

**ESSAYS ON THE POLITICAL ECONOMY OF DOMESTIC AND TRADE POLICIES  
IN THE PRESENCE OF PRODUCTION AND CONSUMPTION EXTERNALITIES**

by

Joachim Schleich

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APPROVED:

Dr. David R. Orden, Chair  
Dr. Paul J. Driscoll  
Dr. Nancy A. Lutz  
Dr. Everett B. Peterson  
Dr. Terry L. Roe

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Dr. David R. Orden, Chair

Department of Agricultural and Applied Economics

## **(ABSTRACT)**

This dissertation extends the Grossman-Helpman models of endogenous trade policy formation to incorporate local and global production and consumption externalities, and to allow governments to choose domestic production or consumption policies together with trade interventions. The models presented are among the first to allow environmental quality and the structure of industry protection to be simultaneously evaluated in a political economy framework, when some industry groups lobby their governments for higher output prices.

The equilibrium tax and subsidy policies are implicitly expressed as the sum of distinct political support, terms-of-trade, and local and global environmental effects. Whether these effects reinforce or counterbalance each other depends on whether an industry is organized, whether the good is imported or exported, whether the externality is caused by production or consumption, and, in the large-country models, on whether governments set policies noncooperatively or cooperatively.

The model results imply a political economy version of Bhagwati's normative targeting principle: governments use the most efficient policy available to satisfy the lobbies, to address the externalities, and, in the noncooperative large-country model, to exploit international market power. All of the initial Grossman-Helpman results (for the small-country model and the noncooperative and cooperative large-country models) are shown to be special cases where governments have only trade policy available and there are no externalities.

In the small-country model and the cooperative large-country model, when there are production externalities, the lobbying of a polluting industry usually leads to lower environmental quality than socially optimal, but with terms-of-trade effects or for particular preferences cases the equilibrium policies may induce environmental quality higher than socially optimal. When there are consumption externalities, and the government has consumption (or production) as well as trade policy available, environmental quality will be socially optimal

(again, unless governments exploit market power). Thus, depending on the policies available, a local or global consumption externality will be fully internalized, even though polluting industries lobby and production may be distorted. This dissertation also shows that--in contrast to standard economic theory--the use of trade policy alone can lead to higher environmental quality than a more direct domestic policy alone.

*Key Words:* Environmental Policy, Trade Policy, Political Economy, Common Agency, Cooperation, Production Externality, Consumption Externality;

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## NOMENCLATURE

$N$	population size
$l$	total labor supply
$n$	number of nonnumeraire goods
$L$	set of organized industries
$p_i^w$	world price for good $i$
$p_i^s$	output price for good $i$
$p_i^d$	consumption price for good $i$
$\Pi_i$	quasi-rents of to the specific factor in industry $i$
$X_i$	supply of industry $i$
$X_i'$	derivative of supply of good $i$ with respect to output price of good $i$
$c_{ij}$	consumption of good $i$ by individual $j$
$E$	level of environmental externality generated by the consumption of good $e$ by $N-1$ consumers (consumption externality) or by the production of a good $e$ (production externality)
$E_X$	derivative of production externality with respect to output
$u_j$	utility of individual $j$
$u_{ij}$	subutility of individual $j$ derived from the consumption of good $i$
$u_{Ej}$	subutility of individual $j$ derived from the externality generated by all other individuals or the production of a good $e$

$u'_E$	derivative of subutility derived from the externality with respect to the level of the externality E
$d_i$	individual demand for good i as a function of the domestic consumer price for good i
$D_i$	total domestic demand for good i
$D'_i$	derivative of total domestic demand for good i with respect to the consumer price of good i
$s$	individual consumer surplus derived from the consumption of nonnumeraire goods
$v$	individual's indirect utility
$y$	individual income
$\tau_i$	ad valorem tax or subsidy on consumption/production of good i
$\theta_i$	ad valorem tax or subsidy on imports or exports of good i
$\tau$	vector of consumption/production taxes and subsidies
$\theta$	vector of import or export taxes and subsidies
$r$	per-capita transfer of government net revenue
$C_i$	proposed contribution of organized industry i to the government
$W$	total consumer welfare
$G$	government's welfare
$a$	parameter that captures the trade-off between contributions and total welfare for the government
$W_i$	gross welfare of all members of lobby i
$\Omega$	joint surplus of lobbies and government
$l_i$	total labor supply of all members of lobby i

$\nabla$	gradient vector of the partial derivative with respect to domestic and trade policies
$M'_i$	derivative of domestic import demand for good $i$ with respect to domestic price for good $i$
$I_{iL}$	indicator variable that takes on the value of 1 if industry $i$ is organized and zero if the industry is not organized
$\delta$	indicator variable that takes on the value of 1 if the consumption or production of good $i$ generates a local environmental externality, and a value of 0 otherwise
$\gamma$	indicator variable that takes on the value of 1 if the consumption or production of good $i$ generates a global environmental externality, and a value of 0 otherwise
$\alpha_L$	share of the population that owns specific factors in organized industries
$\varepsilon_{X_e, p_e^s}$	elasticity of domestic output supply of good $i$ with respect to the price of good $i$

# CHAPTER 1

## INTRODUCTION

This dissertation explores endogenous cooperative and noncooperative domestic and trade policies when production or consumption gives rise to environmental externalities. The core of the dissertation consists of the three individual papers presented in Chapters 2-4.

The objective of this introduction is to motivate the subject, briefly describe the methodology used, explain the contribution of this dissertation to the existing literature, link the three separate papers to one another, and finally summarize the main findings.

### *1.1. Objective*

The objective of this dissertation is to characterize the structure of environmental and industry protection when local or global production or consumption externalities exist, and when organized industry groups lobby their governments for higher output prices. Governments have domestic production or consumption policies as well as trade policies available. The political equilibrium policies are analyzed when governments set these policies noncooperatively and cooperatively. In particular, the following questions are addressed: (i) Do actions of organized interest groups lead to higher or lower environmental quality than socially optimal? (ii) What are the implications for environmental and industry protection when governments have multiple policies available? (iii) Will more direct domestic policy always lead to higher environmental quality than trade policy? (iv) Will governments prefer trade or more efficient domestic policies?

