**A Dynamic Model of Endogenous Trade Policy**

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May 1999

**Abstract**

Empirical evidence suggests that past levels of protection are significant determinants of current levels of protection. This paper investigates *dynamic* interactions among interest groups and endogenous links between current and future trade policies. We explore these intertemporal links in a small open economy in which lobbying and tariff policies are the outcome of a dynamic game among factor owners. The model can generate cycles with prolonged periods of free trade and/or prolonged periods of restricted trade (i.e. persistent trade policies). An interesting aspect of the environment is the role of lobbying as a partial substitute for intertemporal trade.

*JEL Nos.* F13, C73

We thank Allen Head, Dani Rodrik, and two anonymous referees for helpful comments and gratefully acknowledge financial support of the Social Science and Humanities Research Council of Canada.

## I. Introduction

Despite a trend towards freer trade over successive decades of GATT rounds and recent developments in NAFTA, tariff based and non-tariff based forms of protection are still abundantly evident. Hillman (1989) suggests a number of theoretical explanations for why free trade outcomes, which maximize world income, are not more often observed. Among the explanations he puts forth are optimum tariff arguments, infant-industry concerns, national defense issues, strategic trade considerations, and policies which emanate from the political process reflecting conflicts surrounding the distribution of income. The last of these explanations is generally termed the *political economy of protection* and has received considerable attention from economists and non-economists alike. As Hillman points out, this approach views trade policy as endogenously determined by interactions among consumers, producers, and governments.

In addition, substantial empirical evidence exists suggesting that past levels of protection are significant determinants of current levels of protection. In particular, protection appears to be relatively persistent. See, for example, Baldwin (1985), Marvel and Ray (1983) and Pugel and Walter (1985). One possible explanation for this persistence is that special interest groups expend more resources on lobbying to maintain a current policy which is favorable to their interests than to change a policy which does not favor their interests. In this paper we explore this possibility in a dynamic political economy model of protection. We derive conditions under which special interest groups behave as described above and study the implications for the persistence of trade policy.

Two approaches to modeling endogenous trade policies have emerged from the literature: voting models and lobbying models. Voting behavior and resulting policies have been studied by Mayer (1984), Baldwin (1982), Brock and Magee (1980) and others. The median voter approach adopted by Mayer assumes that voters are perfectly informed and have single peaked preferences. Equilibrium tariffs will reflect the preferred tariff of the median voter. The second methodology is based on an imperfectly informed electorate. Different trade policies create rents for different groups, and an incentive for rent seeking in the form of lobbying exists. At least two approaches to modeling the participation of interest groups in the political process can be found in the literature. One approach incorporates governments who choose policies so as to maximize their political support. Lobby groups offer contributions to incumbents to influence those policy decisions. Examples of this approach include Grossman and Helpman (1995a,1995b, 1994) and Hillman (1982). A second approach focuses on political competition between candidates and the motivation for lobbying is to influence election outcomes. The mechanism by which lobbying expenditures translate into votes is usually not modeled explicitly, but operates through the dissemination of noisy information to the imperfectly informed electorate.[1] The outcome of political elections are stochastic and lobby-

[1] Mayer and Li (1994) are an exception.

ing expenditure by interest groups affects the probabilities over those outcomes. Examples of this approach include Young and Magee (1986), Findlay and Wellisz (1982), Brock and Magee (1978), and Magee, Brock, and Young (1989), and Rodrik (1986).

This paper is most closely related to the latter approach and explores *dynamic* interactions among special interest groups. Of particular interest are the resulting endogenous links among levels of protection between periods. A dynamic linkage is present as current lobbying expenditures by special interest groups affect the outcome of an election in the next period. The trade policy platforms of potential government candidates are given and lobbying by factor owners influences which government is chosen in the next election. The framework is well suited to study endogenous links between current and future policies (persistence and feedback effects of protectionist policies). Future levels of protection are affected by current levels as prevailing policies determine current prices and, hence, the real income of factor based interest groups. These, in turn, affect both the ability and the willingness of interest groups to lobby for future governments which will impose policies favoring the groups' interests. We also derive conditions under which we would expect policies to be relatively persistent.[2]

