-even when adopting timber certification and ecolabeling. The most optimistic yield estimate in the INFORMAN data set requires about 23% of the concession output to be sold at that price premium in order to break-even. Simulation based on INTAG's logged-over area data requires more than 60% of the timber that need to be sold in ecolabeled segment. The break-even proportions of sales decrease significantly rapidly as the price premium rise above 5%. At 10% price premium, for instance, the most pessimistic yield estimate requires that only less than one-fifth of the logs produced that need to receive that level of premium.

Figure 6.6 and lower portion of table 6.5 present comparisons of required minimum percentage sales in ecolabeled markets across major island group. This regional comparison includes only unlogged-area of the production forest.

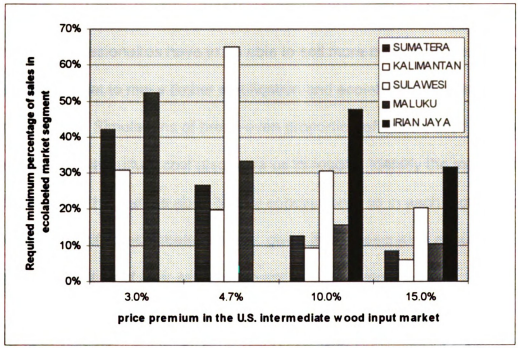
Figure 6.5
Break-Even Proportion of Sales in Ecolabeled Market at Various Levels of Price Premium, National Average



The exhibits show that at 3% premium rate, Sulawesi and Irian Jaya will not be able to participate in ecolabeled timber market. Maluku, Sumatera and Kalimantan are able to participate if they can sell 30%-53% of their products in the ecolabeled markets segment. Concessionaires in Sulawesi may be able to adopt timber certification and ecolabeling at 4.7% premium if about two-thirds of their products can receive the corresponding price premium in the market. If the premium is 10% or higher, the option of adopting timber certification and ecolabeling becomes a viable option for all concessionaires despite some regions may have high break-even proportion of sales. At 15% premium, producers in Sumatera and Kalimantan need to sell only less than 10% of their

products in the ecolabeled market in order to break-even in adopting timber certification and ecolabeling.

Figure 6.6.
Break-Even Proportion of Sales in Ecolabeled Market at Various Levels of Price Premium by Region



6.4 Discussions of the Results of Break-Even NPV Analysis

Two basic variables on the producers' side appear to have very strong effects on the required break-even proportion of sales in ecolabeled market segment in order for the concessionaire to be able to participate in timber certification and ecolabeling. The first variable is the estimate of timber yield potentials of the commercial species in the forest. Differences in the basic estimates of INFORMAN and INTAG data set illustrate the importance of these yields in determining the minimum proportion of sales that must receive price

premium in the ecolabeled market to induce concessionaires to implement sustainable logging and forest management practice.

Second, silviculture cost also turns out to be an important factor affecting the break-even proportion of sales in ecolabeled market. The higher the silviculture cost, the higher the break-even proportion of sales in the ecolabeled segment. Concessionaires have to be able to sell more of their products in the ecolabeled market to make timber certification and ecolabeling a viable business option. Simulations of break-even proportion of sales based on the changes in the silviculture cost also allow us to roughly identify the maximum level of the cost that can be absorbed by concessionaires in each region in order to become a certified/ecolabeled source, given their expectation about the maximum proportion of their sales in the ecolabeled market.

On the market side, section 6.3.3 shows the importance of the role of price premium in inducing the adoption of timber certification and ecolabeling. The required proportion of sales in ecolabeled segment decreases rapidly as the price premium goes up.

The issue of break-even proportion of sales in the ecolabeled market segment and getting premium is relevant in evaluating entrance into the ecolabeled wood product markets in the consuming countries. The situation in the US intermediate wood input market gives a mixed signal on this issue (Stevens, Ahmad and Ruddell 1997). A few forest management companies have been able to get 100% of their products recognized and receive price premium in the market. A few others say that only up to 40% of their products are

currently receiving recognition from the market. In place or in addition to the price premium, receiving recognition from the market could sometimes mean getting access to the market they were not used to be part of. This is certainly an option for the companies whose intention is to establish a share in the existing market. Another small number of certified forest land companies in the US choose not to sell all their products in the ecolabeled market – despite a strong demand and willingness to pay for certified logs -- because they are not sure that the risks of completely shifting the customers from traditional to ecolabeled market can be justified by the benefits they received from the ecolabeled market segment.

Based on the analysis in this chapter, two general policy implications can be identified. First, there emerges a possibility of selectively promoting timber certification and ecolabeling based on regional basis and forest condition. Second, if timber certification and ecolabeling is to be used to promote sustainable forest management in *all area*, the potentially large social and environmental benefits of sustainable forest management may justify some public initiative with a view to reducing the burden faced by the private forest concessionaires when practicing the sustainable logging and forest management. Both these implication will be discussed further in the concluding chapter.

