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INTERNATIONAL TRADE IN THE FOOD SECTOR AND ENVIRONMENTAL QUALITY, HEALTH, AND SAFETY: A SURVEY OF POLICY ISSUES

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I. Introduction

A. Background

The use of barriers to international trade is virtually as old as trade itself and, in particular, conflicts between domestic regulations and international trade are not new to the food sector. In the wave of protectionist tariffs that spread across Europe in the late 1800's, livestock products were protected less than grains. However, another practice began to appear. "Apparently, most countries used veterinary and sanitary restrictions to ban livestock imports from particular countries until the day when frozen meat made this instrument less effective (Heidhues, 1979, p. 119)." In the U.S., regulations concerning health, safety, and product quality were well established by the 1930's (Hillman, 1991, p. 20).

With the liberalization of international trade, it has become increasingly difficult for countries to maintain policies that overtly protect specific sectors. Consequently, some countries have turned to non-tariff barriers to trade. Over the past several years, there have been a number of well-publicized charges that certain domestic environmental, health, or safety (EHS) regulations are, in fact, disguised trade barriers. While concern over EHS/trade conflicts by trading sectors has been growing, so has the demand for consumer, worker and environmental protection (Association for Consumer Research, 1990).[1] Thus, the direction of alleged causality also runs the

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[1]The EC, for example, has introduced detailed consumer protection legislation covering production, processing and marketing of agricultural products and foodstuffs. At the production stage, legislation addresses the marketing and use of plant protection products (pesticides); the establishment of maximum levels of pesticide residues in cereals, fruits and vegetables, and foodstuffs of animal origin; animal feed additives and microbial contamination; veterinary medicinal products such as hormones and antibiotics;

other way; some consumer and environmental organizations view multilateral trade liberalization as a threat to local and global environmental quality, food safety, and human health.

While progress has been made toward trade liberalization, the food sector has tended to lag behind other sectors in the establishment of international rules for resolving or preventing trade disputes that arise from domestic regulations. Food sector EHS/trade disputes have proven challenging, partly because they pose relatively intractable political problems in which different domestic constituencies are pitted against one another. Food sector EHS policies are highly salient and politically charged because food and land resource quality often have implications for national sovereignty, cultural identity or have long-standing symbolic or social values (preservation of family farmers or rural landscapes, food self-sufficiency, low/stable prices for basic foodstuffs).

Such disputes are challenging also because of the analytical difficulty in estimating the economic effects of an EHS regulation, justifying some countermeasure, and predicting improved outcomes from alternative dispute resolution mechanisms. There is insufficient information about the manner in which regulations are applied, the degree to which they impede trade, and the magnitude of protection they afford various agricultural commodities (Hillman,

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and radioactive contamination of agricultural products. With respect to processing and marketing stages, the EC has legislation addressing additives to improve durability, texture, stability, color, aroma, and taste; treatment processes, specifically quick-freezing and irradiation (Smeets, 1990). In addition, the Common Agricultural Policy (CAP) contains provisions discouraging large industrial type units in egg, poultry, and pig production by restricting aids to such units. Also, CAP provides for annual allowances to farmers to offset higher production costs in "less favored agricultural areas" and aids to protecting the environment and countryside. Finally, the CAP provides funds for agricultural research on environmental protection and forestry measures (Godin, 1987).

p.53).

These analytic challenges are compounded by competing perspectives by which to measure positive or negative economic effects of an EHS regulation. Judgements about whether an EHS regulation warrants some countermeasure are made, albeit often implicitly, in the context of a particular analytic perspective. As discussed in Section IV, a regulation's trade effects must be analytically and politically distinguished from its social welfare effects. Trade effects are typically measured by changes in sectoral output, exports, or employment or overall trade balance or terms of trade. Welfare effects, in contrast, are measured by changes in net social benefits (benefits minus costs), without regard to their distribution.

EHS/trade disputes in the food sector are expected to become increasing visible with the unification of the European Community, which may generate strong incentives to create common regulations for internal purposes and to impose restrictions on the rest of the world. A similar propensity may occur as a result of the U.S./Canada Free Trade Agreement (Runge, 1990b).