The environment is an infinite horizon Heckscher-Ohlin-Samuelson model of trade in a small open economy. Interest groups are associated with factor ownership and agents within a group divide their factor endowment between productive activity and lobbying.[3] Each period, there are two potential political parties seeking election. The parties' platforms consist of (opposing) positions on trade policy and positions on other policies. Factor owners, who care only about the parties' trade policy positions, vote for the party whose trade policy favors their interests. Other consumers who do not own any of the factors of production and who are imperfectly informed about parties' positions vote for the party which maximizes their expected utility. In addition,

[2] Cassing and Hillman (1986) examine tariff policies in a dynamic model without lobbying but with feedback effects in the sense that the level of employment in an industry affects and is affected by the degree of protection. Fernandez and Rodrik (1991), in a voting model without lobbying, demonstrate that the presence of uncertainty regarding the distribution of gains from policy reform may lead to persistence of policies (i.e. may lead to a status-quo bias on the part of voters.) Gould and Woodbridge (1998,1997) also examine the dynamic process behind protection in a model where lobbyists are imperfectly informed about critical levels of protection which will evoke retaliation from their rivals. Dynamics arise as past levels of protection provide information for updating lobbyists' beliefs about critical levels of protection. This, in turn, affects their current lobbying effort directed at influencing trade policy. Another explanation of persistence of protection in a political economy model of lobbying can be found in the work of Brainard and Verdier (1997, 1994). In their models, dynamic linkages arise because of adjustment costs and this leads to the result that current levels of protection are increasing functions of past protection.

[3] There is limited empirical evidence that lobbying activity may be associated more with industry interests and less with factor interests. Magee, et.al., however, demonstrate that tariff rates across countries are correlated with a country's capital/labor endowment. In addition, they argue that in the U.S., blue-collar workers have traditionally aligned with protectionist Democrats while management trade associations have aligned with pro-export Republicans. It would, however, be interesting to explore the dynamic issues highlighted in this paper in a specific factors model of trade.

factor owners devote part of their endowment to lobbying to influence the consumers who own no factors so as to increase the probability that the government which favors their trade interests will be elected in the next period. The two factor groups play a dynamic Nash game in Markov strategies and choose levels of lobbying activity to maximize their expected discounted lifetime utility. The equilibrium concept is that of Markov perfection with the current trading regime (free trade or autarky) as the state variable.

The degree of relative risk aversion of factor groups determines whether factors lobby more or less when current policies favor their interests than when current policies do not favor their interests. In particular, factor groups will lobby more in favorable states than in unfavorable states if their preferences exhibit a relatively high degree of relative risk aversion (i.e. a coefficient of relative risk aversion greater than one). This result implies that economies comprised of relatively risk averse agents will have the feature that at least one of the trading regimes is more likely to continue in the next period than to switch to the other trading regime. That is, at least one trading regime is relatively persistent.

An interesting aspect of the environment is the role of lobbying as a device for intertemporal consumption smoothing. Lobbying expenditures act as a partial substitute for borrowing and lending (and other forms of intertemporal trade). This feature gives rise to the aforementioned relationship between agents' risk aversion and the persistence of protection. In particular, more risk averse agents will be willing to expend more resources on lobbying when their real income is high so as to increase the probability of maintaining a steady consumption stream. Less risk averse agents are less concerned with consumption smoothing and increase their consumption expenditures, rather than their lobbying expenditures, when their real purchasing power is high. This characteristic of lobbying activity has not been discussed previously in the literature.

The remainder of the paper is organized as follows. Section II describes the economy and characterizes relationships between current trade policies and lobbying activity. The section also discusses the issue of persistence in trade policies and the normative implications of dynamically interacting special interest groups. Section III concludes and offers suggestions for future work.

## II. The Model

*The Economy*

We examine a Heckscher-Ohlin-Samuelson model of trade of a small open economy with two factors of production. There is a non-traded endowment good and two traded goods (good 1 and good 2) which are produced with constant returns to scale technologies. Factor and goods are labelled so that good $j$ uses factor $j$ relatively intensively. In addition, we assume that the small country is well-endowed with factor 1 relative to the rest of the world. The Heckscher-Ohlin-Samuelson Theorem holds here and implies that the country will export good 1 and import good

2 when trading with the rest of the world.