### *1.2. Motivation*

Over the last two decades, trade and environmental policy issues have gained considerable attention: environmental concerns are more and more recognized in trade agreements and the effects of environmental policies on trade are taken into account in formulating domestic policy. For example, the Uruguay Round of GATT incorporates a work program on the environment and trade, including the foundation of a Committee on Trade and Environment and agreements on Sanitary and Phytosanitary Standards and on Technical Barriers to Trade. Some even predict that the next GATT round of negotiations could be the ‘Green Round’.<sup>1</sup> NAFTA is the first trade agreement in history to formally contain environmental objectives. It includes, for example, an “Environmental Side Agreement” whose objective is to supervise the environmental effects of liberalized trade, as well as a “US-Mexico Integrated Border Environmental Plan” that calls for the foundation of a “Commission for Environmental

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<sup>1</sup> For example, Charles R. Carlisle, then Deputy Director-General of the GATT (quoted in Wilkinson, 1994).

Cooperation” to foster the harmonization and coordination of environmental measures.<sup>2</sup> Representatives of four leading environmental organizations participated in the Advisory Committee for Trade Policy and Negotiations for NAFTA.<sup>3</sup>

The increasing importance of the trade and environmental policy complex has been widely recognized in previous research. This research has mainly focused on the following issues (see for example Low 1992, Anderson and Blackhurst 1992, Bredahl et al. 1996, and Congleton 1996):

- i) the impact of trade liberalization and economic growth on local and global environmental quality;
- ii) the use of trade policy to affect environmental quality;
- iii) the use of environmental policy to affect international competitiveness of domestic industries; and
- iv) the design of an institutional framework that leads to both, free trade and protection of the environment.

While optimal domestic and trade policies can be conceptualized, as Anderson and Blackhurst (1992, p. 20) have noted, the trade and environment area has “an above-average risk of being exploited by special-interest groups to their own benefit and at the expense of the general interest.” Trade policy can also conflict with environmental objectives: a recent case involves the production of sugar in Florida, which has been stimulated by protective import quotas, while at the same time state and national legislators have considered imposition of an output tax to reduce sugar production’s devastating effects on the Everglades. This example also illustrates that governments often have multiple policies available to achieve their various goals.

The traditional approach to formally analyze environmental policy-making is based on Pigou (1932) and views the government as an omniscient benevolent dictator who maximizes social welfare.<sup>4</sup> In this normative framework, interventions are necessary to achieve allocative efficiency in the presence of market failures, such as production or consumption externalities. Because property rights are not well defined or because transaction costs are high, a Coasian (Coase 1960) solution in which externalities are fully internalized is generally ruled out. Thus, Pigouvian taxes that are directly linked to the source of the externality emerge as the optimal solution. Trade policies, such as import tariffs, lead to a deadweight loss and less environmental protection, so they are generally inferior to more direct interventions such as effluent fees, input, output, or consumption taxes, depending on the cause of the market failure.

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<sup>2</sup> See Esty (1994) for a detailed description of environmental considerations in NAFTA.

<sup>3</sup> These environmental groups are the Audubon Society, the National Wildlife Federation, the National Resources Defense Council, and the World Wildlife Fund.

<sup>4</sup> See Baumol and Oates (1988) for an overview.

The superiority of domestic policies to address an externality on efficiency grounds has been recognized in international trade agreements. GATT Article XX (which is adopted in NAFTA Article 2001) in principle allows countries to deviate from basic GATT obligations for certain public policy goals such as the protection of human life or health, but protective trade measures are prohibited when these goals can be fully achieved through non-discriminatory GATT-conforming domestic policies.<sup>5</sup> In 1992, a GATT Panel decided that an import tariff imposed by Thailand on US cigarettes was not justifiable by GATT Article XX (b) because Thailand could have accomplished its national health goals using a non-discriminatory consumption tax on all of domestic sales of cigarettes (reported in Petersmann, 1991).

Various International Environmental Agreements (IEAs) such as the 1987 Montreal Protocol to the 1985 Vienna Convention (on Substances That Deplete the Ozone Layer) or the 1972 Stockholm Conference on Human Environment also address the use of domestic as well as trade policies for environmental purposes. In general IEAs let member countries decide how to achieve environmental goals and rarely specify which domestic policies are to be used, while both GATT and NAFTA permit trade sanctions to enforce IEAs.<sup>6</sup> Command-and-control type regulation is still the dominant approach to addressing environmental externalities, but the role of market-based policies such as “Eco-taxes” has been increasing for political and economic reasons, at least in OECD countries (OECD 1995). When budgets are tight, policy-makers find the revenue generated by environmental or health taxes, such as taxes on energy, motor vehicles and tobacco products, particularly attractive.<sup>7</sup>

Finally, some international trade agreements not only address trade policies, but also trade-distorting domestic policies. To illustrate, the Uruguay Round Agreement of GATT requires a 20-percent reduction in total expenditures on price supports in agriculture, which might also have implications for environmental quality. For example, wheat and corn production account for over 50 percent of all nitrogen fertilizer applied in the U.S., causing attendant water quality problems. Thus, depending on the production technology, a reduction in domestic price supports might lead to a decrease in U.S. wheat or corn production and an improvement of

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<sup>5</sup> See Sorsa (1992) for the relation of GATT rules to various environmental issues.

<sup>6</sup> When a country violates basic GATT obligations to comply with provisions of IEAs and gets challenged by another country, the measure taken has to pass a “necessary” test. That is, the challenged country has to show that it has applied the least GATT-inconsistent measure to achieve its environmental objective. Under NAFTA (Article 104) the chosen measure only has to be least trade distorting “among equally effective and reasonable available means.” Thus NAFTA makes it easier to justify environmental standards (Esty, pp. 70). A similar conclusion holds for the treatment of technical standards and sanitary and phytosanitary measures. While GATT requires them to be “least trade restrictive”, under NAFTA they only have to avoid “unnecessary obstacles to trade.” For dispute settlements, NAFTA assigns the burden of proof to the complaining party, while GATT shifts this responsibility to the party being charged with the violations.

