CHAPTER 2

EFFICIENT CHOICE AMONG DOMESTIC AND TRADE POLICIES IN THE GROSSMAN-HELPMAN INTEREST-GROUP MODEL

2.1. Introduction

The traditional normative approach to policy-making features a benevolent government choosing policy instruments to maximize a social welfare function. The positive counterpart to this approach explicitly models policies as the equilibrium outcomes of political processes. This theory of political economy has frequently been applied to explain why international trade policies hardly follow recommendations from normative economic analysis (for example Findlay and Wellisz 1982, Mayer 1984, Magee, Brock and Young 1989, Hillman and Ursprung 1988, see Rodrik 1995 for an overview).

In two recent papers, Grossman and Helpman (1994, 1995) develop innovative political economy models for small and large open economies. In their models, some owners of sector-specific inputs are represented by organized interest groups. These lobbies make contributions to the government in order to influence its policy stance. In deriving lobbies' contribution schedules, which map each feasible policy vector into a payment level, Grossman and Helpman explicitly characterize the demand side for protection. The government is assumed to maximize a weighted sum of total contributions and average consumer welfare. Taking the contribution schedules as given, it decides on the levels of trade policies, that is on the supply of export or import taxes and subsidies.

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. 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, Grossman and Helpman derive the levels of intervention in the political equilibrium.[26]

Like most other approaches in the literature on endogenous trade policy, Grossman and Helpman *a priori* restrict the domain of policy interventions available to the government to trade instruments. In equilibrium, tariffs and export subsidies make domestic producers better off, while unorganized industries face import subsidies and export taxes. This set of policies may not always be available--as in the United States where the Constitution prohibits export taxes.

Moreover, the trade policies are inefficient measures to redistribute income to organized producers. Even in the absence of lump-sum transfers, the government could choose a domestic instrument, if it were available, that resulted in lower deadweight losses than trade interventions. Thus, the political equilibrium trade policies derived by Grossman and Helpman might not hold in a more general framework where the government has both domestic and trade policies available. Instead, the structure of protection will depend on the set of instruments the government has at hand.

In one innovation within the Grossman-Helpman framework, Dixit (1996) allows two sets of instruments, production and consumption taxes or subsidies, in a small open economy model. Production efficiency is desirable in the normative theory of commodity taxation when the government can choose production or consumption taxes (or subsidies) on all commodities. For a small open economy, domestic producers should receive world prices, while domestic consumer prices deviate. Dixit shows that the political equilibrium policies violate production efficiency since they generally include production subsidies to satisfy the lobbies.

In a second innovation, Dixit, Grossman and Helpman (1997) also use a positive model of public finance for a small open economy. The available policies include lump-sum taxes or subsidies and utility is not confined to be transferable across individuals. Dixit, Grossman and Helpman show that (globally) truthful strategies achieve an efficient outcome of the menu auction for the more general specification of preferences. In their model, choice implies that in equilibrium only the non-distorting lump-sum transfers are applied.

[26] Following Bernheim and Whinston, Grossman and Helpman (1994) select a truthful Nash equilibrium, where the lobbies play globally truthful strategies, bidding exactly their willingness to pay for a change in the government's actions. That is the shapes of the contribution schedules reveal the lobbies' preferences everywhere, not just at the equilibrium point. Bernheim and Whinston have shown that for quasi-linear preferences, which imply transferable utility across individuals, truthful strategies achieve an efficient outcome of the menu auction. Among the available instruments, equilibrium policies are selected Pareto-efficiently for the government and the organized interest groups. In the Grossman-Helpman model, in particular, since average welfare appears in the government's objective function, Pareto-efficient choices are made for the entire polity, not just for the active players. See also Corollary 2 to Proposition 5 in Dixit, Grossman and Helpman.

This paper generalizes the results of Helpman and Grossman in a third direction. The political equilibrium policies are analyzed when the government has either production or consumption taxes and subsidies available together with trade policies. The trade policy instruments are assumed to consist of taxes and subsidies on exports and imports while lump-sum transfers are, as in Grossman and Helpman or Dixit, not allowed.

In general, the results demonstrate that Bhagwati's (1971) 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 the government has production and trade policies available in a small-country model, the government applies production policies only, while consumers pay world prices. Consumption policies by themselves fail to provide an instrument the government can use to favor the organized lobbies in exchange for contributions, but a combination of consumption and trade policies is chosen when both are available. Tariffs that serve the interest of lobbies are offset by subsidies at the consumer level, whereas unorganized import-competing industries face import subsidies and consumption is taxed. The political equilibrium domestic prices are the same as with production policies alone.

The political equilibrium policies in the large-country model are a combination of production and trade interventions, or alternatively consumption and trade interventions, to favor lobbyists and exploit international market power. If production subsidies are available, they are used to serve the lobbies, while trade policies take on the role of optimal tariffs (and export taxes). When consumption and trade policies are available, the equilibrium trade policies reflect special-interest as well as terms-of-trade considerations. The equilibrium consumption policies are used not only to address consumer efficiency but also to please the lobbies through their impacts on world prices. For both the small-country and large-country models, the outcomes obtained by Grossman and Helpman are special cases where trade policies are the only instruments available. Protection is higher for the organized industries with more policy instruments because satisfying the special interests of any particular lobby come at less costs to the other lobbies and average welfare.