B. Organization of Paper

In this paper, we seek to clarify several policy questions that have discussions EHS/trade disputes:

- What are the principal rationales for government intervention in the areas of environment, health, and safety and why have these justifications become obscured in the food sector?
- How do different underlying analytical perspectives used by disputants in EHS/trade conflicts tend to polarize the issues?
- What are the pathways by which domestic EHS regulations may affect international trade?
- What are the pathways by which liberalized international trade may affect environmental and food quality and human health and safety?

- What insights into EHS/trade disputes are provided by theoretical and empirical results from trade/environment models?

- What are the advantages and disadvantages of unilaterally and multilaterally applied tests and standards of trade impacts?

- What institutional mechanisms have been proposed for avoiding and/or resolving EHS/trade disputes?

Section II provides some examples of EHS/trade disputes and existing institutions mechanisms to resolve them. Sections III through IX of the paper are organized and ordered according to above questions. Finally, section X offers a summary of policy issues, and a prognosis for EHS/trade conflicts and some policy recommendations.

II. The Policy Problem

To help motivate this paper, we review a few examples of EHS/trade disputes that have disparate trade and welfare implications. We then examine existing institutional mechanisms with attention to their shortcomings for resolving such disputes.

A. Examples of Recent EHS/Trade Disputes

The first example is food irradiation. As international trade in food products increases, irradiation has been viewed as a solution to concerns over food-borne diseases and spoilage losses as well as to costly regulations related to quality and quarantine. The industry position is that irradiation is safe and that uniform national irradiation regulations and promotion of consumer acceptance will facilitate the use of this technology. Furthermore, irradiated food products have already been test-marketed in several countries, with consumers preferring irradiated products to their non-irradiated counterparts in several side-by-side comparisons (Loaharanu, 1989).

While the benefits of irradiation with respect to pathogens are well-established, substantial consumer opposition to the process has been manifest in Europe, notably in the European Parliament, Denmark and Germany. Opponents argue that irradiation may adversely affect food quality; it may be used to preserve the appearance of food the nutritional value of which has decreased; and labeling is unreliable. Opponents also fear that consumers will inadvertently purchase poorly or nonlabeled food products. The industry view is that "political heavyweights" are "making use of often ill-informed public opinion and prejudice (Eurofood, 1989a, 1989b)." Nonetheless, opposition was sufficiently strong for the EC Commission to reduce the number of product

groups for which irradiation is approved (Eurofood, 1989c). Since irradiation has been primarily proposed for imported tropical foodstuffs, such a ban cannot be accused of giving European producers an unfair advantage but is a barrier to market access.

This dispute emphasizes the tension between consumer sovereignty and scientific expertise. According to a scientific perspective, for a country to unilaterally ban imports of irradiated food would constitute a trade barrier. In contrast, if prevailing consumer preferences were negative, such a ban would constitute a legitimate domestic policy, albeit heavy-handed, to address a source of market failure (lack of consumers' ability to differentiate food products).

The second example of an EHS/trade dispute arises out of subnational legislation directed at domestic production practices. Specifically, several U.S. municipalities and states have proposed legislation requiring newspaper publishers to use partly recycled pulp in newsprint. American legislators maintain that such measures, intended to conserve landfill space and reduce resource consumption, represent a "legitimate domestic objective." Canadian pulp and paper companies, however, suspect that the measures constitute a non-tariff barrier to trade because insufficient supply and higher costs of used newspaper collection in Canada would tend to favor U.S. industries. The matter may be taken before a dispute settlement panel established through the U.S/Canada Free Trade Agreement (St. Pierre, 1990, p. 4).

Our third example, a bill proposed in the 101st U.S. Congress called the Global Environmental Protection and Trade Equity Act, is directed at foreign rather than domestic production practices. Its ostensible goals are to protect international environmental quality and level the international trade

playing field. To protect U.S. industry from "unfair" competition with countries having less stringent environmental standards, the bill would allow the U.S. Trade Representative to pursue "unreasonable" trade practice cases, under Section 301 of the U.S. Trade Act, if a competing country fails to enact effective environmental protection legislation. The bill also prohibits the President from granting favorable tariff treatment to a country under the Generalized System of Preferences or Caribbean Basin Initiative unless it enacts and enforces environmental protection controls. The determination of compliance with this provision is to be made by advisory groups with representation from government, business, and environmental organizations. The President may waive this requirement for national security or economic reasons (Congressional Record, 1990, p. S-5486). Since the bill received support from the Sierra Club, National Wildlife Federation and the United Steelworkers of America, questions may be raised by other countries about its intent.

