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Chapter 3

International Public Goods, Export Subsidies, and the Harmonization of Environmental Regulations

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Introduction

The reasoning of this chapter may be summarized as three key points.
First, gains from more open agricultural trade are in large part public
goods. Both reductions in export subsidies and the harmonization of
standards may be thought of as public goods. Benefits are widely
distributed while costs are narrowly concentrated on noncompetitive
sectors, leading to incentive problems which pose fundamental challenges
to trade negotiators. These difficulties will continually confront the trade
reform process, emphasizing the political and economic effort that must
be expended to overcome interest groups threatened by the process of
liberalization.

Second, the negotiating position of the United States in the GATT is less
powerful today than in the past, especially in relation to the European
Community (EC). However, the United States remains
disproportionately influential as a source of trade policy reform, in part
because the "marginal productivity" of its own actions continues to loom
large in the negotiating process. Nonetheless, unilateral trade policy
reform is far less likely to succeed than coordinated efforts inside (and
outside) of GATT.

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Third, trade policy coordination is driven by the reciprocal obligations encoded in the GATT treaty itself. The theory of reciprocity outlined below emphasizes that such rules of obligation can provide the basis for trade liberalization, if the assurance exists that the effort will be jointly pursued by a "critical mass" of members of the GATT. The theory of reciprocity predicts that the lower the level of support for trade liberalization and its harmonization that is signaled by the United States, the less likely other countries are to pursue similar strategies. Even with a critical mass of countries favoring such liberalization, the heterogeneity of country interests will make the process exceedingly difficult.

Liberalizing agricultural trade and harmonizing national environmental regulations are economic, political, and legal problems. Economists emphasize efficiency gains and losses from trade; political scientists examine the interest group pressures and power structures affecting trade regimes; legal analysts focus on rules under which different national trade regimes can be brought into harmony.

This chapter attempts a partial synthesis of these perspectives by describing international agricultural trade and environmental policy harmonization as a "public good problem." Public goods are shared by a group without direct rivalry and without the exclusion of those whose benefits are not matched by proportionate contributions (Samuelson, 1954, 1955). Public goods form an intersection of economic, political, and legal scholarship, because they involve incentives to "free ride" which are directly related to interest group pressures and lead to different national regulatory regimes that are often in conflict and disharmony (Olson, 1965).

There are at least three senses in which public goods problems arise in international agricultural trade relations. First, trading regimes and rules of international commerce are conventions of behavior which in themselves are public goods (Kindleberger, 1986; Koester, 1986; Silk, 1987). Second, the stability which these rules provide is widely distributed, leading to generalized benefits in the form of more stable market prices (McCalla and Josling, 1985, p. 203). Third, gains from trade themselves may be public benefits (ex ante) even if their distribution is ultimately a matter of rivalry (McCalla and Josling, 1985, p. 204). Although not a "pure" public good in the sense used by economists, free and open international markets generate an economic surplus that is shared by all market participants (World Bank, 1987). These "gains from trade" are public benefits (ex ante) even if their distribution is ultimately

a matter of rivalry. Although the benefits of more open trade are widely shared, its costs tend to fall more narrowly on those groups that are uncompetitive. When countries retain the general benefits of open trade while attempting to protect certain sectors from competition, they are "free riding," drawing down the global benefits which trade provides. Recent research on the provision of public goods lends insight into the problem of opening trade in the face of protectionist pressures.

This chapter focuses on several specific forms of these protectionist pressures: the use of agricultural export subsidies and the use of health, safety, and environmental regulations as nontariff trade barriers. Export subsidies have been at the heart of the Uruguay Round discussion. There is also growing evidence that in the years following the Uruguay Round much of the disharmony in national trade policies, especially in agriculture, will focus on "sanitary and phytosanitary measures." These measures may be described less technically as environmental, health, and safety regulations (EHS regulations).

