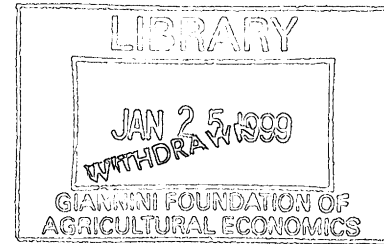


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**Achieving Environmental Goals in a World of Trade and Hidden Action:
The Role of Trade Policies and Eco-Labeling**

by

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Abstract

Consumers, mainly in Europe and North America, frequently express concerns about the environmental, social or health impacts of the products they purchase. When these products are produced abroad, consuming countries often resort to using trade policies and consumer actions targeting imported products in order to reduce negative environmental or social impacts. Traditionally, these policies were *non-discriminatory*, i.e., they treated all imports equally, without considering the actual damages caused by the product. More recently, there is a trend towards *process-discriminatory* policies which attempt to discriminate against imports from environmentally or socially unsound production processes while encouraging environmentally or socially sound alternatives. Such policies often rely on eco-labeling and costly monitoring of the producers' claims. This paper develops a theoretical model of the consuming country's optimal trade policy, allowing for asymmetric information and costly monitoring. I analyze what type of policy is preferable under what conditions, and how the optimal policy depends on the target country's alternative markets and the type of consumer concern. It is shown that imperfect information reduces the optimal level of sound and total imports while raising the level of unsound imports. It is generally optimal to monitor imperfectly, and non-discriminatory policies can be interpreted as corner solutions to the optimal process-discriminatory policy. The observed shift from non-discriminatory policies to process-discriminatory policies over time might be explained by a reduction in monitoring costs. The target country always at least weakly prefers process-discriminatory policies over non-discriminatory policies, possibly explaining why producing countries establish their own labeling systems when faced with the threat of non-discriminatory policies. The optimal tariff on unsound imports is shown to be generally less than the Pigouvian tariff and is less for consumption pollution, health and safety effects, and moral concerns than for production pollution. Implementation of the optimal policy through consumer action rather than trade policy is also discussed.

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1. Motivation

Consumers, particularly in Europe and North America, increasingly value environmentally friendly products. Several surveys have indicated that consumer interest in the environmental effects of products are rising and that a substantial segment is willing to pay a premium for environmentally friendly products [United States Congress, 1992].

At the same time the world economy has become increasingly integrated with a growing share of domestic consumption goods being produced abroad. Production practices in other countries frequently affect environmental quality. For example, tropical timber production affects global forest stands which provide both use and nonuse values to consumers in other countries. This nexus between production and the environment has led consumer groups to translate their environmental concerns into concerns about the environmental impacts of production abroad. Producing countries may not share these environmental concerns, and thus may have little incentive to internalize another country's nonmarket environmental valuations. Some environmental groups have responded by proposing to achieve their environmental goals through trade interventions [Esty, 1994].

National sovereignty limits the policies that a country can use to achieve its environmental objectives abroad. In practice, there are two basic ways to proceed: international cooperation or unilateral action. While cooperation is generally preferable, negotiating global environmental agreements has proven to be both lengthy and difficult [Wilson, 1994]. Therefore, concerned countries have resorted to using unilateral trade policies. (Here, I interpret both government policies and consumer action targeting imported products as trade policies.)

Traditionally, these policies were *non-discriminatory*: They treated all imports equally, without considering the actual damages caused by the product. For example, local

governments in Europe and the United States banned all tropical-timber use in public projects [Jackson, 1996]. Similarly, concern about harvesting tuna by setting on dolphins led to calls for canned-tuna boycotts in the United States [United States International Trade Commission, 1992]. Economists have shown that non-discriminatory trade policies can be second-best in the absence of global cooperation, but such policies can also have minimal or even adverse environmental effects [Snape, 1992; Barbier, 1994]. Moreover, non-discriminatory trade policies often conflict with World Trade Organization (WTO) rules.

Consequently, *process-discriminatory trade policies* have grown more popular. These are policies which attempt to discriminate against imports from environmentally damaging production processes while encouraging environmentally friendly alternatives. Process-discriminatory trade policies are defined here to include both government policies which discriminate between products on the basis of environmental impacts, as well as consumers' decisions to incorporate environmental considerations into their purchasing choices.¹ Examples are policies which give preferential market access to timber from sustainable forestry and the formation of groups of retailers which agree to buy some percentage of total timber purchases from sustainable sources, possibly at a price premium. Extreme cases of process-discriminatory trade policies are the International Dolphin Conservation Act of 1992, which mandates that only 'dolphin-safe' tuna can be sold in the U.S. market [Buck, 1996], and laws and initiatives in many European countries and North America prohibiting all timber imports from unsustainable

¹While consumer-based actions (often referred to as 'voluntary eco-certification') are less likely to be in conflict with the WTO than government policies, consumer-based actions are subject to the potential for free-riding on the part of consumers due to the effect that an individual's purchase of environmentally friendly products leads to an increased provision of a public good that all consumers benefit from. These aspects are ignored for now. Except for these differences, both consumer- and government-led decisions that discriminate between imported goods on the basis of their environmental impacts, are formally unilateral, process-discriminatory trade policies.

forestry on the national, regional, or local level [Ghazali and Simula, 1994].