Chapter VII

CONCLUSIONS

7.1 Summary of Research Issues

This research examined the potential use of ecolabeling as an alternative economic instrument to mitigate externality problems in renewable natural resource extraction. With timber certification and ecolabeling, the mitigation of externalities is achieved through the adoption of sustainable logging and forest management practice. The practice will result in sustainable yield and less damage in the forest, hence it helps maintain other economic and non-economic functions of the forest. The timber certification and ecolabeling analyzed in this study are based on the internationally negotiated Principles and Criteria of Sustainable Forest Management under the Forest Stewardship Council.

The objectives of this study were: (1) to investigate the effects of timber ecolabeling on the demand, supply and market equilibrium of tropical timber; (2) to evaluate the welfare effects of ecolabeling ; and (3) to determine condition(s) under which the ecolabeling can induce the producers to adopt ecolabeling; hence, internalize the stock externalities of the timber production.

7.2 Summary of Literature Review

The review of the literature documented that the rise of ecolabeling initiatives in general, and timber certification in particular, were induced by two situations: (1) The existence of externality problems associated with production. In the case of timber, these include both stock and non stock externalities. Reduction in timber stock in the forest is always larger than the amount of timber recovered for commercial use. This problem is unlikely to be solved with the first best economic policy instruments alone, especially in the developing countries such as Indonesia; and (2) The rise of green consumerism that has not been appropriately responded to by market institutions. With this perspective, ecolabeling initiatives emerged as an alternative to bans and boycotts which create disincentives for resource conservation and for promoting sustainability. Further, ecolabeling: (1) allows consumers to make an informed choice at the time of purchase, and to discriminate in favor of environmentally friendly products; and (2) facilitates the creation and transmission of market incentives for producers to internalize the costs of externalities associated with production process.

Support from economics literature on the workings of ecolabeling can be built on the application of the economics of information. With an asymmetry of information between producers and consumers on product characteristic, product certification and labeling offer a way to provide warranty to prevent adverse selection in the market. As it is true in market signaling situations, the key to the working of ecolabeling is that high quality (in this case,

environmentally friendly) producers find it worthwhile to convey the information on the product characteristics. At the same time, less environmentally friendly producers do not find it worthwhile to do so due to higher costs needed for meeting the labeling requirements. With the existence of mechanisms to verify the environmental claim stated on the label, and the threat of punishment from the market, certification and ecolabeling can potentially be an economical way to overcome the problem of information asymmetry about product characteristics.

7.3 Conclusions of the Study

Theoretical and empirical analyses were conducted to evaluate whether ecolabeling is a viable economic instrument. Using simple diagrammatic analysis of market equilibrium, this study showed that:

(1) Markets for wood products split into two segments as the result of the introduction of the ecolabeled products in the market. Taking total demand in the market as constant, a portion of it will become an ecolabeled segment. Buyers in the ecolabeled segment are willing to pay a higher price than the ones purchasing the conventional product. The size of the proportion of this segment is determined by the price premium of the ecolabeled product above the conventional one.

(2) Total welfare is increasing as the results of ecolabeling introduction. In he case of timber ecolabeling, three sources of increase in the welfare are:

   a. a larger consumer surplus results due to a smaller need to compensate losses induced by the externality of the production.

b. a larger consumer surplus results due to higher utility from knowing the characteristics of the product. This part of consumer surplus gain can be attributed to the value of information provided by the ecolabel. The information conveyed by the ecolabel has value because it helps consumers make the pro-sustainable choice and avoid the mistakes they used to make when the information is not available.
c. a lower total social cost in timber production occurs because less damage is realized under the sustainable production process compared to the situation under conventional logging and forest management practice.

Adopting the constant elasticity demand function and parameters developed in other studies, the empirical analysis quantifies the theoretical findings. The empirical finding reflects the intuition that the size of the increase in consumer surplus will become smaller if the price premium for the ecolabeled wood increases. It also shows that the size of the ecolabeled segment in the total market becomes smaller with the rise in premium. Consumer surplus is larger if consumers purchase ecolabeled wood product instead of the conventional one. The surplus decreases as the price premium rises.

Unfortunately, from the business perspective, adoption of timber certification and ecolabeling does not always appear as a viable option. The Break-even NPV analyses showed the required minimum percentage of sales in the ecolabeled market in order that the log producer can adopt timber certification and ecolabeling. At the national, at the average annual silviculture

cost of $ 5.00 per hectare, an optimistic yield scenario suggests that the break-even proportion of sales in ecolabeled market is in the range of 14.7% - 21.5%. The more pessimistic yield scenario suggests that the minimum required proportion of sales in ecolabeled market is between 34.4% and 33.9%.