In the face of these pressures, GATT has given specific attention to both export subsidies and EHS regulations in the Uruguay Round. If export subsidies can be disciplined and "sanitary and phytosanitary" measures harmonized, these would prevent a large share of abuses currently in practice. If such action leads to lowering export subsidies and preventing nontariff EHS protection (or at least requiring that compensation be paid to damaged parties), the Uruguay Round might be judged a success.

This chapter is divided into three parts. First, I present the intuition behind thinking of trade disharmony as a "public goods problem." Second, I present a model drawn from the public goods literature and discuss it in the context of the "assurance problem" (Sen, 1967; Runge, 1981, 1984). Third, I apply insights from the model to the problem of reducing export subsidies and harmonizing EHS regulations in the years ahead.

Gains from Trade as a Public Good

In economic theory, the most powerful argument for more open trade is that it yields efficiency gains, such that the demands of more agents are satisfied at higher levels than would occur in its absence. The first fundamental theorem of welfare economics holds that in the absence of constraints on trade, the allocation of goods in a competitive equilibrium

is "Pareto-efficient." In principle, once this efficiency has been achieved, those disadvantaged by trade can be compensated out of the resulting gains. The existence of public goods and other "externalities" upsets the fundamental theorems of welfare economics, making efficiency and compensation difficult to separate in practice (Stiglitz, 1985).

Critics of more open trade question the relevance of Pareto-efficiency and have emphasized that such trade is not necessarily "fair" (Hudec, 1990). "Fair trade," in addition to being an appealing (though ambiguous) political argument, is also a concern of some theorists, who note that even a Pareto-efficient allocation is entirely compatible with one person (or country) getting everything, and everyone else getting nothing (Sen, 1983). In reality, the debate over U.S. trade policy revolves around not only the efficiency, but also the fairness, of various alternatives (Rausser, 1982; Runge and von Witzke, 1987).

For these reasons, the treatment of trade policy reform as an international public goods problem raises the same issues that seem most prominent in policy debates. Public goods pose problems of both efficiency and fairness. They are difficult to efficiently supply because of the "free rider" problem. Their supply is also related to fairness, because few are willing to contribute more than a "fair share," based on some prior understanding about what a fair contribution is (Marwell and Ames, 1979; 1980; 1981). An open trading system is continually confronted by countries that enjoy its benefits while overtly or surreptitiously protecting certain sectors. This form of free riding offends other countries' sense of fairness, leading to retaliation. Both protection and retaliation reduce the gains from trade, leaving all countries worse off. Indeed, one can show that the gains from trade can be completely eroded by retaliatory distortions in domestic policy (Schmitz and others, 1986).

Recent research points to the constructive role which obligations to institutional rules can play in the efficient provision of public goods. The relationship between rules and public goods makes this research relevant to the impact of GATT on trade liberalization. The key feature of such rules is that they provide a well-defined structure of obligation and liability. When these rules are broadly perceived to be fair, they make claims of benefit and cost more secure. This security, or assurance, can result in successful collective agreements leading to public goods provision, even if total (Pareto-efficient) levels of public goods are not achieved (Runge, 1984).

Sugden (1984) proves that public goods can be provided at such levels, although in general underprovision equilibria prevail. In Sugden's model, the propensity to free ride can be overcome by a set of reciprocal obligations in which each member of a group contributes to the public good, <u>conditional</u> on the assurance that others will do the same. The result turns crucially on the resolution of this "assurance problem" (Sen, 1967). Sugden (1984, p. 781) emphasizes, that a structure of reciprocal obligation, encoded in institutional rules of behavior, can provide public goods at a Pareto-efficient level only if the rules act to assure the group that its members are contributing their "fair shares." This approach does not predict that the free rider problem will be solved, only that it can, depending on the level of reciprocal obligation, and the assurance that these obligations will be kept. Without sufficient assurance, any group can be trapped in an underprovision equilibrium in which everyone would contribute more if only others would too, but in which no one will make the first move.