<sup>7</sup> For example, in May, 1997 the U.S. Senate discussed a proposed 43-cent per pack cigarette tax increase, that would provide health care coverage for low-income children and help reduce the federal budget deficit (Washington Post, May 22, 1997). The German Government has recently decided to increase taxes on electricity, gas, gasoline, crude oil in order to meet the maximum deficit-criteria set by the Maastricht Treaty (Sueddeutsche Zeitung, December 20, 1996).

environmental quality. While the Uruguay Round domestic support reductions are estimated to have little effect given previous domestic policy reform and specific GATT exceptions (Orden 1994), future GATT provisions on domestic programs might become binding.

In a noncooperative normative model with local production or consumption externalities, if the government is restricted to only domestic policies, Krutilla (1989) demonstrates that Pigouvian output or consumption taxes will not be the outcome. The government uses the production or consumption policy to affect the terms of trade in addition to the externality. Whether the equilibrium taxes are higher or lower than Pigouvian taxes depends on the nature of the externality and whether the country is an importer or an exporter.

The above observations lead to the conclusion that trade policies should be analyzed in conjunction with domestic policies, in particular in the trade and environment context. Moreover, treating the government as a benign dictator maximizing national welfare will not be adequate in a positive theory of policy determination regarding trade and the environment.

### ***1.3. Political Economy Models of Trade Policy and Trade and Environmental Policies***

This section provides an overview of the political economy of trade policy, and of trade and environmental policies. A particular focus is on the Grossman-Helpman political economy models, which forms the basis for the models developed in this dissertation.

#### ***1.3.1. Traditional Approaches to Trade Policy***

The influence of organized interest groups on the structure of trade policies has long been recognized. A well developed literature on endogenous trade policy formation derives the equilibrium policies as the outcomes of a political process that may include self-interested governments, bureaucrats, organized industry groups (lobbies) and voters as participants.<sup>8</sup> Within this literature two main approaches can be identified: the *political competition* approach (Hillman and Ursprung 1988, 1993, and Magee, Brock and Young 1989) and the *political support function* approach (Stigler 1971 and Peltzman 1976).

In the political competition approach, opposing political candidates announce trade policies that they are committed to implement if elected. Organized interest groups make contributions to maximize their expected utility, that is, to increase the probability that their favorite candidate wins the election. Politicians use the money to sway rationally ignorant, imperfectly informed voters. In this approach, the main purpose of the contributions is to influence the outcome of elections, not to affect the politicians' policy stance. Formally, the trade policies are set before the lobbies contribute.

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<sup>8</sup> See Hillman (1989) and Rodrik (1995) for overviews on the political economy of trade policy, and Swinnen and van der Zee (1993) for a survey on the political economy of agricultural policies.

In the political support function approach, an incumbent government selects policies to maximize a reduced-form support function subject to economic constraints. The support function generally contains a weighted sum of the welfare of designated interest groups and the general welfare.

The political competition approach is more successful in explaining the general profile of trade policies, that is, whether trade policy is liberal or protectionistic; or whether it favors labor or capital. This approach is less suited to explaining the structure of protection, that is, what determines the political equilibrium policies and which groups gain more than others. Further, policies are assumed to be fixed and unaffected by contributions, and multiple policies can generally not be analyzed.

Conversely, in the political support function approach, the politician's policy stance is not fixed, but rather endogenously determined through an explicit maximization problem. This approach does better at explaining the finer details of the structure of protection. However, a major criticism of the support function approach is that the political weights for the welfare of different interest groups are often treated as fixed and no explanation is given for the government's preference structure itself.<sup>9</sup> The weights can only be inferred indirectly from the first-order conditions to the politician's maximization problem.<sup>10</sup> Further, campaign contributions do not directly enter this objective function, and political competition is kept in the background.

### ***1.3.2. The Grossman-Helpman Model***

This dissertation is based on an innovative political economy model developed by Grossman and Helpman (1994) for a small open economy and extended by Grossman and Helpman (1995) for large open economies. This model is in the spirit of the political support function approach, but corrects some of its weaknesses. In this model, some owners of sector-specific inputs are represented by organized interest groups.<sup>11,12</sup> These lobbies make contributions to the government in order to influence its trade policy stance. Grossman and Helpman (1994) implicitly assume that all organized interest groups have the same lobbying technology. That is, there are no differences in how lobbies acquire from their members the funds that are used for political contributions. Also, lobbies have equal access to the government

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<sup>9</sup> Roe (1992) derives the weights endogenously as a function of pressure generated by various interest groups. In his model, interest groups noncooperatively devote some of their total labor endowment to lobby the government. This lobbying effort affects the weights and thus the government's equilibrium policies.

<sup>10</sup> See Johnson, Mahe and Roe (1993) for an empirical application.

<sup>11</sup> The inelastically supplied sector-specific factors are the residual claimants to profits after the other factors (here labor) have been paid their competitive prices. Since these rents increase with the output-price of the good in which the specific factor is employed, specific-factor owners have an interest in policies that increase the output price. Each individual supplies one unit of labor and owns at most one specific factor.

<sup>12</sup> The set of organized industries is exogenously given and no attempt is made to explain why some lobbies overcome Olsons's (1965) "free-rider problem."

and their contributions are equally efficient, that is the government values contributions from different interest groups evenly. Since transactions cost are assumed to be zero, one dollar spent by any interest group translates into one dollar received by the government.