Because the environmental impacts of production are hard to observe or verify, process-discriminatory trade policies are often combined with *eco-certification*. Eco-certification takes two basic forms: labeling legislation and third-party labeling. The U.S. Dolphin Protection Consumer Information Act of 1990 is an example of the first. It defines "dolphin-safe" and provides for monitoring of firms' claims. The other, more common, form of eco-certification is third-party labeling. Here firms apply to an independent agency for the right to use a label that distinguishes their products from environmentally unfriendly products. The firm either provides evidence of the truthfulness of its claims or the labeling agency tests to verify the firm's claims. Currently, about 20 countries have government-sponsored third-party labeling programs, and the European Union is launching a regional eco-labeling program. Canada, Indonesia, Brazil, Costa Rica, and groups of Nordic and African countries are designing timber certification systems [Ghazali and Simula, 1996].

Process-discriminatory policies are frequently discussed in international fora. Chapter 4 of Agenda 21, at the June 1992 United Nations Conference on Environment and Development in Rio de Janeiro, specifically identifies eco-certification as a potential instrument for making trade and environmental goals mutually supportive. Process-discriminatory trade policies and certification have been criticized by target countries as trade barriers [Wasik, 1996]. Particularly developing countries argue that developed countries have depleted their own resources and common-property, thus enhancing their well-being and standard of living, but degrading environmental quality. Presumably, developing countries should have the same rights. The essential issue is who possesses the property rights to globally significant resources such as forests, and consequently who should pay for the costs of environmental protection. Developing countries believe they

will lose from certification as consumers substitute away from their products (e.g., tropical timber) toward developed-country products (e.g., temperate timber) or close substitutes (e.g., metal or plastic) [Ghazali, 1996]. Still, under the pressure of importing nations, several exporting countries, including many developing countries, are designing their own certification systems.

Despite the growing interest by policymakers, consumers, and producers in eco-certification and process-discriminatory trade policies, little economic analysis of this topic exists. This paper develops a model capturing the following stylized facts: (i) the presence of what is formally a transnational externality² between one country's technology choice and consumer environmental concerns in another country; and (ii) hidden action caused by the costliness and difficulty of observing the choice of production technologies. The model is used to analyze the conditions under which an environmentally concerned country would prefer process-discriminatory to non-discriminatory trade policies in achieving environmental objectives abroad. Moreover, the target country's alternatives and the type of the consuming country's concerns are explicitly specified and their effect on the concerned country's optimal policy is analyzed.

While most of the paper focuses on production effects, consumption pollution is analyzed as a special case. Also, while the paper is phrased mainly in terms of environmental objectives, the topic is much broader. The basic approach applies to many other social and health objectives, including concerns about human-rights violations, fair

² The term 'externality' is potentially value-laden in this context because it could be taken to imply that developing countries are imposing a cost on developed countries by choosing an environmentally damaging production process. However, given the history of resource depletion and environmental degradation in developed countries, developing countries may well be seen as providing a benefit to developed countries by protecting a resource, such as forests, which developed countries themselves did not protect within their own borders in the past. The term 'externality' here is not meant as a value judgment on this issue, but rather is

wages, child labor, hazardous work conditions, or health impacts of pesticides. Recently passed 'no sweatshop' labeling legislation in the United States is an example of a process-discriminatory trade policy pursuing social objectives [Washington Post, 1997]. I show how the optimal policy depends on the type of consumer concern.

Deriving the optimal trade policies to affect the behavior of other countries is important not only as a policy guideline, but also as an evaluation tool of existing policies. In particular, it can serve as a basis for assessing target countries' concerns that current policies reflect protectionist rather than environmental considerations.

The outline of the paper is as follows. Part 2 gives a short review of the related economic literature and outlines the contribution of the paper. Part 3 describes the basic model and its assumptions. Part 4 presents some preliminary results, including the equilibrium in the alternative market and the optimal policy under perfect information. Part 5 derives the home country's optimal policy under asymmetric information. Section 5.1 analyzes the optimal process-discriminatory policy. Section 5.2 discusses the optimal non-discriminatory policy and bans as corner solutions to the optimal process-discriminatory policy. Part 6 analyzes the effect of imperfect information on the optimal policy. Part 7 describes how the optimal policy could be implemented in reality. Part 8 discusses the effects of alternative market conditions and the type of the consuming country's concerns on the optimal trade policy. Part 9 concludes.

used to denote the economic relationship at hand, namely the fact that one agent's actions (positively or negatively) affect another agent's payoffs.