The international trading system is in large part founded on a similar form of assurance. If countries fail to commit domestic resources to reduce protectionism, and instead seek a free ride by benefiting from the trading system while protecting themselves from its costs, the structure of reciprocity will unravel toward protectionism. Higher levels of protectionism thus constitute greater and greater "free riding." To hold the line against demands for protection (especially domestic demands for "fair trade"), countries must be assured that other trading nations will not impose new barriers of their own. This structure of mutual obligation is encoded in the first and most basic principle of the GATT: nondiscrimination and reciprocity, expressed in the most favored nation (MFN) clause. Reducing export subsidies in agriculture is one form of contributing to the public good of global trade liberalization. The harmonization of EHS standards is a further example of attempts to coordinate economic policies to prevent their use as a form of nontariff barrier.

The purpose of GATT as an institution is to adjudicate and coordinate a system of reciprocal and harmonized trading rules. Like many other international institutions, GATT is relatively weak, because countries are unwilling to provide international public goods by surrendering sovereignty to an international government or single hegemonic power (Kindleberger, 1986). The role of the United States as a hegemonic power after World War II (which allowed it to demand and receive the 1955 and other waivers to agriculture) has eroded (Keohane, 1984). In the absence of hegemony, the system depends primarily on coordinating

the collective actions of the trading nations as a whole. The global "assurance problem" posed by efforts to liberalize trade and to harmonize EHS regulations is thus one in a larger set of international coordination problems (Snidal, 1985).

This view of international trade has implications for both theory and policy. In theory, wherever public goods are present, efficiency will not be achieved through atomistic competition alone. Its achievement will be bound up not only with fairness but with the problem of acquiring information concerning the likely behavior of others. The assurance problem arises because of insufficient information concerning the willingness of others to honor an agreement to contribute to a public good. Theory must thus explicitly account for problems of information acquisition and the strategic structure of reciprocal expectations and obligations.

At the level of policy, the approach suggests that atomistic pursuit of national or group self-interest will ultimately fail to provide international public goods. The invisible hand guiding decisions toward collectively rational outcomes is a palsied one without explicit efforts at coordination provided by nonmarket institutions (Stiglitz, 1985). Where international governance is weak and hegemonic power by single countries is insufficient to provide order, efforts at collective coordination will rise in importance (Snidal, 1985). This approach leads to calls for strengthening international institutions such as the GATT. It predicts that policies favoring protectionist free riding or unrealizable hegemony will reduce the level of obligation felt to the international trading system as a whole.

Agricultural Trade, Reciprocity, and the Assurance Problem

Any country's policies have some effects on other countries.[1] Macroeconomic policies of economic expansion or contraction in one country, for example, may lead to costs for other countries. Stimulative monetary policy under flexible exchange rates may cause a country to

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[1] The fundamental insight of modern economics is that market trading leads to positive effects that are greater than in the absence of such trade. This gain from trade is a "pecuniary externality" (Scitovsky, 1954) which, if widely shared, is a form of public good. When large numbers of agents share a positive externality, it is a public good (Mishan, 1971, pp. 9-13).

increase inflation in the hope of weakening its currency, leading to reductions in domestic unemployment at the expense of increases in domestic inflation. But if all (or a sufficiently large) number of countries pursue such a policy, none can succeed, because exchange rates cannot fall for everyone. Expansionary monetary policies then result in much higher overall inflation than expected, due to a failure to anticipate that other countries will follow suit. Instead of increasing export trade through a lower exchange rate, such policies may only "export inflation" (Hamada, 1976).

In agriculture, U.S.- and European-subsidized exports have led to similar problems due to a failure to account for the strategic interdependence of such policies. As both the United States and EC have subsidized these export sales in a cycle of retaliation, they have contributed to decreasing prices for world trading nations as a whole. In the case of EHS regulations, failure to agree on standards for hormone treatments of beef have triggered a similar, though smaller, cycle of retaliation.