While this particular bill died in committee, others of its type are likely to be proposed and have the potential to generate EHS/trade disputes even if other countries are not required to have EHS standards identical to those prevailing in the U.S.. This bill's sponsors note that it is modeled after U.S. international worker's rights standards which have not been successfully challenged under GATT provisions to date (Congressional Record, 1990, p. S-5489).

B. Existing Institutional Mechanisms to Resolve EHS/Trade Disputes

There are several established avenues for aggrieved parties to pursue to resolve EHS/trade disputes: intergovernmental litigation, supranational

regulation, unilateral retaliation. Here, we discuss only a few of the more prominent examples.

The earliest and still primary institutional mechanism based on multilateralism is contained in the GATT language establishing rules of international trade. The GATT articles, adopted by the contracting parties in 1947, explicitly recognize the possibility that domestic health, safety and environmental policies might override general attempts to lower trade barriers (Jackson, 1969). GATT article XI, headed "General Elimination of Quantitative Restrictions," states in paragraph (1):

> No prohibitions or restrictions other than duties, taxes or other changes, whether made effective through quotas, import or export licenses or other measures, shall be instituted or maintained by any contracting party on the importation of any product of the territory of any contracting party or on the exportation or sale for export of any product destined for the territory of any other contracting party.

Yet Article XX, headed "General Exceptions," provides

> ...nothing in the Agreement shall be construed to prevent the adoption or enforcement by any contracting party of measures:
>
> ...(g) relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption;

provided that such measures:

> ...are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade.

A similar set of exceptions was applied to health related measures under Article XX (b). GATT law emphasizes that any restrictions imposed on foreign practices for environmental or health reasons must also reflect a domestic commitment, so that the exception cannot be misused as a disguised form of protection (Runge, 1990b).

Following a detailed analysis of these early provisions of GATT relating to environmental protection, Kirgis concludes:

> In the absence of effective coordination, GATT provides some rules and procedures that will have to be used to try to find a balance among liberal trade policies, national full-employment objectives, and pollution control imperatives. But the outlook is cloudy at best if GATT has to go it alone in its present form (Kirgis, 1972, p. 917).

The Tokyo Round of GATT negotiations produced a Code of Conduct for Preventing Technical Barriers to Trade (also known as the Standards Code). The Standards Code covers all types of product standards, including technical, health, safety, consumer protection, and environmental standards. The obligations of the Standards Code are easy to state but difficult to apply: product standards, tests and test methods, and systems for certifying conformity with standards are not to create "unnecessary obstacles to international trade." Nor are they to be used "with a view to creating obstacles to international trade." Signatory governments are to accord treatment, with respect to product standards, to imports no less favorable than that accorded domestic products. Other provisions require open procedures in the adoption of product standards, fairness in the application of test methods to foreign products, and procedures for settling international trade disputes. The problem of subnationally promulgated standards is handled by requiring central governments to use "such reasonable means which may be available to them" to see that states, local governments, and private studies adhered to the requirements of the Code (Rubin, 1982, pp. 8-10).

Under the Standards Code, an exporting party must prove that the importing party has imposed a regulation for protectionist reasons or that the measure is "unduly burdensome" or "unnecessary." These terms, however, are not further defined (Rothberg, 1990, p. 111).

The Standards Code establishes several phases of dispute resolution. The first phase calls for prompt bilateral consultations by the disputants. The second phase calls for the convening of the GATT Committee on Technical Barriers to Trade to investigate the matter. Where the dispute concerns questions of a technical nature, the Code requires a third phase that entails formation of a Technical Expert Group to examine scientific judgement on the issue.

The dispute settlement process set out in this agreement failed to resolve a dispute between two signatories, the U.S. and EC, regarding the EC's ban on meat treated with growth hormones (Dick, 1989). In the hormone issue, the dispute resolution process displayed its flaws in its third phase. Formation of a Technical Expert Group is stated to be an act of the Committee which acts only in consensus. Since the EC objected to forming the Group, its objection was fatal. It is unlikely that such a consensus can ever be reached as long as the disputants themselves are allowed to vote on the Committee.