2.2. Small Open Economy: Production and Trade Policies

The model is based on Grossman and Helpman (1994), and the exposition follows partially Dixit. In total, there are (n + 1) goods in the economy where good 0 is the numeraire with world and domestic prices equal to one. Since this is a small open economy, the vector of world prices, $p^w = (p_1^w , p_2^w ,....., p_n^w)$, for all nonnumeraire goods is exogenous and constant.

All goods are produced with constant returns to scale. The numeraire good is made from labor alone, such that one unit of labor produces one unit of output. The constant marginal product of labor in this sector fixes the wage rate for the entire economy at unity. All other

goods are produced from labor and one inelastically supplied specific input, with constant returns to scale but diminishing returns to labor. Each individual supplies one unit of labor and owns at most one specific factor.

The production structure leads to (aggregate) quasi-rents $\Pi_i(p_i^s)$ to the specific factor in industry i that only depend on the price received by producers p_i^s. Owners of the specific factor in the production of good i have an incentive to lobby for policies that raise p_i^s because a higher price increases their rents. Hotelling's Lemma provides the supply of industry i, $X_i(p_i^s) = \Pi_i'(p_i^s)$.

On the demand side, the population of N residents in the home country provide a total labor supply l and have identical, additively separable preferences and maximize $u = c_0 + \sum_{i=1}^{n} u_i(c_i)$, where c_0 is the consumption of the numeraire good, and c_i is the consumption of good i. Further assume that $u_i' > 0$, $u_i'' < 0$, and $u_i'(0) \to \infty$. The consumer price vector is denoted $p^d = (p_1^d, p_2^d, ..., p_n^d)$. All individuals have the same marginal utility of income equal to one. The quasi-linear preferences lead to ordinary demand functions that depend only on their own prices $d_i(p_i^d)$ and the indirect utility level can be expressed as $v(p^d, y) = y + s(p^d)$, where y represents individual income and $s(p^d) = \sum_i u_i[d_i(p_i^d)] - \sum_i p_i^d d_i(p_i^d)$ is individual consumer surplus from nonnumeraire goods. Individual demands are derived from Roy's Identity, $d_i(p_i^d) = -\frac{\partial s(p^d)}{\partial p_i^d}$.

The government can impose ad valorem production policies τ_i and trade policies θ_i on any of the nonnumeraire goods. The domestic measures drive a wedge between the prices that consumers and producers face and the trade interventions separate domestic consumer and world prices. Supply and demand price equilibria for good i require $p_i^s = \frac{\theta_i}{\tau_i} p_i^w$ and $p_i^d = \theta_i p_i^w$. respectively. A production tax implies $\tau_i > 1$, while a production subsidy requires $\tau_i < 1$. For the trade instruments, an import tariff or an export subsidy implies $\theta_i > 1$, while an import subsidy or an export tax requires $\theta_i < 1$, depending on whether the home country is an exporter or importer of good i.

The net revenue of the government is generated by its domestic and trade policies. The use of lump sum taxes or subsidies as separate policy instruments is ruled out by assumption, but the government's net revenue is redistributed evenly on a per-capita basis. Proceeds are derived from output and export taxes and from import tariffs, while expenditures are made for output, import, and export subsidies. The policy vector (τ, θ) generates net per-capita transfer

$$(1) \quad r(\tau,\theta) = \sum_{i=1}^{n} p_i^s(\tau_i - 1)\tfrac{1}{N} X_i(p_i^s) + \sum_{i=1}^{n} p_i^w(\theta_i - 1)[d_i(p_i^d) - \tfrac{1}{N} X_i(p_i^s)].$$

The first summation in (1) adds up the receipts and outlays from domestic policies and the second expression captures the net revenue from trade policies. For simplicity, the population size is normalized to one (N≡1). Contributions received by the government from organized interest groups are not part of the per-capita transfer (1). Instead, as Dixit, Grossman, and Helpman explain, "they might be used by the governing party for its reelection campaign, or by a governing dictator for his own consumption."

Following Grossman and Helpman, some interest groups are assumed to overcome the free-rider problem (Olson, 1965) and organize themselves in order to affect government policies. The set of organized interest groups is exogenous and denoted L. Each organized interest group represents one of the n sector-specific factors and offers the government a *contribution schedule* that maps every policy vector into a non-negative campaign contribution level. Lobbies are assumed to credibly commit to their actions or write binding contracts. The government then chooses policies to maximize its objective. In the models herein, the government chooses two policy vectors, θ and τ, and the lobbies condition their contributions on both sets of instruments. Like Grossman and Helpman, the analysis is based on Bernheim and Whinston who model the lobbies' and government's behavior as a menu auction in a common agency game.