Exchange rates, export subsidies, and EHS regulations are all instances in which there are coordinated solutions that would leave all countries better off. However, such coordination generally means that existing institutions must be modified or a new institutional framework invented, so that countries are assured that their actions will be coordinated to mutual advantage.[2] In the GATT case, two primary changes in the institutional arrangement contemplated during the Uruguay Round have been greater inclusion of export subsidies and EHS regulations under GATT rules.

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[2] Kehoe (1986a, b) demonstrates in a dynamic optimal taxation model that fiscal policy coordination may be inoptimal due to a lack of binding commitments by government not to tax capital too highly. The problem is a lack of assurance by consumers that taxes on capital will not be raised once an agreement between countries has been struck. This assurance problem prevents coordination from being a superior solution. An institution to maintain this assurance is lacking.

A simple coordination problem for two countries, each with trade strategies 0 and 1, is shown below in normal form.

Country B

0   1

	0	(4, 3) (2, 2)
Country A		
	1	(1, 1) (3, 4)

Trade strategies coordinated along the diagonal lead to outcomes that are Pareto-optimal (Sen, 1969). Despite the optimality of the solutions in which trade policy coordination occurs, one cooperative solution (0, 0) is better for Country A, and one (1, 1) is better for country B.[3] However, both equilibriums are better than the off-diagonal, uncoordinated strategies. Note that policy coordination does not necessarily imply that countries A and B pursue the same policy, only that their trade strategies are coordinated with one another.

The problem is that neither country can choose its best policy without some assurance concerning what the other intends to do (Snidal, 1985, pp. 931-34). Easy resolution is hindered by the inherently opposed country interests over where coordination should occur. Unlike the more familiar prisoners' dilemma (PD) game, the problem in this case is one of a choice over multiple stable equilibriums. In the PD, the problem is to

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[3] Schelling (1960) describes such a problem in terms of Holmes and Moriarty, each aboard separate trains, neither in touch with one another, attempting to coordinate the point at which they might detrain. Both benefit from getting off at the same station, with Holmes benefiting most if they detrain together at (0, 0) and Moriarty benefiting most if they detrain together at (1, 1).

avoid a single stable but Pareto-inferior equilibrium.[4] Trade negotiations, however, involve nondiscrete choices that are not "all or nothing" and which are affected by considerations of both bargaining power and fairness.

Solving this problem of strategy requires a form of strategic commitment, in which Country A commits to a cooperative solution conditional on its expectation that Country B will do likewise. This conditional commitment can be rationally self-interested where reinforced by strengthened rules of international trade. To provide a formal basis for this reciprocal obligation, we consider the role of GATT as a solution to the assurance problem in the context of what Sugden has called "reciprocity theory."

The theory of reciprocity (Sugden, 1984) argues that agents can supply themselves with public goods through conditional commitments. Such commitments do not stipulate that a group member always contributes to a public good. These commitments say only that if others in a well-defined group are contributing, then a group member is obliged to do the same. Well-defined obligations exist to a group to which one belongs and from which one derives benefits. These groups may be local, national, or international, including signatories of international trade agreements. Individual contracting parties to GATT, for example, have well-defined obligations to maintain an open international trading system.

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[4] If C^A represents the strategy of country A and C^B that of country B, for two strategies 0 and 1, the prisoners' dilemma ordering is:

$$C^A (0, 1) > C^A (1, 1) > C^A (0, 0) > C^A (1, 0)$$
$$C^B (1, 0) > C^B (1, 1) > C^B (0, 0) > C^B (0, 1)$$

The equilibrium $(0, 0)$ is a single, stable, and Pareto-inferior equilibrium. In contrast, the assurance problem takes the general form:

$$C^A (0, 0) > C^A (1, 1) > C^A (0, 1) = C^A (1, 0)$$
$$C^B (1, 1) > C^B (0, 0) > C^B (1, 0) = C^B (0, 1)$$

Here there are multiple equilibriums: $(0, 0)$ and $(1, 1)$. In the special form of this game in which there is an agreed best outcome, the ordering takes the form:

$$C^A (1, 1) > C^A (0, 0) > C^A (0, 1) > C^A (1, 0)$$
$$C^B (1, 1) > C^B (0, 0) > C^B (1, 0) > C^B (0, 1)$$

While retaining the set of multiple equilibria, the problem is now not one of conflict but of being assured of the other country's action (Sen, 1969, pp. 4-5).