The jurisdictional nature of the EC's objection to the formation of the expert group exposes a second flaw of the Standards Code. According to the EC, the ban was a requirement in terms of a "process and production method (PPM)," while the Standards Code only governs requirements in terms of product characteristics. The Code's drafters expressly excluded PPMs because PPMs were intensively used in the agricultural sector and signatories did not want this highly sensitive area to be subject to the Standards Code. There is provision, however, for a party to claim that the obligation under the agreement is being purposely circumvented by the language used in the requirements (Dick).

In addition to the Standards Code, the Tokyo Round of GATT also produced

a Code on Subsidies and Countervailing Duties which recognizes both that domestic subsidies may have harmful effects on trade and that such subsidies are used by governments to promote important objectives of national policy. The rules concentrate on the effects of subsidy practices, rather than on the acknowledged sovereign right of governments to subsidize, and permit governments whose industries are adversely affected by others' subsidies to take offsetting action in the form of countervailing or penalty duties imposed against imports. While the analogy between subsidies and environmental controls is imperfect since controls are the obverse of subsidies, the Code may offer a conceptual model for accommodating national sovereignty in trade rules (Rubin).

Three organizations have been identified in GATT negotiations for providing international scientific expertise: the Codex Alimentarius (CODEX) for food safety, International Plant Protection Convention (IPPC) for plant health, and the International Office of Epizootics (OIE) for animal health. (There are several other international organizations that could serve to harmonize food and other standards (Vettorazi, 1989), leading one author to call for international mechanisms that will "harmonize the harmonizers" (Gerard, p. 289)). Critics have charged that at best, the Codex Commission receives advice from expert committees whose members come from a limited number of countries and do not usually represent the full range of expert opinion and perspectives (Association for Consumer Research) and, at worst, CODEX is "stocked with industry handmaidens" (Wysham, 1990, p. 771). In a recent U.S. delegation of 28 individuals, 12 represented multinational corporations such as Coca-Cola and Nestle (Wysham). Thus, there is some public perception of lack of scientific objectivity on at least one of these

international panels.

In summary, existing multilateral institutions for resolving EHS/trade disputes appear ill-equipped to resolve disputes arising out of the magnitude and varieties of current world trade. Their language regarding what constitutes a trade barrier is sometimes vague or inconsistent and practical application of legal terms is difficult. Procedures are often cumbersome and can be stymied by disputants themselves. The role of international scientific organizations is unclear and their objectivity has been questioned.

III. Market Failure as Rationale for EHS Regulations

A. Causes of Market Failure

Government intervention in the food sector has been justified on the basis of correction of market failure or for a variety of nonefficiency-related national objectives such as price stabilization, self-sufficiency or income redistribution. Market failure exists when market prices do not reflect real resource costs to society or when markets do not exist for a good or service. Since a given EHS regulation may address both market failure and nonefficiency related social goals (as with the U.S. Conservation Reserve Program and European land retirement programs[2]), it may be difficult to classify a given EHS regulation in terms of its dominant national objective.

Two extreme perspectives can be differentiated regarding government intervention in private markets (Rausser). One is that governments intervene to correct market failures, a rationale that lends legitimacy to domestic EHS regulations. The other is that governments intervene to redistribute wealth to politically potent interest groups, resulting in "government failure", which lends itself to an interpretation of EHS regulations as instruments of protectionism.

Because market failure is the most common (if sometimes implicit) justification for EHS regulations, we summarize its major sources in the food sector. EHS regulations in the food sector are similar to regulations directed at other sectors in terms of the sources of market failure they are

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[2]The Conservation Reserve Program and some European programs are intended to reduce temporal and spatial externalities associated with soil erosion, redistribute income to participating landowners, and reduce agricultural production, thus reducing government budget exposure from commodity price stabilization programs.

ostensibly designed to redress--externalities, information asymmetry, open access resources divergence between social and private discount rates and market power.

Agricultural production activities sometimes result in spatial or intertemporal environmental externalities. An example of a spatial externality is nonpoint source water pollution that adversely affects off-farm water resources. Some spatial externalities are transnational, such as flooding in Bangladesh being exacerbated by erosive farming practices in Nepal. An example of an intertemporal externality is soil loss contributing to future crop productivity loss that may or may not occur within the tenure of the landowner whose practices are causing the erosion.