There are three types of consumers in the country. Consumers in group 1 are endowed with factor 1 only, consumers in group 2 are endowed with factor 2 only, and consumers in group 3 are endowed with the non-traded good only. All members of group $j$ own the same amount of factor $j$ for $j \in \{1, 2\}$. In addition, the measure of each of the first two groups in each country is normalized to one so that group aggregates equal individual levels within a group. This allows us to focus on representative members of groups 1 and 2 in the symmetric equilibrium. Neither of these groups comprise a majority of consumers (voters). Consumers in groups 1 and 2 have identical preferences. These preferences over consumption of the two traded goods are represented by the following period utility function

$$U(c_{1j}, c_{2j}),$$

where $c_{ij}$ denotes consumption of good $i$ by a member of group $j$. $U(\cdot, \cdot)$ is a Von Neumann-Morgenstern utility function, and is assumed to be homothetic, concave, and increasing in both its arguments. A description of consumers in group 3 and their role in the model will be given below.

There are two potential government types in the country. Only one government is in power in any one period. Government $j \in \{1, 2\}$ seeks to maximize the utility of factor $j \in \{1, 2\}$ in its choice of trade policy when in power. Hence, government 1 will choose a zero tariff when in power as this maximizes the real income of the factor used intensively in production of the export good. In this case, the country will engage in free trade with the rest of the world. In contrast, government 2 will choose a prohibitive tariff when in power as this maximizes the real income of the factor used intensively in production of the import good. In this case, since we assume balanced trade holds in this model, the country will not export or import any goods from the rest of the world.[4] Therefore, depending on the government in power, the state in any period will be either autarky or free trade. We denote the state by $z \in \{A, F\}$. Each government is also characterized by its position on other policies (which are not formally modeled here). Which government is in power is the result of an election in which each consumer has a vote.

We now return to a description of consumers in group 3 who do not own any factors. These consumers are heterogeneous and have preferences over consumption of their endowment of the non-traded good and over a variety of government policies. These consumers are, however, imperfectly informed about the potential governments' policy positions. In addition, the heterogeneous characteristics of these consumers' preferences are private information. The role of these consumers in the model is two-fold. The fact that they are imperfectly informed about policy positions pro-

[4] A focus of this model is on the role of lobbying as a means of intertemporal consumption smoothing. Therefore, we impose balanced trade (no borrowing and lending) so that lobbying is the only mechanism for consumption smoothing.

vides a role for lobbying expenditures by factor owners to provide noisy information to these voters regarding the political platforms of potential governments. The fact that their preferences are unknown implies that the outcome of the election is stochastic from the viewpoint of factor owners and governments as they cannot determine how consumers in the third group will vote in an election.

Consumers in groups 1 and 2 devote some of their factor endowment to lobbying aimed at influencing the voters in the third group and this lobbying affects the probability of a particular government being elected.[5] Lobbying, then, uses a portion of each consumer's factor endowment and the remaining factor endowment is used to produce final consumption goods.[6] The relationships between lobbying activity and these probabilities are modeled as follows. Let the vector of lobbying activity in the country be given by $\lambda \equiv (\lambda_1, \lambda_2)$ where $\lambda_j$ denotes the amount of the endowment of factor $j$ which is devoted to lobbying. Let $\pi^F(\lambda)$ be the probability that government 1 will be elected in the country and the country will trade freely with the rest of the world in the next period. This probability function satisfies the following:

$$0 \leq \pi^F(\cdot) \leq 1 \tag{1.1}$$

$$\frac{\partial \pi^F(\cdot)}{\partial \lambda_1} > 0 \qquad\qquad \frac{\partial \pi^F(\cdot)}{\partial \lambda_2} < 0 \tag{1.2}$$

$$\frac{\partial^2 \pi^F(\cdot)}{(\partial \lambda_1)^2} < 0 \qquad\qquad \frac{\partial^2 \pi^F(\cdot)}{(\partial \lambda_2)^2} > 0 \tag{1.3}$$

Of course, the probability that government 2 will be elected and the country will operate in autarky is given by $\pi^A(\lambda) = 1 - \pi^F(\lambda)$. This framework implies that increases in lobbying activity by a group, ceteris paribus, increases, at a decreasing rate, the probability that the government which favors its interests will be elected and decreases, at a decreasing rate, the probability that the other government will be elected.

The specification of these probabilities is consistent with the political science literature on probabilistic voting (see, for example, Austen-Smith (1991); Enelow and Hinich (1984); and Hinich,

[5] Lobbying by any one member of a group benefits all members of that group by increasing the probability that the government which favors that group's interests will be elected. Therefore, lobbying expenditures provide a group-specific public good. We do not, however, address the potential free rider problem that this gives rise to. We assume that group members choose lobbying expenditures in a non-cooperative manner ignoring how much other members of their own group are lobbying. We use this specification so as to focus on the intertemporal aspects of lobbying. The public good nature of lobbying is discussed by Hillman (1991), Ursprung (1990), and others.