The Environment and International Trade

Let the welfare W_i of each GATT contracting party i be an increasing function of the gains from international trade measured by z. This trade creation, Z, constitutes a public good. Country welfare is a decreasing function of the resources (political and economic) necessary to overcome domestic efforts at protection. These resources, q_i, are equivalent to the domestic effort contributed to maintain an open trading system. One way of specifying q_i is the reduction in net effective protection for country i, in relation to a predetermined base period. Hence:

$$W_i = W_i(q_i, z) \qquad (i = 1, \dots n) \qquad (1)$$

If $h_i(q_i, z)$ is the marginal rate of substitution between z and q_i, then by

definition:

$$h_i(q_i, z) = - (\delta W_i/\delta_{qi})/(\delta W_i/\delta_z) \qquad (i = 1, \dots n) \qquad (2)$$

Two additional restrictions, reasonable for one good (gains from trade) and one bad (efforts to reduce protection), are:

$$\delta h_i(q_i, z)/\delta q_i > 0 \quad (i = 1 \dots n) \qquad (3)$$

and

$$\delta h_i(q_i, z)/\delta_z > 0 \qquad (i = 1 \dots n) \qquad (4)$$

World gains from trade are a function of the resources devoted to maintaining an open trading environment by individual countries. These are contributions to the public good. The "production function" for z is thus the weighted sum of individual country efforts to reduce trade protection.

$$z = f \left(\sum_{i=1}^{n} \alpha_i \, q_i \right) \qquad (5)$$

The function $f(\cdot)$ is assumed continuous, increasing, and concave (or linear in the limit). The parameter α_i (a positive constant) is the "weight" or effect on world gains from trade of the policies of country i, on the assumption that equal effort need not be equally productive for all countries. This assumption opens the possibility of disproportionate contributions by certain countries to an open international trading system.

If the United States or EC were prepared, for example, to substantially reduce levels of export subsidies, the effect on total gains from trade would be disproportionately felt by the world trading system. Now define a total contribution function $F(\cdot)$ for a given level of country efforts or contributions $\bar{q} = (q_i, ... q_n)$ by a group G (signatories of GATT) and a given level of total effort τ, such that where $\tau \geq 0$,

$$F (G, \tau) = f \left(\sum_{j \in G} \alpha_j \tau + \sum_{k \in G} \alpha_k q_k \right) \qquad (6)$$

This equation says that for any group of countries G, and level of effort τ ≥ 0, $F(G, \tau)$ is the gain from trade that would result if every signatory of GATT had contributed to open trade by a lower level of protection τ and each nonmember k had contributed q_k. (This function must be continuous, increasing, and concave in τ.) For the GATT signatories, given the contributions of nonsignatories q_k, let qi^G be the value of τ that maximizes $W_i[\tau, F(G, \tau)]$.

If each country i could choose a lowered level of protection for all GATT signatories, this is the level it would choose. The principle of reciprocity says that GATT signatory i is obligated to contribute qi^G, conditional on every other member of G doing the same.[5] If countries pursue self-interest subject to these obligations, then country i will make the smallest contribution to reduced levels of protection that is compatible with its obligations to all groups of which it is a member, including the group G = {i}. Hence, purely domestic self-interest is allowed expression, since every country has an obligation to itself to contribute at least as much (or as little) protection as self-interest requires.