Equilibrium

In the first stage of this two-stage noncooperative game, lobbies simultaneously set their contribution schedules as functions of domestic and trade policies $C_i(\tau,\theta)$. In the second stage, the government chooses both policies simultaneously. The political equilibrium consists of a set of feasible contribution functions $\{C_i^0\}_{i\in L}$ and the policy vectors (τ^0,θ^0).

Starting with the second stage, the government is assumed to maximize the weighted sum of total contributions and total consumer welfare $W(\tau,\theta)$

$$(2) \quad G = \sum_{i\in L} C_i(\tau,\theta) + aW(\tau,\theta),$$

where the coefficient *a* captures the trade-off between contributions and total consumer welfare as perceived by the government.[27] Total consumer welfare consists of the sum of total labor income, total profits, net government revenue, total consumer surplus, and the total utility derived from environmental quality. Thus

[27] In a model of political competition between two parties contending for seats in a legislature, and where lobbies use contributions to affect the outcome of the elections, Grossman and Helpman (1996) show that each party behaves as if it maximizes an objective function like (2).

(3) $W(\tau,\theta) \equiv l + \sum_{i=1}^{n} \Pi_i(p_i^s) + r(\tau,\theta) + s(p^d)$

In the first stage of the game, each lobby i chooses its contribution schedule to maximize the (aggregate) net welfare of its members

(4) $W_i(\tau,\theta) - C_i(\tau,\theta) \equiv l_i + \Pi_i(p_i^s) + [r(\tau,\theta) + s(p^d)] - C_i(\tau,\theta),$

where l_i is the (aggregate) labor income of members of lobby i. Necessary conditions for a subgame-perfect equilibrium are[28]

i) C_i^0 is feasible for all $i \in L$,
that is, contribution schedules must be non- negative and cannot exceed aggregate income of each lobby;

ii) (τ^0, θ^0) maximizes (2),
that is, given the lobbies' contribution schedules, the equilibrium policies must maximize the government's objective function; and

iii) (τ^0, θ^0) maximizes

(5) $W_i(\tau,\theta) - C_i^0(\tau,\theta) + \sum_{j \in L} C_j^0(\tau,\theta) + aW(\tau,\theta),$ for all $i \in L$,

that is, the equilibrium policies must maximize the sum of any lobby i's net welfare and the government's objective function, given the payments of all other lobbies.

If condition (iii) was violated for any lobby i, it could modify its contribution schedule so that the government selected a more favorable policy vector and the surplus from such a switch could be shared by the lobby and the government. Thus, a policy that violates (iii) could not have been an equilibrium.

As in Grossman and Helpman (1994), assume that the equilibrium is interior and that contribution schedules are differentiable around the equilibrium point. Taking the first-order conditions for (2) and (5), and combining terms yields

(6) $\nabla_\beta C_i^0(\tau^0,\theta^0) = \nabla_\beta W_i(\tau^0,\theta^0)$, for $\beta = \tau, \theta$ and for all $i \in L$.

[28] See Proposition 1 in Grossman and Helpman (1994) for all necessary and sufficient conditions.

The operator ∇ denotes the gradient vector of the partial derivative with respect to the β. Equation (6) requires that the marginal change in payments to the government for a small change in the policy vector has to equal the marginal change in lobby i's gross welfare. In other words, the shapes of the contribution schedules reveal the lobbies' true preferences around the equilibrium point; the contribution schedules are *locally truthful*.[29]

Summing equation (6) over all i and then substituting into the first-order condition of the government's objective function(2) yields

$$(7) \quad \sum_{i \in L} \nabla_{\beta} W_i(\tau^0, \theta^0) + a \nabla_{\beta} W(\tau^0, \theta^0) = 0.$$

Equation (7) is the first-order condition for maximizing the sum of the lobbies' net welfare, and the government's objective.

From the first-order conditions (7), using Hotelling's and Roy's rules, and collecting terms yields for the interventions in industry i

$$(8a) \quad (\tau_i - 1) = -\frac{(I_{iL} - \alpha_L)}{(a + \alpha_L)} \frac{X_i}{p_i^s X_i'} + (\theta_i - 1) \frac{p_i^w}{p_i^s}$$

$$(8b) \quad (\theta_i - 1) = -\frac{(I_{iL} - \alpha_L)}{(a + \alpha_L)} \frac{X_i}{\tau_i p_i^w M_i'} - (\tau_i - 1) \frac{p_i^s X_i'}{\tau_i p_i^w M_i'},$$

where $\alpha_L = \sum_{i \in L} \alpha_i$ for $i \in L$ is the exogenous share of the population that is organized, $I_{iL} = 1$ for $i \in L$ and zero otherwise, and $M_i' = d_i' - X_i'/\tau_i$ is the derivative of domestic import demand. The system of equations (8) implicitly determines the political equilibrium levels of τ_i and θ_i