[6] An alternate approach is to have factors use income rather than endowment for lobbying purposes. This would affect our results. In particular, if we use this latter specification, we cannot determine conditions under which we would expect trade policies to be persistent. We chose the current specification as it allows us to focus on the role of lobbying as a means of consumption smoothing (see Proposition 1 below) and to analyze economy characteristics which affect the persistence of trade policies (see Proposition 2 below). Both approaches can be found in the literature on endogenous trade policy. For example, Magee, Brock and Young (1989) use the approach taken in this paper while Brainard and Verdier (1997) and Grossman and Helpman (1995a, 1994) use the income approach.

Ledward and Ordeshook (1972)). It is based on our assumptions of incomplete information on the part of governments, factor-owners, and the consumers in group 3 as discussed above.[7]

The timing of events within a period is as follows. At the beginning of each period an election is held in which all consumers in the country vote for one of the two government types. Members of group 1 vote for government 1 and members of group 2 vote for government 2. Members of group 3 may vote for either government type and, as described above, are influenced by lobbying expenditures undertaken in the previous period. The elected government chooses tariff policies and other policies. The two factor groups simultaneously choose how much of their endowments to allocate to lobbying activities to maximize their expected discounted lifetime utility. The factor owners then allocate their income from productive activity over consumption of the two traded goods to maximize period utility. Finally, in each new period, new consumers (voters) enter group 3 and some exit so that the uncertainty concerning the preferences of this group is not revealed by their voting behavior. This turnover also implies that in each period some consumers in this group will have incomplete information about potential governments' policy positions.

*Equilibrium Lobbying*

We focus on equilibria in which all factors are fully employed and in which the country produces both goods (i.e. the country is in its cone of diversification). In the autarkic state, equilibrium goods' and factor prices are affected by the level of lobbying activity whereas in free trade, these prices are determined outside the country and are unaffected by the level of lobbying activity. We denote goods' prices in state $z \in \{A, F\}$ as follows:

$$p(z) \equiv (p_1(z), p_2(z)),$$

and factor prices as

$$w(z) \equiv (w_1(z), w_2(z)).$$

Let the endowment each period of factor $j \in \{1,2\}$ to each member of group $j \in \{1,2\}$ be denoted $\bar{l}_j$. For a given state, $z$, we write the second-stage static income allocation problem for a representative member of group $j$ as follows:

$$\max_{c_{1j}, c_{2j}} U(c_{1j}, c_{2j})$$

$$\textit{subject to} \quad p_1(z)c_{1j} + p_2(z)c_{2j} = w_j(z)(\bar{l}_j - \lambda_j(z)),$$

[7] An alternative environment which would allow us to use the approach described in the literature on probabilistic voting would be to eliminate the third group of consumers and introduce heterogeneity over government policies and private information in the preferences of the factor owners. In this case, the voting decisions of factor owners would not be predictable and the outcome of the election would be stochastic. We have chosen the simpler approach in this paper so as to focus on the intertemporal role of lobbying.

where $\lambda_j(z)$ is the optimal expenditure on lobbying from the first-stage of the consumer's problem. The first-stage problem will be described in detail below. Consumers take goods and factor prices as given when solving their maximization problems. The solution to the above period problem gives Marshallian demand for good $i$ by a member of group $j$ as functions of goods' prices and income:

$$d_{ij}(p(z), I_j(z, \lambda_j(z))), \tag{2}$$

where $I_j(z, \lambda_j(z)) \equiv w_j(z)(\bar{l}_j - \lambda_j(z))$. Substituting these demands into the utility function allows us to write an indirect period utility function for a member of group $j$ in state $z$ as:

$$W_j(p(z), I_j(z, \lambda_j(z))) = U(d_{1j}(p(z), I_j(z, \lambda_j(z))), d_{2j}(p(z), I_j(z, \lambda_j(z)))). \tag{3}$$

In the first-stage of their utility maximization problem, each member of each group chooses lobbying activity to maximize their expected discounted lifetime utility. We write this problem as a dynamic programming problem as follows:

$$V_j(z) = \max_{\lambda_j}\left\{W_j(p(z), I_j(z, \lambda_j)) + \beta \sum_{z' \in \{A,F\}} \pi^{z'}(\lambda)V_j(z')\right\} \tag{4}$$

where $V_j(\cdot)$ is the value function of a member of group $j$ and $0 < \beta < 1$ is the common discount factor. Each agent takes prices and the lobbying activity of all other agents as given when solving their problem.