The essential features of this model are that (a) equilibrium exists; (b) it is not necessarily unique; (c) one equilibrium is Pareto-optimal--the Samuelsonian one in which the marginal rate of substitution between q_i and z is equal to the marginal rate of transformation; and (d) every other

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[5] The following formal definitions may be stated (Sugden, 1984, p. 777):

Obligations. For any vector of contributions q, for any group G, and for any group member i, i is meeting its obligation to G if and only if either (a) $q_i \geq qi^G$ or (b) for some other agent j in G, $q_i \geq q_j$.

Equilibrium. An equilibrium is a vector of contributions q such that for each country i, given the contributions of other countries, q_i is the smallest contribution that is compatible with all of i's obligations.

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equilibrium involves undersupply of the public good (Sugden, 1984).[6] Pareto-inefficient equilibriums involving underprovision of the public good are due in the case of GATT to excessive levels of protection by the signatories.

If insufficient effort is expended to reduce these levels, the theory outlined here suggests the assurance problem as an important explanation. Inefficient equilibriums are ones in which every country would reduce its level of protection if only they were assured that others would do so too (Sen, 1967; Runge, 1984).[7] This statement does not suggest that the problem of protectionism will be solved--only that it can be solved. In theory, even in a world of identical countries, reciprocal obligations can break down in the face of the assurance problem. This breakdown is even more likely where the countries have widely varying objectives (Sugden, 1984, p. 783).

Despite these obstacles, the reciprocal obligations defined by GATT can be an important basis for more open international trade and the harmonization of EHS standards. One of the important predictions generated by the theory is that if country j's level of protection is the same as country i's, an increase in j's will probably bring about an increase in i's, and vice versa. If the United States, with a comparatively large influence (αi) over GATT, reduces its level of export subsidies and seeks to harmonize its EHS regulations with major trading partners such as Canada and the EC, then the incentive for others to take similar actions will increase (Paarlberg, 1987). However, the overall success of policy coordination will depend on the assurance that the effort is general and that some countries will not simply free ride by continuing to maintain high levels of protection.

A critical mass of countries may be necessary to overcome the assurance problem. Schelling (1973) has proposed a framework in which the willingness of country i to contribute is described as a function of the number of others that are expected to do so. Therefore, payoff curves to country i from contributing to the reduction of trade barriers (C) versus a

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[6] Sugden proves these results for the case of homogeneous agents. Where agents are heterogeneous, the results are qualitatively the same, but the assurance problem is exacerbated.

[7] If the problem were a prisoners' dilemma, then no country would reduce its level of protection, even if every other country did. Protectionism would be a dominant strategy.

protectionist trade strategy (P). The payoff W_i to country i is a function of the number of other countries that are expected to contribute. Where the P function lies above the C function, protection is a dominant strategy, until point y, when "critical mass" makes the reduction of trade barriers a dominant strategy. The function of multilateral trade negotiations (MTN's) is precisely to generate such a critical mass by negotiating agreements in which each country is assured that a sufficiently large number of others will engage in coordinated trade reforms.

An important feature of MTN's is the degree to which they prompt optimism that other countries will in fact cooperate to reduce trade barriers. While beyond the scope of this chapter, "pessimism" over whether other countries will reduce protectionism is one measure of assurance. Hurwicz (1951) has proposed an index of pessimism, such that the likelihood of a given country choosing a protectionist strategy is a direct function of a "pessimism-optimism index."[8]

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[8] If each country follows the pessimism-optimism index of Hurwicz (1951), a critical pair of values (a, b) exists representing the indexes of country A and B, and contained in the open interval (0, 1), such that if either country actually has an index above this value (is "too pessimistic") then the outcome will be Pareto-inferior. If both countries have greater than critical pessimism, then the outcome will be a Pareto-inferior equilibrium point, equivalent to Sugden's underprovision equilibrium.