In deriving lobbies' contribution schedules, which map each feasible trade policy vector into a payment level, Grossman and Helpman (1994) explicitly characterize the demand side for protection. The government is assumed to maximize a weighted sum of total contributions and consumer welfare. Taking the contribution schedules as given, the government decides on the levels of trade policies, that is, on the supply of export or import taxes and subsidies. The model is solved as a two-stage noncooperative game, where in the first stage lobbies simultaneously and noncooperatively set their contribution schedules and in the second stage the government sets its policies. In the large-country model, two governments set their policies either noncooperatively (trade war) or cooperatively (trade talks). Thus, while previous studies on endogenous trade policy formation only consider the case of a small or isolated country, Grossman and Helpman (1995) explicitly model the strategic relations between interest groups and the government on the national level, and between governments from different countries on the international level.<sup>13,14</sup>

Grossman and Helpman build their analysis on Bernheim and Whinston (1986) and model the lobbies' and government's decisions as a first-price menu auction in a common agency game with perfect information.<sup>15</sup> The government is the common agent whose actions are the trade policies, while each lobby is a principal whose bids are its contributions. Assuming that contribution schedules are differentiable around the (interior) equilibrium point, and that preferences are quasi-linear and identical across all individuals, the levels of trade-intervention in the political equilibrium can implicitly be derived. The equilibrium results from the Grossman-Helpman model lead to the conjecture that protection for an industry depends on whether the industry is organized or not, on the import elasticity, on the ratio of domestic output to imports (import-penetration ratio), and on the elasticity of foreign output supply.<sup>16</sup>

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<sup>13</sup> The concept of such a "two-level game" was informally developed by Putnam (1988). Putnam's concept has found appealing applications to the Uruguay Round of GATT ( see for example Avery, 1993).

<sup>14</sup> In the framework of the political support function approach, Hillman and Moser (1995) describe reciprocal trade liberalization as an exchange of market access. Increased market access leads to higher domestic political support for each country's government from their exporting industries.

<sup>15</sup> A *common agency* problem arises when several principals attempt to induce a single agent to take an action that may be costly for the agent to perform. In a *menu auction*, each of several bidders (here, lobbies) announces a menu of offers for various possible actions (here, policies) by an auctioneer (here, the government) and then pays the bids associated with the action. The bids are offered as schedules that map each action into a payment level. In a *first price auction*, the bidder offering the highest bid wins and has to pay according to his bid. By contrast, in a *second-price auction*, the highest bidder wins, but has to pay according to the second highest bid. In a game with *perfect information*, at every stage, the structure of the game is common knowledge (see for example Fudenberg and Tirole, 1991).

<sup>16</sup> Goldberg and Maggi (1997) investigate the empirical validity of the small-country version of the Grossman-Helpman model for a cross-section of U.S. industries in 1983. They find that the actual structure of protection is consistent with the basic predictions of the Grossman-Helpman model. The share of the population that is organized is estimated to be above 90 percent and the relative weight the government attaches to total welfare versus contributions is estimated to be between 50 and 88.

The Grossman-Helpman model does not suffer from some of the major shortcomings of the political support function approach. More specifically, the authors' modeling of the interactions between lobbies and the government provides a micro-foundation for this approach. The behavior of the lobbies that transforms governments' policies into contribution levels is derived from first principles, that is from the utility maximization of the lobby members. Also, governments' preferences are explicitly defined over contributions (and total welfare) and not just given in an ad-hoc manner. This makes the usual fixed weights for different lobbies obsolete. Via the lobbies' contribution schedules the government gets information about how much their members are willing to pay for different policies and then decides on the policies. Formally, the lobbies move before the government moves. Thus, lobbies supply contributions to affect the government's policy stance which makes "protection for sale". In particular, the Grossman-Helpman model implies that the main purpose of contributions is not to "buy access" to the government. Instead, the lobbies want, and the politicians are willing to deliver, favorable policies in return for the contributions.<sup>17</sup>

### ***1.3.3. Political Economy of Trade and Environmental Policies***

Until recently, the political economy of environmental policy formation was "a rather neglected topic" (Hoekman and Leidy, 1992, p. 242). The main focus was to analyze why in reality firms prefer less efficient environmental policies like standards over market oriented policies like taxes or tradable permit systems in a closed economy setting. In their seminal paper, Buchanan and Tullock (1975) show that in a closed economy producers prefer quantity restrictions because they facilitate collusion. Hoekman and Leidy (1992) and Leidy and Hoekman (1994) analyze the choice of domestic environmental policies for an open economy and argue that import-competing industries favor inefficient instruments, in particular when institutional provisions exist that facilitate contingent protection.<sup>18</sup> However, these studies are mostly descriptive and not embedded in a formal political economy framework.

There are also some formal models analyzing the political economy of trade and environmental policy relying on the political competition approach. In a noncooperative game, Hillman and Ursprung (1992) show how politically active environmental groups affect the chances of liberal versus protectionist trade policy outcomes. In their one-sector model, an oligopolistic home industry seeks protection while an oligopolistic foreign industry seeks free

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<sup>17</sup> In 1994, about \$3 billion were spent on campaigns in all elections in the U.S., and on average, every senator had to raise about \$14,000 a week to cover his 1994 campaign expenditures (The Economist, February 8, 1997). How close these funds raised are to "contributions" in the Grossman-Helpman model depends on how precisely the campaign funds are linked to specific benefits subsequently delivered to the contributors. On the latest attempt for campaign finance reform in the US, on March 18, 1997, the U.S. Senate defeated the Hollings-Spencer constitutional amendment. This amendment would have empowered Congress to limit contributions and spending in federal elections and let states set limits in local elections.

<sup>18</sup> Contingent or administered protection contains antidumping and countervailing duty procedures, as well as the safeguard provisions of the GATT Article XIX, allowing a country to circumvent its GATT obligations and erect protective trade barriers under certain conditions (Leidy and Hoekman, 1994, p. 254).

market access. For a local or a global consumption externality, environmental groups unambiguously prefer protectionist trade policies, which raise the price for consumers and thus lead to a decrease in the externality. For a production externality, when environmental groups are concerned about environmental quality in both countries, they will support candidates promising protectionist trade policies that deny market access for foreign firms. When environmental groups only care about environmental quality in their own country, their preferred policy depends on differences in the market structure across countries and on the consumption substitutability of domestic versus imported goods. However, these models are subject to the same criticism as the political competition approach in general.