The solution to the above problem is a best response function as a function of the state and the other agents' lobbying activities. We focus on Markov strategies and Markov perfect equilibria. We write the Markov perfect equilibrium vector of lobbying activity by representative members of each group as $\lambda(z) \equiv (\lambda_1(z), \lambda_2(z))$. Since the state space is discrete and current lobbying activity affects only the *probabilities* of future states, the Markov perfect equilibrium can be written as the solution to a system of 8 equations. This can be seen as follows.

From equation (4), the value functions must satisfy:

$$V_j(z) = W_j(p(z), I_j(z, \lambda_j(z))) + \beta \sum_{z' \in \{A,F\}} \pi^{z'}(\lambda(z'))V_j(z') \tag{5}$$

This represents 4 equations: one for each of the 2 states and one for each of the 2 groups. In addition, the functions must satisfy the first order conditions:

$$\left(\frac{\partial W_j(p(z), I_j(z, \lambda_j(z)))}{\partial I_j}\right)\left(\frac{\partial I_j(z, \lambda_j(z))}{\partial \lambda_j}\right) + \beta \sum_{z' \in \{A,F\}} \frac{\partial \pi^{z'}(\lambda(z))}{\partial \lambda_j} V_j(z') = 0 \tag{6}$$

This also represents 4 equations. Hence equations (5) and (6) are 8 equations in the 8 unknowns: $\{\lambda_j(z), V_j(z)\}$ for $j = 1, 2;\ z \in \{A, F\}$.

Using the properties of the probability functions given by equations (1.1)-(1.3) and rearranging allows the first order conditions to be written as:

$$\beta \frac{\partial \pi^F}{\partial \lambda_j}[V_j(F) - V_j(A)] = \left[\frac{-\partial W_j(p(z), I_j(z, \lambda_j(z)))}{\partial I_j}\right]\left[\frac{\partial I_j(z, \lambda_j(z)}{\partial \lambda_j}\right]. \tag{7}$$

The left-hand side of this equation is the marginal benefit of lobbying to a member of group $j$ and the right-hand side is the marginal cost of lobbying. Consider each term.

The marginal benefit term reflects the benefits from increasing the probability that the government which favors the group's interests will be elected in the next period. The marginal benefit is a function of lobbying by both groups and the function is independent of the current state. Since $\pi^F(\cdot)$ is increasing in $\lambda_1$ and decreasing in $\lambda_2$, and since $V_1(F) - V_1(A) > 0$ and $V_2(F) - V_2(A) < 0$, then the marginal benefit term is positive for both groups. The properties of the second derivatives of the probability functions given by equation (1.3), imply that the marginal benefit for a group is a decreasing function of their own lobbying activity.

The marginal cost of lobbying reflects the foregone current period consumption associated with lobbying. Homotheticity of the direct utility function is sufficient for there to exist price and consumption indexes, $P(z)$ and $C_j(z, \lambda_j)$, such that $I_j(z, \lambda_j) = P(z)C_j(z, \lambda_j)$ at consumption levels which maximize period utility. In addition, the indirect utility function can be written as:

$$W_j(p(z), I_j(z, \lambda_j)) = g(C_j(z, \lambda_j)), \tag{8}$$

where $g(\cdot)$ is a monotone increasing, concave function. By evaluating the right-hand side of equation (7) and using (8), we obtain the marginal cost of lobbying for a member of group $j$ as a function of both the state and own lobbying:

$$MC_j(z, \lambda_j) = \frac{g'(C_j(z, \lambda_j))w_j(z)}{P(z)} = \frac{g'(C_j(z, \lambda_j))C_j(z, \lambda_j)}{(\bar{l}_j - \lambda_j)}. \tag{9}$$

Now, with these preferences, the coefficient of relative risk aversion for factor $j$ as a function of their consumption index is given by:

$$\sigma(C_j(z, \lambda_j)) \equiv -\frac{g''(C_j(z, \lambda_j))C_j(z, \lambda_j)}{g'(C_j(z, \lambda_j))}. \tag{10}$$

The following proposition illustrates that differences in lobbying activity by a group across trading environments can be characterized according to the value of their coefficient of relative risk aversion.