[29] Local truthfulness suffices to characterize the structure of protection. Since this game in principle has multiple Nash-equilibria, one has to be selected to determine lobbies' payments in equilibrium. Grossman and Helpman (1994) choose the truthful equilibrium, in which contribution schedules correctly reflect the lobbies' preferences globally, not just around the equilibrium point. In the truthful equilibrium, each lobby pays to the government for any policy vector (τ,θ) the excess of lobby i's gross welfare at (τ,θ) relative to some base level of welfare (Grossman and Helpman 1994, p. 840). A truthful equilibrium may be focal among the set of Nash equilibria for two reasons: (1) it is coalition-proof, that is it is stable to nonbinding communication among the lobbies, and (2) it is efficient for the strategic players, that is, given the available policy instruments no feasible Pareto superior outcome exists for the government and the organized interest groups (for discussion, see Bernheim and Whinston, for quasilinear preference, and Dixit, Grossman and Helpman, for more general preferences). In the Grossman-Helpman political economy model, since total welfare appears in the government's objective function, efficient choices are made at the truthful equilibrium not just for the strategic players but for the entire polity (see Corollary 2 to proposition 5 in Dixit, Grossman and Helpman).

$$(9a) \quad (\tau_i - 1) = -\frac{(I_{iL} - \alpha_L)}{(a + \alpha_L)} \frac{X_i}{p_i^s X_i'} = -\frac{(I_{iL} - \alpha_L)}{(a + \alpha_L)} \frac{1}{\varepsilon_{X_i, p_i^s}}$$

where ε_{X_i, p_i^s} is the elasticity of domestic output supply, and

$$(9b) \quad (\theta_i - 1) = 0 .$$

The political equilibrium where the government can use production and trade policies involves only production and no trade instruments.[30] For $\alpha_L < 1$, the equilibrium policy will be an output subsidy if industry i is organized (I_{iL}= 1) and a tax if it is not (I_{iL}= 0). The government is interested in providing lobbies with higher producer prices, since income from ownership of specific factors is the only difference between a lobby member's welfare and average welfare. In order to satisfy the lobbies, the government sacrifices production efficiency and grants a production subsidy if the industry is organized, while taxing unorganized industries. Applying production subsidies is more efficient than trade restrictions because the latter would also distort domestic consumption.

Since all members of organized industries j $\in$ L , with j $\neq$ i, will bid against protection of sector i, protection for industry i decreases with α_L, the share of the population that is organized. There will be no intervention in any market when either the government weighs total welfare infinitely high ($a \to \infty$), the entire economy is organized ($\alpha_L = 1 = I_{iL} \ \forall i$), nobody is organized ($\alpha_L = 0 = I_{iL} \ \forall i$), or the elasticity of domestic output supply is infinite ($\varepsilon_{X_i, p_i^s} \to \infty$).

In general, protection for industry i decreases with α_L, the degree of organization, with *a*, the weight the governments puts on average consumer welfare, and with ε_{X_i, p_i^s} reflecting the deadweight loss associated with the production distortion.

The case where the government has only production instruments available can be analyzed using equation (8a) and setting the ad valorem trade policy θ_i equal to one. The political equilibrium production policy is the same as when the government's set of available policies also includes trade instruments.

Setting the ad valorem production measure τ_i in equation (8b) equal to one yields the political equilibrium trade policies for the small-country model when production policies are not available. The result is

[30] In Dixit (1996), where the set of available instruments are production and consumption policies only, preferences of specific-factor owners and of the average consumer are generally allowed to differ. Equations (9) are the same as in the Dixit model, when preferences are identical.

$$(10)\quad (\theta_i - 1) = -\frac{(I_{iL} - \alpha_L)}{(a + \alpha_L)} \frac{X_i}{p_i^w M_i'} \ ,$$

which is the same as in Grossman and Helpman (1994).[31] Thus, the political equilibrium policies in Grossman and Helpman hold only in the special case where trade policies are the only instrument.

To compare the levels of protection when the government is restricted to trade policies to the levels where production and trade policies are available, assume that the industry is organized and import competing. Protection is measured by the price domestic producers receive. Since a production subsidy generates less deadweight loss than an import tariff to provide the same level of protection, it will lead to a smaller loss in support from the other lobbies and the average consumer. Thus, in the political equilibrium, the government can provide organized domestic producers with a higher price when it has production policies available.[32]

2.3. Small Open Economy: Consumption and Trade Policies

Suppose, the government has only consumption taxes or subsidies and trade policies at hand. The ad valorem consumption policies drive a wedge between the prices that consumers and producers face, and the trade measure separates domestic producer and world prices. The price equilibrium conditions for the supply and demand of good i are now $p_i^s = \theta_i p_i^w$ and $p_i^d = \tau_i \theta_i p_i^w$. A consumption tax implies $\tau_i > 1$, while a consumption subsidy requires $\tau_i < 1$.

As in the previous model, an import tariff or an export subsidy implies $\theta_i > 1$, while an import subsidy or an export tax requires $\theta_i < 1$. The policy vector (τ, θ) now generates net per-capita transfer

---

[31] Note that equation (10) can also be expressed as $\frac{(\theta_i - 1}{\theta_i} = -\frac{(I_{iL} - \alpha_L)}{(a + \alpha_L)} \frac{X_i}{M_i} \frac{1}{\varepsilon_i}$. Thus protection can be expressed in terms of the export-import ratio and the elasticity of home import demand or export supply ε_i.