Regionally, for the unlogged forest area, the break-even proportion of sales in ecolabeled market falls within 19.8% - 65.0% range. Kalimantan appears to be the best prospective region for adopting timber certification and ecolabeling while Irian Jaya will not be able to participate at this level of silviculture cost. A sensitivity analyses with respect to changes in silviculture effort shows that the viability of adoption declines as the cost of silviculture increases. The concessionaires will have to sell higher proportion of their timber in ecolabeled market in order to break-even when they adopt timber certification and ecolabeling.

These Break-even NPV analyses show that the viability of the adoption of timber certification and ecolabeling depends largely on: (1) productivity of the forest concession area; and (2) the cost of conducting proper silviculture effort to comply with certification and ecolabeling requirements. The higher the yield of the forest land, the lower is the break-even proportion of sales in the ecolabeled market, and the more viable is the adoption of timber certification and ecolabeling. The higher the silviculture cost, the less viable is the option because concessionaires have to sell a higher proportion of the logs in ecolabeled market in order to reach the break-even point.

7.4 Policy Implications

Based on the analysis in this chapter, two general policy implications can be identified. First, there emerges a possibility of selectively promoting timber certification and ecolabeling based on regional basis and forest condition. It may also be appropriate to prioritize the promotion toward the existing unlogged forest area to prevent potential damage. Of 64 million hectares permanent production forests in Indonesia, about 60% are still unlogged. And about 56% of this unlogged area is located in the more productive forests of Sumatera and Kalimantan (INTAG 1996). As the Break-even NPV analyses show (figures 6.2 and 6.3), adoption of timber certification and ecolabeling by concessionaires in these regions has a strong appeal. At a $ 5.00 annual silviculture cost per hectare, concessionaires in Sumatera and Kalimantan only need to receive $ 4.67 price premium in less than 30% of their logs in order to break-even if they adopt timber certification and ecolabeling. Given a significant share of Indonesia's plywood in the U.S. as well as in the world hardwood plywood market, reaching the 30% break-even proportion of sales in ecolabeled market seem feasible to the Indonesia's forest concessionaires.

In the logged-over area, timber certification and ecolabeling will be viable only for high growth forest regions and where silviculture can be done at low cost. Among the 30 million hectare forests that has been logged over since 1967, about 10 million had become deforested. Promotion of timber certification and ecolabeling within the logged-over area can then be viewed to slow down

further deforestation that begins when the logged-over area is left unmaintained by the concessionaire.

Second, large potential social and environmental benefits of sustainable logging and forest management may justify some public initiative with a view to cover part of the costs faced by the private forest concessionaires when practicing sustainable logging and forest management. This policy implication is particularly relevant for Indonesia's setting given the availability of the stock of unused reforestation fund (which is part of timber royalty) currently maintained by the Ministry of Forestry outside the official budget system.

However, some larger problems of commercial forest may need be addressed before timber certification and ecolabeling can be an effective economic instrument to promote sustainable forest utilization in Indonesia. While Break-even NPV analysis may show it is feasible for a concessionaire to certify its operation, a short concession license period (i.e., 20 years) does not guarantee that the concessionaire will be able to harvest the results of his investments in 35 years time after the first logging. The government should reconsider this property right issue while trying to promote the timber certification and ecolabeling. If the warranty for long-term benefits for sustainable forestry can be provided, this will act as a counter balance against the pressures and short term incentive to over harvest which is induced by over investment in wood processing industry.

7.5 Limitation and Suggestion for Future Research

Validity of the results presented in this dissertation and applicability of the approach for empirical analysis depends largely on the parameters borrowed from other studies. The ratios and relationships used to calculate the empirical results are all averages that represent, if at all, the aggregate situation. While the theoretical equilibrium analyses may be applied to significantly wider cases of ecolabeling initiatives, the applicability of empirical results depends mainly on the demand function specification adopted for this study. Nevertheless, the approach used for concessionaire prospective analysis for adopting timber certification and ecolabeling, can potentially be applied to help forest management companies evaluate their position. However, for the model to be realistic at the firm level, some ratios and parameters would need be adjusted to represent the reality in which the concessionaires operate.

With respect to future research potentials, currently, ecolabeling is perhaps the least mined research topics in the field of resource and environmental economics. In my limited view, this study opens up the opportunity to develop a research program on this topic. Many aspects of ecolabeling need be studied to provide more support (or to negate) that ecolabeling is an economical way to promote sustainability to complement the first best economic instrument. Some possible topics that seem productive along this line include: (1) consumer response toward ecolabeling; (2) potential trade generation and diversion effects of ecolabeling; and (3) the set up of ecolabeling-related institutions to support an efficient ecolabeling program.

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