2. Contribution to the Literature

Several papers on optimal non-discriminatory trade policy in the presence of transnational externalities exist. In a two good - two country model, Markusen (1975) shows that if production of one good causes transnational pollution in fixed proportion to output the optimal unilateral policy involves: (1) setting a Pigouvian tax on domestic production equal to the domestic external cost per unit of output, and (2) an import tariff on the polluting good which is higher than the standard optimal tariff. Panagariya et al. (1993) derive a similar result in a slightly more general model.

Both studies assume that all imports of the good must be treated equally, independent of how environmentally damaging their production is. However, eco-certification is a way to discriminate between imports on the basis of the way in which they were produced. So, although one country cannot tax pollution in another, it can tax pollution imbedded in its imports. If monitoring were costless, process-discriminatory trade policies would be generally preferable to non-discriminatory policies.

Copeland (1993) generalizes Markusen's model to allow for process-discriminatory policies. He shows that the affected country would always prefer to use a pollution content tax, in which imports are taxed at a rate contingent on the amount of pollution generated during production. He also shows that such a tax is equivalent to a non-discriminatory tariff combined with a process-standard.

Ludema and Wooton (1994) show that in Nash Equilibrium between an exporting, polluting country and an importing country affected by pollution, the exporting country might voluntarily introduce environmental policy in order to capture a larger share of the gains from trade. They also show that the importing country will impose a process standard limiting imports to products which use clean production processes.

All of the existing models assume that the importing country can perfectly observe the exporting country's environmental technology choice. However, in the real world environmental impacts of production are difficult to observe [e.g., Barbier, 1994]. The model presented below explicitly incorporates asymmetric information regarding environmental technology choice and the possibility of costly monitoring.

Moreover, the existing literature focuses on the case of two countries, thereby ignoring the fact that the producing country may be able to sell to an alternative market where consumers are not concerned about environmental effects. In reality, such alternative markets usually do exist. For example, a large proportion of tropical timber production is exported to Japan and many developing countries which do not exhibit a significant concern about the effect of timber imports on tropical deforestation [Ghazali and Simula, 1994; Joint German-Indonesian Initiative, 1996]. The model described below incorporates a third country which represents such an alternative market and explicitly analyzes how the concerned country's optimal policy varies with the conditions in the alternative market. Moreover, the effect of the type of consumer concern on the optimal policy is also discussed.

3. Assumptions

Consider the following stylized presentation of the problem. A single, physically homogeneous good is produced with two technologies: an environmentally 'sound' (sustainable) technology and an environmentally 'unsound' (unsustainable) alternative. Unsound production affects a public good (e.g., biodiversity or dolphin populations).

There are three countries: The 'home country' consumes the product as well as valuing the public good. For simplicity, and to exclude protectionism, I assume that the

home country does not produce the good, and therefore imports all its consumption. The 'foreign country' only produces, and the 'third country' only consumes the product. The third country is also referred to as the 'alternative market'. Neither the foreign nor the third country value the public good.

The foreign country can produce each unit of output either soundly or unsoundly. The foreign country's constant unit costs of sound and unsound output are denoted by C_s and C_u , respectively. Sound production is more costly than unsound production, i.e.,

$$C_s > C_u. \quad (A1)$$

The foreign country exports to the home country and the third country. Because the third country does not value the public good and sound production is more costly, the third country imports only unsound goods. Let y denote foreign exports to the third country. Let Y denote total exports by the foreign country to the home country, and let α denote the proportion of these exports which is sound. Letting Y_u and Y_s denote the home country's unsound and sound imports, respectively, we have

$$\alpha = \frac{Y_s}{Y} = 1 - \frac{Y_u}{Y}, \quad (A2)$$

$$\text{and } Y_u + Y_s = Y. \quad (A3)$$

Equations (A3) and (A4) imply that there is a direct correspondence between Y and α and Y_u and Y_s . We can therefore phrase the problem in terms of Y and α or in terms of Y_u and Y_s . The two options will be used interchangeably below, depending on which is more intuitive.

$v(X)$ and $w(x)$ denote the valuation function of consumers in the home country and the third country, respectively, where X and x denote total imports by the two countries. Utility is increasing at a decreasing rate in consumption, so that

$$v'(X) > 0, v''(X) \leq 0, w'(x) > 0, w''(x) \leq 0. \quad (A4)$$