Recent studies by Bommer (1996) and Bommer and Schulze (1996) rely on the political support function approach. The policy maker's (ad hoc) objective function includes profits of organized industries and some measure for environmental quality that reflects the impact of environmental groups. In a model of imperfect competition with linear demand and cost structures, Bommer shows that European integration could lead to high-level harmonization of environmental process standards, instead of downward competition of national standards that would provide domestic industries with a competitive advantage. Bommer and Schulze analyze the impact of trade liberalization on environmental policy in a sector-specific trade model when the production process for the exporting good requires the use of natural resources which creates a negative externality. Bommer and Schulze implicitly assume that in the support-maximizing equilibrium, trade policies are set cooperatively before environmental standards are chosen noncooperatively. In their model, trade liberalization which favors the 'dirty' exporting sectors through an increase in the relative price allows governments to impose tighter environmental policies to satisfy 'clean' importing sectors and environmental groups. Bommer and Schulze also provide empirical support for their theoretical findings, using the impacts of NAFTA on the US manufacturing sector. They conclude that, on one hand, the trade liberalizing provisions of NAFTA led to an increase in the production of dirty industries, but on the other hand, the environmental provisions required tighter standards. These models are subject to the same criticism as the political support function approach to endogenous trade policy making.

The models above typically include one or two industries whose sole objective is to maximize profits and organized environmental groups whose only objective is to maximize environmental quality. The consumption side of the economy is not explicitly modeled. Also, due to their failure to get organized or to make contributions, consumers' stakes are not represented in the political process. This implies that the policy maker does not lose support from consumers (or members of organized industries as consumers) when, for example, protective import tariffs are imposed. On the other hand, the policy maker cannot accrue benefits from lower consumer prices—one of the main arguments in the political debate in favor of trade-liberalizing agreements. Further, except for Hillman and Ursprung (1992), the studies above focus on production externalities only.

### ***1.3.4. Trade and Environmental Policies in the Grossman-Helpman Framework***

If the models above did not include organized environmental groups, policy makers would not care about the impact of the selected policies on environmental quality. This outcome differs fundamentally from the models developed in this dissertation and the studies by Fredriksson (1997) and Aidt (1997a,b) which are based on the Grossman-Helpman model.<sup>19</sup> In these models, the utility of individual members of the industry lobbies depends on the level of the production or consumption externality, so the lobbies' contribution schedules will take into account the impact of the government's policies on the environment. Thus, the government is concerned about environmental quality even when there are no organized environmental lobbies. Through these mechanisms, the externality is (at least partially) internalized.

Political economy models within the Grossman-Helpman framework can be helpful in answering important questions that arise in the trade and environment complex, such as:

- (i) Do actions of organized interest groups lead to higher or lower environmental quality than socially optimal?
- (ii) What are the implications for environmental and industry protection when governments have multiple policies available?
- (iii) Will domestic policy always lead to higher environmental quality than trade policy?
- (iv) Will governments prefer trade or more efficient domestic policies?
- (v) Why might industry or environmental lobbies prefer trade over domestic policy?
- (vi) When there are organized interest groups, will cooperation between governments lead to higher or lower environmental quality than noncooperation?
- (vii) Are welfare-enhancing trade and environmental policy reforms, as studied in normative models by Copeland (1994), Copeland and Taylor (1994, 1995), or Beghin, Roland-Holst, van der Mensbrugge and Metcalfe (1996), politically feasible?

This dissertation attempts to answer questions (i) to (iv) in detail and provides an outline for analyzing questions (v) to (vii).

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<sup>19</sup> During the final stages of this dissertation, I became aware of Fredriksson's and Aidt's unpublished work. Fredriksson (1997) and Aidt (1997a,b) also use the Grossman-Helpman model to analyze the structure of environmental and industry protection in a small-country model. Both authors allow for organized environmental groups, but they only consider a production externality. Fredriksson and Aidt (1997a) concentrate on one endogenously derived policy only, that is on production policy. Aidt (1997b) allows for input taxes/subsidies to address an input-based externality, as well as output taxes/subsidies, but not for trade policies.

#### *1.4. Overview of the Chapters*

Chapter 2 is titled “Efficient Choice Among Domestic and Trade Policies in the Grossman-Helpman Interest Group Model” and generalizes the Grossman-Helpman model by allowing the governments to choose among domestic as well as trade interventions.<sup>20</sup> Domestic policies are production or consumption taxes/subsidies and trade policies are import or export taxes/subsidies. The lobbies now condition their contributions on domestic *and* trade policies. The equilibrium structure of industry protection is implicitly derived for a small-country and a large-country model, when governments simultaneously and noncooperatively set their policies. The outcomes when governments have only one policy available (either trade policy *or* a domestic policy) are derived as special cases in Chapter 2, as well as in Chapters 3 and 4.

Chapter 3 is titled “Endogenous Domestic and Trade Policies in a Small Open Economy with Production and Consumption Externalities.”<sup>21</sup> It builds on the methodology developed in Chapter 2 and characterizes environmental and industry protection for a small open economy when domestic and trade policies are available and consumption or production creates a local environmental externality. The externalities are modeled such that production subsidies and consumption taxes are first best instruments to address the production and consumption externalities, respectively.<sup>22</sup>

Chapter 4 is titled “Noncooperative versus Cooperative Endogenous Domestic and Trade Policies with Environmental Externalities.” This chapter extends the analysis of Chapter 3 to the large-country model. Now governments set their policies noncooperatively or cooperatively. In addition, production and consumption externalities are modeled as either local or global.

The cooperative scenario for global externalities is the most comprehensive and encompasses all previous results as special cases. Mathematical Appendices A and B provide detailed derivations of the results for this general scenario.

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<sup>20</sup> An earlier version of this chapter is co-authored with David Orden and published as a Working Paper by the Center for Political Economy, Departments of Economics, Political Science, and Applied Economics, University of Minnesota, Bulletin Number 96-3, October 1996.