*Proposition* 1 :

A group will expend more resources on lobbying in the state which is favorable (unfavorable) to them if and only if $\sigma(\cdot) > 1(< 1)$ for consumption levels in the range between autarkic consumption and free trade consumption. A group's expenditures on lobbying will be independent of the state if and only if $\sigma(\cdot) = 1$ for consumption levels in the range between autarkic consumption and free trade consumption.

*Corollary* :

If the utility function is homogeneous of degree $\theta > 0 (< 0)$, then agents will lobby less(more) in the state which is favorable to their interests than in the unfavorable state.

For proof of these results, see the appendix. The intuition behind these results is as follows. When current trading policies favor a factor's interests, that factor earns a higher real return. This has two opposing effects on the marginal cost of lobbying. Since lobbying uses resources of the factor's endowment, the price of lobbying relative to consumption is high when that factor's real return is high. This implies a higher marginal cost of lobbying in favorable states. This effect is reflected in the term $C_j(z, \lambda_j)$ in equation (9) which is high in favorable states. On the other hand, since the factor's income is high in a favorable state, their marginal utility of income will be low (or unaffected in the case of linearly homogeneous preferences), and marginal foregone consumption will be less valuable than in an unfavorable state. This implies a lower marginal cost of lobbying in favorable states. The latter effect is reflected in the term $g'(C_j(z, \lambda_j))$ in equation (9), where $g(\cdot)$ is concave. The degree of a factor's relative risk aversion will determine which effect dominates with the strength of the latter effect increasing in the degree of relative risk aversion. Figures 1.1 and 1.2 illustrate the effects of relative risk aversion on the marginal cost of lobbying, and, hence, on equilibrium lobbying.[8]

This proposition also serves to highlight the role of lobbying in this model as a device for intertemporal consumption smoothing. In a sense, lobbying acts as a substitute for intertemporal trade (eg. borrowing and lending or insurance). More risk averse agents will be willing to expend more resources on lobbying when their real income is high so as to increase the probability of maintaining a steady consumption stream. Less risk averse agents are less concerned with consumption smoothing and increase their consumption expenditures, rather than their lobbying expenditures, when their real purchasing power is high.

We now turn to the issue of persistence of trading regimes. Equilibrium lobbying expenditures determine equilibrium probabilities over the two states next period contingent on the current state:

$$\pi(z' \mid z) = \pi^{z'}(\lambda(z)), \qquad z \in \{A, F\}. \tag{14}$$

We state the following proposition regarding conditional probabilities:

*Proposition 2* :

[8] Long and Vousden (1987) analyze a rent seeking model in which the degree of agents' risk aversion affects the relationship between the size of the rents and the level of lobbying expenditures. In particular, in their environment an increase in the value of total rents will increase (decrease) lobbying if the degree of relative risk aversion is less than (greater than) one. This is similar in spirit to our result in that there are two offsetting forces at work in their economy: a positive level of wealth effect and a negative marginal utility of wealth effect.

If $\sigma(.) > 1$ for consumption levels in the range between autarkic consumption and free trade consumption, then either (*i.*) $\pi(A \mid A) > .5$, (*ii.*) $\pi(F \mid F) > .5$, or both (*i.*) and (*ii.*) hold.

The proof is presented in the appendix. This proposition implies that if the coefficient of relative risk aversion is greater than one, then at least one trading regimes are more likely to be followed by the same regime in the next period than to switch to the other trading regime. That is, at least one trading regime is persistent. Hence, this model suggests that risk aversion on the part of factor owners may be a part of the explanation for the observed persistence of trade policies.

Given Proposition 1, it is, perhaps, surprising that we cannot show that both trade regimes will be more persistent in economies characterized by relatively high risk aversion. The reason we cannot prove this stronger result is because the persistence of trading regimes depends on relative lobbying expenditures across factor groups which, in turn, depends on relative endowments across factor groups. If, for example, the export factor was well-endowed relative to the import factor, their lobbying expenditures would tend to dominate. In this case, one would expect free trade to be persistent but one would not expect autarky to be persistent. We conjecture that if the levels of endowments are relatively close, then both trading regimes will be more persistent in economies with higher risk aversion.[9]