[32] To show this result, it is convenient to use the fact (established in the next section) that the political equilibrium combination of consumption subsidies and import tariffs (given by equations (13)) leads to the same domestic prices as the production subsidy of equation (9a). Denoting the output price for the scenario with consumption subsidies and import tariffs as $p_i^{s\gamma}$, the claim is that $p_i^{s\gamma} > p_i^{s\theta}$, or, equivalently, $\theta_i^{\gamma} > \theta_i^{\theta}$. Suppose the opposite is true, that is the tariff is lower when the government uses a consumption subsidy in addition to the import tariff. Eliminating the consumption subsidy must then lead to an increase in the tariff such that $\theta_i^{\gamma} = \theta_i^{\theta}$. However, equation (12a) implies that the optimal reaction to an increase in the tariff is an increase in the consumption subsidy, which is a contradiction to the assumption that $\theta_i^{\gamma} < \theta_i^{\theta}$. Equations (10) and (13b) lead to a contradiction if it is assumed that $\theta_i^{\gamma} = \theta_i^{\theta}$. Thus, $\theta_i^{\gamma} > \theta_i^{\theta}$.

$$(11) \quad r(\theta,\tau) = \sum_{i=1}^{n} p_i^s(\tau_i - 1)d_i(p_i^d) + \sum_{i=1}^{n} p_i^w(\theta_i - 1)[d_i(p_i^d) - X_i(p_i^s)].$$

The first term on the right-hand side captures the net revenue from the consumption interventions and the second term from trade policies. Using the same approach as before, the first-order conditions for the equilibrium interventions are

$$(12a) \quad (\tau_i - 1) = -\frac{(\theta_i - 1)}{\theta_i}$$

$$(12b) \quad (\theta_i - 1) = -\frac{(I_{iL} - \alpha_L)}{(a + \alpha_L)} \frac{X_i}{p_i^w M_i'} - (\tau_i - 1)\frac{p_i^d d_i'}{p_i^w M_i'},$$

where the derivative of domestic import demand is now $M_i' = \tau_i d_i' - X_i'$.

Solving the system of equations (12) gives implicit expressions for the political equilibrium levels of τ_i and θ_i

$$(13a) \quad (\tau_i - 1) = -\frac{(I_{iL} - \alpha_L)}{(a + \alpha_L)} \frac{X_i}{p_i^s X_i'} = -\frac{(I_{iL} - \alpha_L)}{(a + \alpha_L)} \frac{1}{\varepsilon_{X_i, p_i^s}}$$

$$(13b) \quad (\theta_i - 1) = \frac{(I_{iL} - \alpha_L)}{(a + \alpha_L)} \frac{X_i}{p_i^w X_i'}.$$

The political equilibrium where the government can use consumption taxes and trade instruments involves both sets of policies. If industry i is organized, the equilibrium trade policy will be an import tariff or an export subsidy depending on whether good i is imported or exported. It will be an import subsidy or an export tax if industry i is not organized. As before, protection for industry i decreases with the degree of organization, with the weight the government puts on the welfare of the average consumer, and with the elasticity of domestic output supply.

The equilibrium consumption measure will be a subsidy if industry i is organized and a tax if it is not. However, equation (12a) reveals that the consumption measure is not used to satisfy organized interest groups. No term reflecting the political support effect appears in this equation. The government only applies the consumption policy to counterbalance the distortions arising from the trade instrument. This allows it to provide protection to organized interest groups, while ensuring that domestic consumers face world prices.

In the small-country model, the government has no instrument to address the special interests of lobbies when only consumption policies are available. Consumption policies will not

affect domestic output prices, so their impact on the welfare of lobby members is exactly the same as on the welfare of the average consumer. A consumption intervention will lead to a deadweight loss and no interest group is willing to offer positive contributions to the government to make consumption prices deviate from world prices. Thus, the government has no incentive to manipulate the consumer price of any good. When the government is confined to the use of trade instruments, however, equation (12b) becomes the same as equation (10), which is the structure of protection in Grossman and Helpman (1994).

Given the choice between a tariff, a production and a consumption policy in a traditional normative model, any one policy can be substituted by an equal rate combination of the other two. Equations (9a) and (13) together with the respective price equilibria conditions establish this result in the Helpman-Grossman framework. 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.[33]

2.4. Large Open Economy: Production and Trade Policies

As in Grossman and Helpman's (1995) 'trade wars' scenario, in the large-country model herein there are two countries, home and foreign, whose governments noncooperatively and simultaneously set their policies. Since the structure of the economies and the political systems are similar in both countries, the exposition will focus on the home country, while variables and parameters associated with the foreign country will be denoted with an asterisk (*). The choice among domestic and trade policy instruments in the large-country model has to take into account, that the world price is no longer fixed but can be affected by both types of interventions. In particular, differentiating the price equilibrium conditions for the scenario where production and trade policies are available, $p_i^s = \frac{\theta_i}{\tau_i} p_i^w$ and $p_i^d = \theta_i p_i^w$, yields

$$(14) \quad \frac{\partial p_i^s}{\partial \tau_i} = \frac{\partial p_i^w}{\partial \tau_i} \frac{\theta_i}{\tau_i} - \frac{p_i^w \theta_i}{\tau_i^2}$$

[33] It is straightforward to show that the equivalence of production and consumption taxes or subsidies in a closed economy without interest groups also holds in the Grossman-Helpman model. Independent of whether consumption or production is taxed (subsidized), for a closed economy the political equilibrium policies are given by $(\tau_i - 1) = -\frac{(I_{iL} - \alpha_L)}{(a + \alpha_L)} \frac{1}{\varepsilon_{x_i,p}}$.