Let the index of pessimism of A and B be P_A and P_B respectively, and the strategies be 0 and 1 for C^A and C^B, as in the modified assurance problem (footnote 5) in which (1, 1) is the agreed best outcome, such as multilateral reductions in agricultural protection. Then country A will choose protectionist strategy 0 if:

$$P_A C^A (0, 1) + (1 - P_A) C^A (0, 0) > P_{AC}{}^A (1, 0) + (1 - P_A) C^A (1, 1)$$

that is, if

$$P_A > [C^A (1, 1) - C^A (0, 0)]/[C^A (0, 1) + C^A (1, 1) - C^A (0, 0) - C^A (1, 0)]$$
$$\equiv a$$

Similarly, country B will choose 0 if

$$PB > [C^B (1, 1) - C^B (0, 0)]/[C^B (1, 0) + C^B (1, 1) - C^B (0, 0)$$

$$- C^B (0, 1)] \equiv b$$

If $C^A (1, 1) > C^A (0, 0)$ and $C^A (0, 1) > C^A (1, 0)$ (see footnote 5), then $0 < a < 1$, and $0 < b < 1$. If $P^A > a$, or $P^B > b$, the outcome will be other than (1, 1), the unique Pareto-optimum. If both hold, the choice will be (0, 0), the underprovision (protectionist) equilibrium (Sen, 1969, pp. 5-6).

We have argued thus far that a structure of reciprocal obligations, encoded in international trading rules such as GATT provides a basis for the coordination of trade and reduction of protectionism in world agriculture. The principal reason these rules fail is the assurance problem, which is exacerbated by the heterogeneity of interests and lack of enforcement typical of international public goods. Despite these difficulties, such rules are capable of improving the welfare of all those who subscribe to them, especially if a critical mass of others is expected to do so.

Models and Reality

Several specific features of the above model are worth emphasis. Apart from its characterization of trade negotiation problems in terms of a public goods model, which provides a formal interpretation of the sort of obligations encoded in the GATT articles, four specific features lend it some realism in a trade-negotiating context. The first of these is the allowance for differential "productivity" in the provision of the public good. The capacity of the model to show that certain GATT contracting parties, such as the United States and EC, disproportionately influence the general level of trade liberalization provides a formal basis for the fact that while all contracting parties to GATT are theoretically equal, some are more equal than others. When considering the possibility of a "critical mass" of countries required to provide a requisite degree of assurance that cooperative trade liberalization, rather than protectionism, will be the norm, one can also adjust the capacity of any agent to "contribute" according to this differential productivity (Schelling, 1973). In effect, an agent can "count" as more than one in a set of n agents in terms of its contribution to the process of liberalization or harmonization of standards.

Second, the model accurately portrays the difficulties of achieving substantial levels of trade liberalization, by emphasizing the observation that achieving "full provision" equilibriums at Pareto-optimal levels is difficult for several reasons. However, some provision is likely, characterized by equilibriums in which the group G (here the GATT contracting parties) is partially but not wholly successful in solving the assurance problem. This observation is consistent with the partial and incremental success of various GATT Rounds in eliminating or binding trade-distorting measures and harmonizing various standards. Because

multiple underprovision equilibriums are possible, depending on the expectations and perceived obligations of the agents, the provision of some of the public good at whatever level will reflect the extent to which the assurance problem has been overcome. The narrow view that "strong free riding" will be a dominant strategy is thus broadened to allow for a continuum of behavior between zero and full provision; that is, between strong free riding and no free riding at all, depending on the expectations, and thus the perceived obligations, of the group.[9]