Lack of information at the point of production is another source of market failure. Farm operators often lack information about the adverse environmental effects of production practices. Farm workers may lack information about health and safety risks of machinery and agrichemicals.

Asymmetric information at the point of consumption may also cause market failure. Unlike manufactured goods, unprocessed (and some processed) foodstuffs do not have brand names from which information about content and production practices can be inferred. Food has attributes of what is called a "credence good", that is, certain qualitative attributes cannot be readily determined even after consumption (Senauer, 1991). While food testing and product labeling are used to reduce this lack of information at the point of consumption, food inspection resources are spread thin. Furthermore, standards violations tend to be higher for imports than for domestically produced commodities (Senauer, 1989).

Information asymmetry in the food sector is exacerbated because of the

multitude of individual production decisions that can not be adequately monitored directly without prohibitive cost. Consequently, environmental policy instruments in agriculture rely on sampling procedures for monitoring and enforcement or on incentive-compatible (preference-revealing) policy instruments at the point of production.

Private time horizons, discount rates, and property rights assignments may give rise to private incentives with respect to agricultural production practices that diverge from those associated with social optimality. For example, land tenure relations may be such that landowners and farm operators have nonconvergent incentives with respect to soil conservation investments.

Factor inputs in production may also be relatively immobile. For example, in some regions, farm workers are subject to monopsonistic hiring conditions.

B. Legitimacy of Market Failure Rationale from International Perspective

While the above examples suggest that market failure is a necessary condition for the legitimacy of a domestic EHS regulation, one country's market failure may be another's government failure. First, countries use a wide variety of policy instruments that affect non-efficiency social objectives to varying degrees. The policy instruments used to achieve environmental, health, and safety objectives include technical standards, restrictions on the use of inputs, output quality standards, positive or negative economic incentives, export restrictions, embargoes, outright bans, labeling requirements, disposal standards, etc. Some EHS regulations allow substitution of production technology to meet an EHS objective, while others do not. Also, EHS regulations may intervene at different points along the

production process, such as controlling inputs, production technology, characteristics of outputs, treatment of environmental externalities, and storage and shipment of commodities. While it may be possible to achieve the same environmental quality goal at any of these points, resulting trade effects may vary widely.

A second reason is that, unlike the industrial sector, prevailing property rights assignments in most countries tend to give landowners the right to manage farm production practices as they wish, even if such practices generate environmental externalities. Policy instruments for land management thus tend to focus on positive incentives, such as subsidies, to change producer behavior in ways that reduce the externality. While the initial assignment of property rights may be considered irrelevant from a simple Coasian perspective, welfare outcomes are sensitive to prohibitively high transactions costs and to power differentials between polluters and pollutees (Livingston). Furthermore, property rights are shifting away from landowners in some countries (exemplified by Conservation Compliance provisions of the U.S. 1985 farm bill[3]); consequently, policy instruments to achieve agricultural resource goals may use positive incentives in some countries and negative incentives in others.

Another reason for lack of international agreement over what constitutes market failure is heterogeneity among nations on both supply and demand side factors. Consider two countries that have both historically regulated a particular form of pollution but have marginally differing pollution emission standards. For some level of emissions between the two standards, the initial

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[3]Under Conservation Compliance provisions, farmers must develop approved farm conservation plan or risk loss of government program benefits.

assignment of property rights lies with the pollutors in one country and the pollutees in the other. In the country with the more stringent standard, the right to enjoy a level of environmental quality above the level of the standard lies with the pollutees. In the more lenient country, inducing a reduction in pollution would require the use of positive incentives (subsidies), while in the other case, the same reduction could be achieved through regulation or taxation. From the perspective of one country, the subsidy is a clear case of government failure if it does not recognize that standards may differ due to supply or demand side endowments.

Theorists have defined at least four determinants of relative environmental factor endowment:

1) the natural assimilative capacity of the land, water, and atmosphere, as determined by such factors as climate, rainfall, wind patterns, and geographical location;

2) the value that citizens place on environmental quality, that may be transmitted via government regulations;

3) the current demands on the natural assimilative capacity of the environment, reflected by levels of industrialization and urbanization and pollution levels; and

4) the amount of public and private investment undertaken to either increase the natural assimilative capacity or decrease the demands placed on it (Leonard, pp. 59-60).