The equivalence of consumption and production policies carries over to the small-country model, when the government also has trade policies at hand (as pointed out above, the relevant expressions in (9a) and (13a) are evaluated at identical points), but the equivalence breaks down when there are only production or consumption policies.

$$\frac{\partial p_i^d}{\partial \tau_i} = \theta_i \frac{\partial p_i^w}{\partial \tau_i}$$

$$\frac{\partial p_i^s}{\partial \theta_i} = \frac{1}{\tau}(\theta_i \frac{\partial p_i^w}{\partial \theta_i} + p_i^w)$$

$$\frac{\partial p_i^d}{\partial \theta_i} = \theta_i \frac{\partial p_i^w}{\partial \theta_i} + p_i^w$$

The world market equilibrium condition for good i, $d_i(\theta_i p_i^w) - X_i(\frac{\theta_i p_i^w}{\tau_i}) = -[d_i^*(\theta_i^* p_i^{d*}) - X_i^*(\frac{\theta_i^* p_i^w}{\tau_i^*})]$ implicitly determines the equilibrium world price of good i as a function of domestic and foreign policies $p_i^w = p_i^w(\tau_i, \tau_i^*, \theta_i, \theta_i^*)$. Total differentiation of the market equilibrium condition yields

$$(15a) \quad \frac{\partial p_i^w}{\partial \tau_i} = -\frac{(X_i' \; {}^{\theta_i}\!/\!_{\tau_i^2}) p_i^w}{\theta_i\left(d_i' - {}^{X_i'}\!/\!_{\tau_i}\right) + \theta_i^*\left(d_i'^* - {}^{X_i'^*}\!/\!_{\tau_i^*}\right)}$$

$$(15b) \quad \frac{\partial p_i^w}{\partial \theta_i} = -\frac{(d_i' - {}^{X_i'}\!/\!_{\tau_i}) p_i^w}{\theta_i\left(d_i' - {}^{X_i'}\!/\!_{\tau_i}\right) + \theta_i^*\left(d_i'^* - {}^{X_i'^*}\!/\!_{\tau_i^*}\right)}.$$

Following Grossman and Helpman (1995) it is assumed that lobbies can only influence the policies in their own country. So, the home (foreign) lobbies' contribution schedules are contingent on the home (foreign) policies only.

Taking into account equations (14) and (15), and otherwise applying the same procedure as before, when domestic production and trade policies are available to the government, the set of first-order conditions can be derived as

$$(16a) \quad (\tau_i - 1) = -\frac{(I_{iL} - \alpha_L)}{(a + \alpha_L)} \frac{X_i}{p_i^s X_i'} + \frac{M_i}{p_i^s(\theta_i d_i' + \theta_i^* M_i'^*)} + (\theta_i - 1)\frac{p_i^w \theta_i^* M_i'^*}{p_i^s(\theta_i d_i' + \theta_i^* M_i'^*)}$$

$$(16b) \quad (\theta_i - 1) = -\frac{(I_{iL} - \alpha_L)}{(a + \alpha_L)} \frac{X_i}{p_i^w \tau_i M_i'} - \frac{M_i}{p_i^w \theta_i^* M_i'^*} - (\tau_i - 1)\frac{p_i^s X_i'}{\tau_i p_i^w M_i'},$$

where $M_i' = d_i' - {}^{X_i'}\!/\!_{\tau_i}$ and $M_i'^* = d_i'^* - {}^{X_i'^*}\!/\!_{\tau_i^*}$ are the derivatives of home and foreign import demand.

Equations (16) implicitly determine the political equilibrium levels of τ_i and θ_i

$$(17a) \quad (\tau_i - 1) = -\frac{(I_{iL} - \alpha_L)}{(a + \alpha_L)} \frac{X_i}{p_i^s X_i'} = -\frac{(I_{iL} - \alpha_L)}{(a + \alpha_L)} \frac{1}{\varepsilon_{X,p_i^s}}$$

$$(17b) \quad (\theta_i - 1) = -\frac{M_i}{p_i^w \theta_i^* M_i'^*} = \frac{1}{\varepsilon_i^*},$$

where ε_i^* is the elasticity of foreign output supply. Equations (17) together with their foreign counterparts determine the political equilibrium levels for domestic and trade instruments.

The equilibrium outcomes will be a production subsidy if the industry is organized and a tax if it is not. Unlike in the small-country model, the government uses both production and trade instruments when the country has market power. While the subsidies and taxes have the same structure as in the small-country model, their levels are generally not the same, since the expressions in (9a) and (16a) are evaluated at different points.