Third, the model predicts that larger, more heterogeneous groups will find higher levels of provision more difficult than smaller, more homogeneous groups. The assurance problem (which is fundamentally a problem of information acquisition about the likely behavior of others) becomes more difficult to solve when agents are diffuse and dissimilar (Runge, 1984). The "size of the group" problem in public goods provision, first emphasized by Olson (1965), has been clearly in evidence as GATT has grown from 22 to over 100 contracting parties. But size is only one aspect of the problem of information acquisition. Size is compounded by the increasing heterogeneity of the parties' interests. The model predicts that the assurance problem is more easily solved by smaller, more homogeneous groups, in which the relevant "n," and thus the relevant "critical mass," is smaller. This prediction generates the corollary prediction that large groups such as GATT's contracting parties may break themselves into smaller, more homogeneous units to resolve difficult issues of trade negotiation. The "localization" of public goods, to borrow a phrase from that literature, is observed in the Uruguay Round in the form of the Cairns Group, the food-importing group (FIG's), and less formal groups meeting on a regular basis in Geneva or elsewhere.[10]

Fourth, careful examination of the model suggests that it is not robust in the face of group members who fail to "do their duty," because obligations are defined specifically in terms of the contribution levels of this "lowest common denominator." This problem (which I refer to as the "one bad apple" phenomenon) may seem to make the model less appropriate to

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[9] Recent experiments (Isaac, Schmidtz, and Walker, 1989) testing the validity of the assurance problem confirm that free riding is not a dominant strategy in these games, reinforcing the results of Marwell and Ames (1979).

[10] These groups have included, for example, the "Morges Group," whose meetings take place in a small village away from Geneva, and a weekly meeting at the U.S. Trade Representative's offices known familiarly as the "Dirty Dozen," a group of high-income developed countries.

many problems of public goods provision, in which a few "bad apples" are evidently tolerated. From a technical point of view, the problem can be corrected by respecifying obligations in terms of a group "norm" or average contribution. In the GATT context, however, the holdout nation is particularly acceptable, since under the GATT articles any country may, in principle, block a proposed action, lowering the obligations of other parties to those previously existing obligations. Thus, a feature which makes the model appear to lack robustness in fact accurately describes the difficulties of multilateral decisionmaking in GATT. Just as this lack of robustness generates a search for a more robust model of obligations to the group G, so GATT has sought to redefine the obligations of contracting parties to avoid the blocking of consensus by a single country. Efforts in the Functioning of the GATT System (FOGS) negotiations to adopt a "consensus minus two" rule for votes on panel disputes, are an example, since the presumably aggrieved parties would then be outvoted by a majority of n - 2.

In terms of the two specific problems that have driven this analysis, export subsidies and the harmonization of EHS standards, the model offers the following insights. First, both reductions in export subsidization and the harmonization of EHS standards will be advanced if "high productivity" contracting parties support it. The defection of a "high productivity" negotiating party such as the EC may, conversely, be sufficient to seriously retard the process.

Second, the negotiating process will probably not lead to an equilibrium in which no progress is made, just as complete trade reform will probably not be accomplished. By strategically asserting high goals (as the United States has done), the expected level of obligation to trade policy reform can be raised, in this sense "moving" the equilibrium toward a "prominent" solution, such as a 50-percent reduction in export subsidies (Crawford and Haller, 1990). The degree of success ultimately turns on the extent to which the assurance problem is overcome.

Third, the increasing size and heterogeneity of GATT does not bode well for rapid trade policy reform. Divisions between the First and Third Worlds, evident in many areas of the Uruguay Round, are likely to be compounded by entry to GATT of Second World countries such as the former Soviet Union and China. This problem is especially true in the case of the harmonization of EHS standards, due to the different views of states on the relative priority of health, safety, and the environment compared with food and agricultural production (Runge, 1990).

Fourth, those nations that "defect" from the process of trade reform by refusing to cooperate, exemplified by the EC in the Uruguay Round are capable of lowering the global sense of obligation to trade policy reform, whether the issue is export subsidies, EHS harmonization, or something else. The apparent decision of the EC to play the role of "bad apple," if the model described has predictive value, will have serious long-term effects by encouraging (or at least not discouraging) global protectionism by others. The prediction is clear: Free riding begets free riding, just as liberalization begets liberalization. In this global game of tit-for-tat, a recurrent pattern of retaliatory protectionism may lead to an equilibrium in world trade that is very low indeed.

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