Of these determinants of relative environmental endowment within a country, only the first is fixed; the rest may evolve over time in response to changing preferences and tastes and rates of industrialization and urbanization, mobilization of environmental constituencies, institutional changes, and income changes.

On the demand side, countries have different tastes and preferences for environmental quality, food safety, and human health. The Japanese, for example, are much more wary of artificial food additives, than natural food

additives, even if their chemical constituencies are identical (Vogel, 1989).

The distinction between supply and demand side endowment heterogeneity is relevant to EHS/trade disputes since efforts to harmonize regulations (discussed in Section IX) are likely to be more intense if national differences are perceived to result from cultural rather than physical endowments.

IV. Alternative Analytical Perspectives for Evaluating EHS/Trade Disputes

Debate over trade barrier effects of EHS and other administrative regulations typically focuses on deviations from a condition of free trade. When all markets operate perfectly and are undistorted by government intervention, free trade between two countries is theoretically a "first best" policy for the countries considered jointly. The two countries are better off with trade than under autarky, in terms of social welfare, though distributional effects may require compensation (rarely carried out) to certain sectors within each country. This fundamental result underlies the push for freer trade, even though the assumptions it requires (perfectly functioning, complete, undistorted domestic markets) are invariably violated. Because those "first best" conditions generally do not prevail, how an EHS regulation affects trade must be distinguished from its welfare effects.

Most models in the literature that integrate EHS regulations and trade focus on changes in net social welfare. Yet virtually all public debate focuses on the competitiveness of specific producing sectors. Reasons for this may include relative visibility, relative ease of measurement (partial versus general equilibrium), and distributional effects on well organized producing sectors.

It may be helpful to make explicit some of the analytical choices that underlie the debate about EHS/trade disputes and remedies.[4] Consequently, this section outlines three analytical dimensions underlying the development of trade impact criteria:

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[4]The importance of being explicit about such choices is apparent from an exchange over semantics and accounting perspective in the American Journal of Agricultural Economics regarding whether gains from trade necessarily occur when government distortions exist (Schmitz et al., 1990).

1) What are the boundaries of the economic system to be analyzed--the specific sector(s) directly affected by the regulation, the entire economy of the affected country, or the economy of the global trading system?

2) Are changes in private market values and/or social (including nonmarket) values being considered?

3) What states of the world are being compared; in particular, what is the base case against which other observed or hypothetical cases are compared?

A. Boundaries of Economic System Affected by EHS Regulation

With respect to the first question, the most parochial choice is to limit the boundaries of an EHS/trade analysis to directly affected commodities or sectors. The results of this type of analysis are typically in terms of changes in sectoral output, exports, or employment. Because of distributional effects of an EHS regulation, political pressure to conduct this type of partial analysis is more intense than the other two choices.

Expanding boundaries to analyze general equilibrium effects of an EHS regulation refocuses the policy question from distributional to efficiency effects. This type of analysis measures changes in terms of national trade balance, employment and economic growth and is more difficult to conduct than sectoral analysis.

The distinction between these two analytical perspectives sometimes becomes blurred in analyzing EHS regulations and the economy-wide effects of actions to remedy them. Overall impacts of changes in EHS regulations cannot be assessed without looking beyond the specific commodities affected. This is because of an identity in national accounts, namely, the trade balance equals the difference between national saving and national investment.[5] A

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[5]The macroeconomic identity is as follows:
$X - M = S + (T - G) - I$
That is, the trade balance of exports less imports (X - M) equals the

relaxation of an EHS regulation, for example, that has the effect of increasing U.S. food exports to Japan may not have any effect on the overall U.S. trade balance. Movements in saving and investment translate into overall trade surpluses or deficits through linkages that may not track with the effects of specific EHS or other domestic policies on particular sectors. "Only insofar as actions influence saving and investment can they influence the trade balance (Cooper, 1988, p. 116)." Furthermore, government subsidies to enhance the competitiveness of specific sectors might actually worsen the overall trade balance, if investment is stimulated and the budget deficit is increased (Cooper, p. 118).