Independent of whether the industry is organized or not, the political equilibrium trade policy is an import tariff or an export tax. Since the country is large, it uses its trade measures to affect the terms of trade in its favor and equation (17b) is just the formula for the optimal tariff. Thus, when the government can use both production and trade policies, it uses the production policy to satisfy the organized industries and the trade policy to exploit its market power.

The case where the government has only production policies available can be analyzed using equation (16a) and setting the ad valorem tariff θ_i equal to one. This yields

$$(18a) \quad (\tau_i - 1) = -\frac{(I_{iL} - \alpha_L)}{(a + \alpha_L)} \frac{X_i}{p_i^s X_i'} + \frac{M_i}{p_i^s (d_i' + M_i'^*)}.$$

In this case, the output tax or subsidy consists of two terms. The first term reflects the impact of the lobby groups and the second term reflects the terms-of-trade effect. The latter captures the price-responsiveness of composite demand and takes on a positive (negative) value if the home country exports (imports) good i.

When the government is restricted to trade policies, equation (16b) becomes

$$(18b) \quad (\theta_i - 1) = -\frac{(I_{iL} - \alpha_L)}{(a + \alpha_L)} \frac{X_i}{p_i^w M_i'} - \frac{M_i}{p_i^w \theta_i^* M_i'^*}$$
$$= -\frac{(I_{iL} - \alpha_L)}{(a + \alpha_L)} \frac{X_i}{p_i^w M_i'} + \frac{1}{\varepsilon_i^*},$$

which is the structure of protection in Grossman and Helpman (1995). Thus, the political equilibrium trade policies for a large-country as derived by Grossman and Helpman also emerge as a special case where the government is restricted to trade policies.

2.5. Large Open Economy: Consumption and Trade Policies

Suppose the government of a large country has a choice between consumption and trade policies. Using the same procedure as before, the set of first-order conditions are

$$(19a)\quad (\tau_i - 1) = -\frac{(I_{iL} - \alpha_L)}{(a + \alpha_L)} \frac{X_i}{p_i^w(\theta_i X_i' - \theta_i^* M_i'^*)} + \frac{M_i}{p_i^w \theta_i (\theta_i X_i' - \theta_i^* M_i'^*)} + (\theta_i - 1)\frac{\theta_i^* M_i'^*}{\theta_i(\theta_i X_i' - \theta_i^* M_i'^*)}$$

$$(19b)\quad (\theta_i - 1) = -\frac{(I_{iL} - \alpha_L)}{(a + \alpha_L)} \frac{X_i}{p_i^w M_i'} - \frac{M_i}{p_i^w \theta_i^* M_i'^*} - (\tau_i - 1)\frac{p_i^d d_i'}{p_i^w M_i'},$$

where now $M_i' = d_i'\tau_i - X_i'$ and $M_i'^* = d_i'^*\tau_i^* - X_i'^*$. In contrast to the small-country model, for a large country the consumption measure is not only used to alleviate the distortionary effects of the trade policy, but also to satisfy the lobbies through its impact on the terms of trade. The first term on the RHS of equation (19a) reflects this political effect and yields a consumption subsidy if industry i is organized. Unlike in the small-country model, the consumption subsidy now raises the price that domestic producers receive.

Equations (19) simultaneously determine the equilibrium levels of τ_i and θ_i, which are implicitly given by

$$(20a)\quad (\tau_i - 1) = -\frac{(I_{iL} - \alpha_L)}{(a + \alpha_L)} \frac{X_i}{p_i^s X_i'} = -\frac{(I_{iL} - \alpha_L)}{(a + \alpha_L)} \frac{1}{\varepsilon_{X_i, p_i^s}}$$

$$(20b)\quad (\theta_i - 1) = \frac{(I_{iL} - \alpha_L)}{(a + \alpha_L)} \frac{X_i}{p_i^w X_i'} + \frac{1}{\varepsilon_i^*}.$$

As in the small-country model, the government's equilibrium choice comprises a combination of domestic and trade instruments. The equilibrium consumption policy has the same structure, the levels however are generally different. Depending on whether industry i is organized or not, the domestic policy will be a consumption subsidy or a tax.

The equilibrium trade policy consists of two parts. The first part of (20b) reflects the impact of the lobby groups and represents an import tariff or an export tax. It is the same expression as in the small-country model. In addition, the second part reflects terms-of-trade considerations.

In the small-country model, the government relies on the consumption policy to equalize domestic consumer prices and world prices to exactly offset the distortionary impact of the trade policy on consumption. Equations (20) together with the price equilibrium conditions indicate that this result does not hold when the country has market power. World and domestic consumer prices differ when the country exploits its market power to manipulate the terms of trade. However, as in the small-country model, the equilibrium mix of consumption and trade policies in the large-country model will generate the same domestic prices as the combination of production and trade policies.