<sup>21</sup> An earlier version of this third chapter was presented at the annual meeting of the International Agricultural Trade Research Consortium (IATRC) Washington, DC, December 1996, and is published as an IATRC Working Paper Number 97-2 under the title “Environmental Protection With Policies for Sale.”

<sup>22</sup> Using taxes implicitly assumes the Polluter Pays Principle, which was endorsed in 1972 by OECD “Guiding Principles Concerning the International Economics Aspects of Environmental Policies.” It implies that the public (and not the polluter) owns the environment.

### *1.4.1. Extensions of the Literature*

This dissertation extends previous work in the political economy of trade policy, the environmental policy literature, and the trade and environmental policy literature. While the original Grossman-Helpman model allows for trade policies only, domestic production or consumption as well as trade policies are considered herein. For the small-country model, industry protection is analyzed for multiple policies under noncooperation. For the large-country model, industry protection is analyzed under noncooperation and cooperation. In particular, the multiple policy analysis in a cooperative setting is innovative, not just for the Grossman-Helpman framework, but for the entire literature on endogenous policy making.

The contribution of this dissertation to the environmental policy literature lies in a new way to analyze environmental and industry protection in a political economy model. The advantages of the original Grossman-Helpman model over the traditional political economy trade models holds equally for its application to trade and environmental policies. Unlike previous approaches, consumers' preferences over consumption goods and environmental quality are explicitly modeled. Thus, the political equilibrium policies will reflect their impacts on consumer utility. In contrast to earlier approaches, industries are not solely concerned with profits. Instead industry owners--as consumers-- also care about consumption and environmental quality. As a consequence, in the models presented herein, governments' decisions will reflect environmental concerns without environmental groups being present, even if the government does not care about total welfare. Organized environmental groups could also be included in the framework, as in Aidt and Fredriksson, or as in previous models that had to introduce environmental groups forcing the government to take environmental considerations into account. In the Grossman-Helpman framework, introducing organized environmental groups would generally lead to higher environmental protection and would also alter industry protection due to terms reflecting the environmental political support effect, but it would not change the basic model structure.

Finally, unlike previous approaches to trade and environmental policy (except for Bommer and Schulze), this dissertation allows for multiple endogenous policies, that is for choice by a government of domestic policies together with trade policies. While Bommer and Bommer and Schulze consider environmental standards, the models in this dissertation incorporate environmental taxes and subsidies. While the analysis in most previous studies is limited to one or two industries, the model presented herein is more general and allows for many goods.

For the large-country model, the political equilibrium policies when governments set domestic and trade policies noncooperatively or cooperatively are analyzed in Chapter 4. Unlike Bommer and Schulze, governments negotiate not only over trade policies but also over domestic environmental policies. Their argument that the environmental provisions in NAFTA were set independently is not very convincing because the U.S. and Mexican governments could have set independent environmental provisions without a multilateral agreement. The models developed herein are more general, because they allow trade and/or domestic policies to be set cooperatively.

Local externalities can appropriately be addressed using domestic instruments. But in the case of global externalities, international cooperation is necessary to internalize transboundary spillovers. This dissertation demonstrates how global production and consumption externalities can be (at least partially) internalized when governments cooperate and lobbies' contribution schedules depend on the outcomes of the negotiations, that is, on all countries' domestic and trade policies.

#### ***1.4.2. Main Findings of Chapter 2***

Given the assumed structure of the model, the equilibrium policies can implicitly be expressed as the sum of distinct political support effects, which reflect the political power of the industry, and terms-of-trade effects, which reflect optimal tariff considerations.

In general, the results demonstrate that a political equilibrium version of Bhagwati's (1971) normative targeting principle also applies to the extended Grossman-Helpman political economy model: the government uses the most direct policies to satisfy the industry lobbies and to accommodate the market structure, respectively. When production and trade policies are available to the governments, the production policy serves to satisfy the lobbies while the trade policy is used to affect the terms of trade. In the small-country model, tariffs are set at zero, and in the large-country model, they take on the optimal tariff formula. While the production policy exhibits the same implicit functional form in the small-country and the large-country models, the intervention levels are generally different.

When only consumption and trade policies are available, in the small-country model, a tariff is applied to satisfy the special interests, and the consumption policy is selected to restore domestic consumption efficiency. In the large-country model, the political equilibrium trade policy reflects special-interest as well as terms-of-trade considerations. The consumption policy not only allows the government to address consumption efficiency, but also to please the lobbies through its impact on the world price.

For both the small-country and large-country models, the outcomes obtained by Grossman and Helpman (1994, 1995) are shown to be special cases where the government has only trade instruments available.<sup>23</sup> Protection for organized industries will be higher when the government has both domestic and trade instruments available because this will allow the government to satisfy a particular lobby at a lower cost to the other lobbies and the average consumer than just trade policy. The Grossman-Helpman model cannot explain why governments might use less efficient trade policy to please special interests when it has more direct policies available.

This paper further shows that a well-known result about policy substitutability from normative trade theory also holds in the Grossman-Helpman framework: given the choice between a tariff, a production policy and a consumption policy in a traditional normative model, any one policy can be substituted by an equal rate combination of the other two. For example, production subsidies on one side or tariffs and consumption subsidies on the other side lead to the same domestic production and consumption prices. Thus, when for some reason the government is unable to apply production subsidies it can achieve the same results using a combination of consumption subsidies and import tariffs.

### ***1.4.3. Main Findings of Chapter 3***

When production or consumption of a good creates an environmental externality, the equilibrium policies in a small-country model can be expressed as the sum of distinct political support and environmental effects.

The political equilibrium version of Bhagwati's targeting principle now implies that governments use the most direct policy to address the environmental externality and to satisfy the industry lobbies respectively.<sup>24</sup> In the case of a negative production externality, production taxes that target the externality are counterbalanced by subsidies to please the lobbies. When production policies are available, there is no role for trade policies.<sup>25</sup> This chapter also addresses the question whether the action of organized polluting industries lead to higher or lower environmental quality than socially optimal. For a production externality, a sufficient condition for environmental quality to be lower than under a Pigouvian tax is that the marginal disutility from the externality does not decrease too fast in the output price. If this condition is not

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<sup>23</sup> Dixit (1996) comes to the same conclusion for the small-country model considering production taxes/subsidies together with consumption taxes/subsidies.