The third analytical boundary, that of the global economy, would be applied when the policy questions address efficiency effects at the international level. As such, results that apply this perspective are unlikely to be considered in EHS/trade disputes unless there is possibility of side payments among nations. Otherwise, even if a given resolution to a dispute results in greater global welfare than some other resolution that results in positive but small welfare gains to both countries, the global Pareto preferred solution is unlikely to gain adherents. This is not to say that countries would not prefer multilateral to unilateral approaches to EHS/trade disputes on the basis of national economic effects. GATT law does provide for compensation for enacting trade barriers under some conditions (Jackson, 1969), a provision that can be interpreted as allowing side payments.

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difference between national savings and national investment (I), where national saving equals private-sector saving (S) plus taxes minus government expenditures (T - G).

B. Social or Private Accounting Perspective

With respect to the second analytical choice (between private or social benefits and costs), two EHS regulations that have identical effects under one framework may have very different effects under the other. What is categorized as a benefit or cost may differ as well as their respective valuations. Under a social accounting framework, all inputs and outputs are valued at their real opportunity costs to society, including nonmarket goods such as environmental amenities and food quality attributes not recognized in market transactions. Government payments are considered transfers and do not directly enter the calculation. Using a private accounting framework, government payments to producers are counted, but environmental amenities may be excluded.

The choice between social and private values also determines how benefits and costs are quantified. When a good is purchased from one country rather than another, there is a net gain to the producing country only if the price of the good exceeds the social opportunity costs of the resources engaged in production of the good. In the food sector, market values may diverge from social opportunity costs because of multiple government interventions, many of which are designed to fulfill social goals other than market failure. Even if market failure were the goal of all interventions, second best considerations may prevent market values from accurately representing social values.

Environmental and consumer groups focus on the social welfare effects of EHS regulations and trade. Accordingly, as countries systematically establish and enforce environmental standards, some alteration of international trade and investment is likely and desirable from an efficiency perspective

(Pearson, 1987).

C. States of the World Being Compared

The third analytic choice may also have strong implications for policy results. The assumed base case state of the world may be one with or without other government distortions and one with autarky or free trade. Since only one state of the world is actually observed, the other state(s) must necessarily be simulated, holding some set of separable conditions constant. Such simulations must make explicit assumptions regarding the presence or absence of other government policies, partial or general equilibrium frameworks, incorporation of dynamic as well as static relationships, etc.

According to Walter, (1975), from a purely theoretical perspective, trade is not distorted when trade flows according to the comparative advantage of different trading partners. Prices should reflect the true productive capacities of the country--the full social costs involved in production activities. Since the definition of trade distortion refers to a hypothetical situation of unrestricted competition, it is impossible to define with certainty such a condition in order to compare an actual distorted situation with a previous undistorted one. With regard to the environment, countries are starting with a distorted situation, since market prices do not reflect true social costs. Because implementation of environmental policies implies internalization of external costs, changes of trade patterns will inevitably result.

V. Linkages from Domestic EHS regulations to International Trade

A. General Linkages

In this section, we discuss how the trade effects of EHS regulations are different than and similar to those of other domestic regulations. EHS food sector regulations affect trade in several ways that are analogous to trade effects from other domestic policies that may act as non-tariff administrative trade barriers.

The principle linkages from environmental regulations (health and safety regulations have similar linkages) to international trade are summarized by Walter (1975) :

1) Short-term competitive effects: Environmental control raises production costs and this affects the competitiveness of domestic export and import competing industries. Productive factors become reallocated in a country's economy.

2) Balance of trade effects: By altering the terms of trade, environmental control costs can influence the balance of trade. If export- and import-competing goods become more expensive, then the balance of trade can be expected to worsen if imports or exports are relatively sensitive to the price changes induced by pollution control.

3) Comparative advantage effects: By influencing the cost of producing different products in different ways, environmental management will also have an impact on the structure of trade, that is, on its direction and commodity composition. When a previously unpriced immobile resource becomes priced, its price will be reflected in international comparative advantage.

4) Factor movement effects: If an industry is threatened with competitive

dislocations, it may choose to shift the location of production facilities, or at least incremental productive capacity, to sites characterized by greater environmental assimilative capacity, different environmental preferences, or both. This is probably less of an issue with respect to agriculture than manufacturing, due to factor immobility in land and labor.