Next, consider the cases where the government has only one type of policies available. Equation (19a) can be used to analyze the optimal policy when the government has only consumption measures at hand

$$(21a) \quad (\tau_i - 1) = -\frac{(I_{iL} - \alpha_L)}{(a + \alpha_L)} \frac{X_i}{p_i^w (X_i' - M_i'^*)} + \frac{M_i}{p_i^w (X_i' - M_i'^*)}.$$

In this case the consumption tax or subsidy consists of two parts. The first part captures the impact of the lobby groups. In the large-country case, a consumption subsidy can be used to increase the price that domestic producers receive through its impact on the world price, benefiting organized interest groups and hurting consumers. The second part reflects the terms-of-trade effect. It captures the responsiveness of composite demand and takes on a positive (negative) value if the home country imports (exports) good i.

When the government can only apply trade policies, (19b) is again the same as in Grossman and Helpman (1995).

2.6. Conclusions

This paper analyzes the structure of protection and the choice among policies in the Grossman-Helpman model when the government has domestic and trade policies available. In the models presented herein, two different domestic policies are considered--production and consumption policies--together with trade policies. When the set of available instruments consists of production and trade policies, the production policy serves to satisfy the lobbies while the trade policy accommodates the market structure. 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 structure in the small and 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 serves the government to address consumption efficiency, but also to please the lobbies through its impact on the world price. In either model, using the equilibrium combinations of consumption and trade policies, the government can achieve the same outcomes as when production and trade instruments are available.

The political equilibrium policies in Grossman and Helpman (1994, 1995) are shown to be special cases where the government has only trade instruments at hand. Protection for organized industries will be higher when the government has both domestic and trade instruments available because they allow the government to satisfy a particular lobby at a lower cost to the other lobbies and the average consumer. Thus, 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.

One of the crucial assumptions in this paper requires that the set of available instruments be exogenously given and no attempt is made to model the mechanism determining policy availability. 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. A question that arises in this context is which instruments will be elements of this set. In Becker's (1983, 1985) models, interest groups prefer more efficient instruments for redistribution because they incur less pressure by competing interest groups. However, in the Grossman-Helpman framework, 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 play each off against the others 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 they receive in equilibrium (Grossman and Helpman, 1994, p. 846). 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. A complete analysis of lobbies' preferred instruments would also have to include how different instruments affect organization costs, such as free riding on the expenditures of other members of the same group. Including these costs could provide a rationale for why interest groups might prefer a combination of consumption subsidies and tariffs to production subsidies and tariffs, or vice versa.

2.7. References

Bernheim, Douglas. B. and Whinston, Michael D. (1986). "Menu Auctions, Resource Allocation, and Economic Influence." *Quarterly Journal of Economics* 101, pp. 1-31.

Becker, Gary S. (1983). "A Theory of Competition among Pressure Groups for Political Influence." *Quarterly Journal of Economics* XCVIII, pp. 371-400.

Becker, Gary S. (1985). "Public Policies, Pressure Groups and Deadweight Costs." *The Journal of Public Economics* 28, pp. 329-347.

Bhagwati, Jagdish, N. (1971). "The Generalized Theory of Distortions and Welfare." In *Trade. Balance of Payments and Growth: Papers in International Economics in Honor of Charles P. Kindleberger,* edited by Jagdish N. Bhagwati, Ronald W. Jones, Robert A. Mundell and Jaroslav Vanek. Amsterdam: North-Holland.

Dixit, Avinash K. (1996). "Special Interest Lobbying and Endogenous Commodity Taxation." *Eastern Economic Journal* 22, pp. 375-388.

Dixit, Avinash K., Grossman, Gene M., and Helpman, Elhanan (1997). "Common Agency and Coordination: General Theory and Application to Tax Policy." *Journal of Political Economy*, forthcoming.

Findlay, Ronald, and Wellisz, Stanislaw (1982). "Endogenous Tariffs, the Political Economy of Trade Restrictions, and Welfare." In *Import Competition and Response,* edited by Jagdish N. Bhagwati. Chicago: University of Chicago Press.

Grossman, Gene M., and Helpman, Elhanan. (1994). "Protection for Sale." *American Economic Review* 84, pp. 675-708.

Grossman, Gene M., and Helpman, Elhanan. (1995). "Trade Wars and Trade Talks." *Journal of Political Economy* 103, pp. 675-708.

Grossman, Gene M., and Helpman, Elhanan. (1996). "Electoral Competition and Special Interest Politics." *Review of Economic Studies* 63, pp. 265-286.

Hillman, Arye L., and Ursprung Heinrich W. (1988). "Domestic Politics, Foreign Interests, and International Trade Policy." *American Economic Review* 78, pp. 729-745.

Magee, Stephen P., Brock, William. A., and Young, Leslie. (1989). "Black Hole Tariffs and Endogenous Policy Theory: Political Economy in General Equilibrium." Cambridge and New York: Cambridge University Press.

Olson, Mancur (1965). *The Logic of Collective Action.* Cambridge: Harvard University Press.

Rodrik, Dani (1995). "Political Economy of Trade Policy." In *Handbook of International Economics*, vol. III, edited by Gene M. Grossman and Kenneth Rogoff. Amsterdam: Elsevier Science B.V.