<sup>24</sup> Aidt (1997b) confirms that the targeting principle also holds when the government uses production and input policies to address a production externality and to satisfy industry (and environmental) lobbies.

<sup>25</sup> Throughout Chapters 3 and 4, the convention is used that when some industries are assumed to cause a production externality, the policy options considered are domestic production policies and/or trade policies. When a consumption externality is assumed, the policy options considered are domestic consumption policies and/or trade policies. This convention ensures that the available domestic policy alone would be the first best instrument in a Pigouvian sense. Policy substitutability options, as demonstrated in Chapter 2, are not explicitly characterized in the latter chapters.

satisfied, the lobbying activities of organized polluting industries might actually lead to higher environmental quality.

A second important finding of the analysis is that--in contrast to standard economic theory--it is generally ambiguous whether domestic policy alone or trade policy alone leads to higher environmental protection, when the government is restricted to use only one or the other. This result is demonstrated for the case of a negative production externality. Using a production *subsidy* incurs a lower deadweight loss than using a trade policy (an import tariff or an export subsidy) for any given *level of protection* for an organized industry. Conversely, using a production *tax* generates a lower deadweight loss than a trade policy (an import subsidy or export tax) for any given *level of the externality*. The *net* outcome from use of only production policy, compared to use of only trade policy, depends on the relative magnitudes of the political support and environmental effects on the political equilibrium policies. Hence, domestic policy will not always lead to higher environmental quality than trade policy.

Consumption policy alone, which does not affect producer prices in a small open economy, fails to give the government an instrument to satisfy industry lobbies. Hence, in the case of a consumption externality, the political equilibrium policy are standard Pigouvian consumption taxes when only consumption policy is available. If trade or production policy is also available, the political equilibrium interventions by the government are production-enhancing protection for organized industries, combined with consumer price policies that result in the same level of environmental quality as the Pigouvian tax. Thus, in the small-country model, when the government has only consumption policy or consumption and trade policy available, in the political equilibrium, environmental quality is the same as under the Pigouvian tax.

#### ***1.4.4. Main Findings of Chapter 4***

As for the large-country noncooperative scenario in Chapter 2, when there are no externalities, the results of Grossman and Helpman (1995) for the cooperative scenario are shown in Chapter 4 to be special cases that rest on the assumption that the governments have only trade policies available. Grossman and Helpman (1995) have also shown that, when governments negotiate over trade policies only, industry protection depends on the industry's political power compared to that of its counterpart abroad. Because of the market clearing condition, one industry will be better off and the other industry will be worse off than under free trade. The findings of this dissertation in contrast, indicate, that when production policies or consumption and trade policies are available, politically strong home and foreign industries can *both* enjoy substantial protection. When only consumption policies are available, support for an industry increases with the political power of the industry abroad, and the level of support for any given organized industry is identical in both countries.

The results demonstrate further that the political economy version of Bhagwati's (1971) targeting principle applies in the extended noncooperative scenarios of the large-country Grossman-Helpman model, and also in the cooperative scenarios. In the noncooperative scenario, when governments have both production and trade policies available and the production of a good causes a negative externality, governments use production subsidies to satisfy the lobbies, which are counterbalanced by environmental production taxes. Trade policy is used to exploit the terms of trade and--when the externality is global--to reduce production abroad by decreasing the world price.

In a large-country noncooperative normative model Krutilla has shown that the chosen production tax for a local production externality is higher than the standard Pigouvian tax if the country is an exporter because a production tax is also used to affect the terms of trade. The findings in Chapter 4 indicate that in a political equilibrium, the production tax can be lower than the Pigouvian tax since the government uses a production subsidy to satisfy organized producers.

For a negative consumption externality, when trade and consumption policies are available, trade policies are used to target the lobbies, to exploit international market power and--when the externality is global--to reduce consumption abroad. The consumption policy is applied to offset the distortions that are due to the political power of lobbies as well as to address the externality. Krutilla's normative analysis has shown that in a large-country noncooperative model the chosen environmental tax for a local consumption externality is higher than the standard Pigouvian tax if the country is an importer. Since in the political equilibrium the government uses a consumption subsidy to address the lobbies, the chosen consumption tax may be lower than the Pigouvian tax.

Similar to the small-country model of Chapter 3, noncooperative trade policy alone can lead to higher environmental quality than a more direct noncooperative domestic policy alone. Whether this is the case in the large-country model also depends on the terms-of-trade effect. The terms-of-trade effects from either a domestic or a trade policy both reinforce the environmental effects or both oppose the environmental effects. Since the relevant terms-of-trade effects for the trade policy and the domestic policy are evaluated at different points, no general conclusion can be drawn as to whether the terms-of-trade effect increases or decreases the chances that trade policy alone will lead to higher environmental quality than domestic policy alone. However, when the foreign import demand elasticity is constant, or when the equilibrium imports under the domestic and the trade policy are identical, the question can be answered. For a production externality, the terms-of-trade effect will increase (decrease) the chances that trade policy alone will lead to higher environmental quality than production policy alone when the good is exported (imported). For a consumption externality, the terms-of-trade effect will increase (decrease) the chances that trade policy alone will lead to higher environmental quality than consumption policy alone when the good is imported (exported).

In the cooperative scenario for a production externality, the political equilibrium policies are the same whether governments have only production policies or production policies together with trade policies available. Since cooperating governments no longer use their policies to manipulate the terms of trade, they apply production policies to satisfy the lobbies and to address a local or global production externality. Therefore, environmental protection will be lower than under a socially optimal cooperative tax, provided the marginal disutility from the externality does not decrease too fast in the output price.