The conditional probabilities defined in equation (14) allow us to compute long-run (unconditional) probabilities over the two trading regimes, under fairly general conditions. These probabilities could then be used to compute expected aggregate welfare for this economy. It is clear that because of deadweight losses associated with lobbying (i.e. lobbying is an unproductive activity), expected aggregate utility in economies with lobbying may be higher *or* lower than aggregate utility in an equilibrium with *no* trade and no lobbying. If the lobbying equilibrium is such that a high probability is placed on the free trade outcome, then the lobbying equilibrium may result in higher expected aggregate welfare than in an autarkic equilibrium with no lobbying. On the other hand, it is possible that the deadweight loss associated with lobbying outweighs the benefits of a positive probability of free trade, and expected aggregate welfare is actually lower in the lobbying equilibrium than in autarky. This result is similar to the discussion of black and gray holes by Magee et.al. (1989) in a static environment.

## III. Conclusions and Extensions

This paper has highlighted a role for lobbying as a means of intertemporal consumption smoothing and has examined resulting endogenous feedback effects between current trade policies and future policies. Current trading regimes affect agents' abilities and willingness to lobby for future

[9] We base this conjecture on the intuition described above and on numerical simulations of the model with Leontief technologies and Cobb-Douglas preferences. In all simulations in which endowment levels were relatively similar across factor groups, both trading regimes were persistent in economies characterized by coefficients of risk aversion greater than one. Details of these simulation exercises can be obtained from the authors.

regimes which favor their interests. This gives rise to an endogenous probability distribution over future trade policies which is conditional on current policies. The relative risk aversion of factor groups determines whether factors lobby more or less when current policies favor their interests than when current policies do not favor their interests. If factors are relatively risk averse, then at least one and perhaps both trading regimes (i.e. autarky and free trade) are more likely to be followed by the same regime in the next period than to switch to the other trading regime. That is, at least one trading regime is persistent.

We have limited our analysis to import tariffs. A natural extension would include examining dynamic lobbying behavior and trade policy in the presence of other policies such as export subsidies and quotas. It would also be interesting to incorporate specific factors into this dynamic framework so as to examine issues associated with declining industries such as those raised in the small open economy models of Brainard and Verdier (1997) and Long and Vousden (1991). In addition, allowing consumers to endogenously accumulate factors of production would add another dynamic dimension to the economy and may contribute to the persistence properties of the economy.

## APPENDIX

*Proof of Proposition 1:*

Define the following function:

$$f(C_j(z,\lambda_j)) = g'(C_j(z,\lambda_j))C_j(z,\lambda_j).$$

Since the consumption index, $C_j(z,\lambda_j)$, is higher in states which favor the group, then, for a given level of lobbying, the marginal cost of lobbying is higher(lower) in the state which favors the group if $f(\cdot)$ is an increasing(decreasing) function for consumption levels between the autarkic and free trade consumption levels. Differentiating $f(\cdot)$ gives

$$f'(C_j(z,\lambda_j)) = g''(C_j(z,\lambda_j))C_j(z,\lambda_j) + g'(C_j(z,\lambda_j)),$$

and

$$Sign(f'(C_j(z,\lambda_j))) = Sign(1-\sigma(C_j(z,\lambda_j))).$$

Hence, whether the marginal cost of lobbying is higher, lower, or the same in the favorable state as in the unfavorable state depends on whether $\sigma(\cdot)$ is less than, greater than, or equal to 1 in the relevant range. Since the marginal benefit of lobbying is independent of the state and agents equate marginal benefit to marginal cost, agents will lobby less in the high cost state. *Q.E.D.*

*Proof of Corollary:*

If $U(\cdot,\cdot)$ is homogeneous then $g(\cdot)$ must take the following form:

$$g(C_j(z,\lambda_j)) = AC_j(z,\lambda_j)^{\theta},$$

where $A > 0$ if $\theta > 0$ and $A < 0$ if $\theta < 0$. In this case, the coefficient of relative risk aversion is constant and is given by

$$\sigma(\cdot) = 1-\theta.$$

The Proposition then implies the result. *Q.E.D.*

*Proof of Proposition 2:*

Given Proposition 1 and the properties of the probability functions given by equations (1.1)-(1.3), it is straightforward to show that $\pi(A\,|\,A) > \pi(F\,|\,A)$ for the economy in which $\sigma(\cdot) > 1$. This can be rearranged as:

$$\pi(A\,|\,A) + \pi(F\,|\,F) > 1.$$

The result then follows directly. *Q.E.D.*

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