Conversely, for a consumption externality, cooperating governments prefer to use both trade and consumption policies. Trade policies are applied to satisfy the lobbies while consumption policies address the distortions arising from the trade policies as well as the externality. In this case, environmental protection is the same as under a socially optimal tax and a local or global consumption externality is completely internalized. On the other hand, when only consumption policies are available to the cooperating governments, the equilibrium consumption externality will be higher than with the socially optimal tax, provided the marginal disutility from the externality does not decrease too fast in the consumption price. These results highlight the importance of allowing negotiations over domestic *and* trade policies in the case of local or global consumption externalities.

It is also shown in Chapter 4 that for a global production or consumption externality, when governments have only trade policies available, in the cooperative scenario, differences in industry protection across countries are only due to differences in the political strength of the lobbies. It is further demonstrated that, when countries have only consumption policy available, the cooperative policy outcomes for a global consumption externality are identical across countries. In contrast, for the noncooperative scenario, differences in industry protection, when there are production or consumption externalities arise from differences in political strength, and from differences in population size or environmental sensitivity across countries.

Since the equilibrium policies can only be determined implicitly for the general specification, it cannot be concluded whether cooperation leads to more or less industry support than noncooperation. Similarly, it cannot be inferred whether cooperation or noncooperation leads to higher environmental quality, or whether welfare-improving trade and environmental policy reforms are politically feasible, without further specifications. However, for specific functional forms, the political support effects, which will generally differ between noncooperation and cooperation, can be evaluated. Hence, using particular specifications, the “political economy” impact of whether trade negotiations lead to higher or lower environmental quality can be assessed.

## ***1.5. Conclusions and Areas for Further Research***

When there are negative externalities associated with production or consumption, governments use production subsidies to target lobbies and a production or consumption tax to address the externality. When production policy is not available, a combination of trade and consumption policy will mimic the production subsidy. When governments do not cooperate, trade policy is applied to manipulate the terms of trade for optimal-tariff reasons, and--when the externality is global--to reduce production or consumption abroad. When governments cooperate, the trade policy is no longer used for optimal-tariff reasons or to deal with externalities.

Whether actions of organized interest groups lead to higher or lower environmental quality than socially optimal might depend on what policies are available, whether the externality is caused by production or consumption, whether the country is small or large, whether governments cooperate or not, whether the good is imported or exported, and whether the externality is local or global. For example, in the small-country model, when consumption causes a local externality, and the government has consumption and trade policies available, the political equilibrium policies result in the same level of environmental quality as standard Pigouvian taxes. This result holds also for the large-country model, when governments cooperate and the consumption externality is local or global. For a local production externality, when production policy or production and trade policy are available, environmental quality will be lower than socially optimal in the small-country model and in the large-country model when governments cooperate, provided the marginal disutility from the externality does not decrease too fast in the output price. When only production policy is available and governments do not cooperate in the large-country model, whether a local consumption or local production externality is lower or higher than under a Pigouvian tax also depends on whether the good is exported or imported because the governments use their domestic policies to affect the terms of trade.

Another important finding of this dissertation is that it is generally ambiguous whether domestic policy or trade policy *alone* leads to higher or lower environmental protection. This result is in stark contrast to standard normative economic theory which suggests that trade policy unambiguously leads to lower environmental quality than a more direct domestic policy.

In evaluating these results, the Grossman-Helpman model and its extension herein may appear restrictive because of the underlying assumptions about production and preferences. However, the basic conclusions drawn about the political equilibrium choice of policies will hold for less restrictive specifications of supply and demand behavior. The assumed structures facilitate the derivation of implicit expressions for the equilibrium interventions, but comparable results can be derived for given parameterizations of more general functional forms.

The structure of the model developed herein is also flexible enough to accommodate a variety of modifications to provide further insight into the little-explored political economy of trade and environmental policies. For example, the production externality can be generated by an

input instead of an output, and the set of available policies can include input taxes and subsidies. Alternatively, organized environmental groups making contributions to the government can compete with organized industries for environmental protection versus higher profits.

In another dimension, political equilibrium policies could be analyzed in an extensive form game, where--instead of setting domestic and trade policies simultaneously--one policy is chosen before the other. The outcome would depend on the order in which policies are chosen. This extension would provide further insight into the strategic aspects of international negotiations over domestic environmental and trade policies.

This dissertation shows that the Grossman-Helpman model itself cannot explain why governments might prefer less efficient policies, like trade policies, to transfer income to lobbies when other more direct policies, like production subsidies, are also available. The question then arises of why inefficient policies might be the focus in a political equilibrium in the Grossman-Helpman framework. In this model, whether the lobbies prefer more efficient instruments depends on the degree of competition between organized interest groups. Grossman and Helpman (1994) demonstrate that if there is only one lobby, it has all of the power in its relation with the government and will extract the entire surplus from their joint decisions. If there are many lobbies, the government can pit them against one another and collect more contributions. In equilibrium, the payments of lobby  $i$  must match the difference between what the government and the other lobbies would jointly accomplish if lobby  $i$  decided not to contribute, and what the government and the other lobbies receive in equilibrium. With more efficient instruments the joint surplus of the government and the rival lobbies will be higher, and each lobby  $i$  will have to pay more. So the lobbies might be better off if they could credibly commit to confine their lobbying to less efficient instruments.<sup>26</sup> The policies available could be interpreted as the equilibrium outcomes of a game that is played between the government and the interest groups prior to the game considered here. Within the trade and environment complex, the model could explain why an organized polluting industry together with an environmental group might prefer trade policies, while each group by itself would prefer more efficient policies. The use of trade policies in the context of production externalities could then be explained by industry and environmental groups colluding to lobby only for trade policies.

The basic Grossman-Helpman model implies that the government directly grants favors to lobbies in return for their contributions. Of course, in most countries this is an illegal practice. A more realistic approach might be to model the contributions as a means to buy "access" to the government. Higher contributions by some lobby will then increase the probability that a favorable policy for that lobby will be implemented. Extending the framework in that direction appears a potentially fruitful avenue for future research, and might help explain why governments prefer less efficient policies.

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<sup>26</sup> See also Dixit, Grossman and Helpman (1997) on the use of efficient instruments in the Grossman-Helpman model.

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