5) International economic policy effects: Increases in production costs and losses in international competitive position attributable to environmental measures may trigger charges of unfair competition. International differences in the instruments of pollution control will tend to raise the probability of commercial policy reactions.

Demand factors have a direct bearing on international trade and resource allocation in three ways. First, a systematic effort to improve the environment may depress real income spendable on conventional goods and services below what would otherwise be obtained. This reduces the overall volume of trade. Second, each internationally traded good has a unique environmental profile, that is, the environmental costs associated with its manufacture, use, and disposal. If these are internalized, their relative size will be highly product specific. Substitution in consumption and production inputs will be reflected in international trade in affected products. Third, environmental control requirements may give rise to development of a wide variety of goods and services that are internationally traded (Walter, 1975).

According to Walter (1975), shifts in the pattern of trade flows from environmental regulations are relatively large under the following conditions:

1) large relevant differences in environmental assimilative capacity for the specific effluents involved;

2) large inter-country variations in social preferences for environmental

quality;

3) wide inter-country differences in approaches to environmental restoration and maintenance;

4) few barriers are applied to trade and capital flows; and

5) high substitution and price sensitivity of the traded products affected (pp. 53).

B. Linkages Specific to Major Categories of EHS Regulations

While EHS regulations appear to result in some general trade effects, they also have some fundamental differences that are relevant to analytical results relating to social welfare effects, the design of tests of trade impact, and international institutional reforms. Several categories of EHS regulations can be differentiated.

The first category is comprised of regulations intended to correct some domestic source of market failure at the point of production within a country. Examples are financial assistance for erosion control, government-supported R&D in cost-reducing or output-enhancing technologies and subsidized infrastructure for agricultural production in the form of irrigation, produce transportation, and rural electrification. Such policies may result in a rightward shift in the industry's domestic supply function. The shift in domestic supply curves results in a shift in the excess supply curve determining the amount of the good that will be exported to the rest of the world (Sutton, 1989). Negative policy instruments may also be used that result in domestic and excess supply shifting in the opposite direction. Examples of such policies are environmental protection regulations, farmworker health and safety standards, and animal welfare standards.

One of the most common types of EHS/trade disputes is when exports are hampered because of product regulations in the importing country. This is what

occurred in the beef hormone dispute between the U.S. and the E.C.. Thus, the second category of EHS regulations are those designed to correct market failure occurring at the point of consumption. Here, an importing country promulgates an EHS regulation that requires standards for certain qualitative attributes of food products consumed domestically, regardless of whether they are produced domestically or imported. Examples include standards regarding chemical residues (pesticides, synthetic hormones and antibiotics, coloring agents, etc.), biological contaminants (pathogens, insects), irradiation, and quality differentiation (based on location of origin, ingredients, processing techniques). A subcategory is when an importing country's regulation has the effect of raising transactions costs associated with international trade, rather than production costs. Examples are plant or animal product quarantines at the importer's national border and packaging/labeling requirements.

The imposition of EHS standards on final goods can put foreign suppliers at a disadvantage in at least two ways. First, if the export market is only a small proportion of the output of a firm (or of an optimally sized plant), the adaptation of a domestic good to higher foreign standards can impose diseconomies of small scale production. Standards that increase production costs may affect all products sold in a given market (whether imported or produced domestically), so there may not be any discriminatory intent aimed at foreign suppliers. Export suppliers, however, may have to service multiple markets subject to a range of environmental controls, so that scale economies are sacrificed in comparison with import-competing suppliers in these markets (Walter, 1975).

On the demand side, the cost and quality changes brought about by the standards may induce buyers to adopt domestic products if they are less costly to bring up to standard. The basis for setting and measuring standards may also

differ among nations. The design needed to serve a foreign market may be substantially different from that required in the home market. Under these conditions, few firms will invest in the product design needed for exporting, thus curtailing volume of international trade (Walter, 1976).

A third category of EHS regulations are those enacted by one country to address market failure within another country at the point of production. There are several pathways for a market failure in one country to adversely affect the welfare of citizens of another country. Production practices may cause transboundary pollution (in which the other country is directly affected) or the citizens of the other country may have non-use value for some environmental resource that is being reduced by the offending production practices. Examples of the latter are boycotts of fish products from countries in violation of international whaling restrictions and bans on imports of products from endangered species (whales, elephants) and endangered ecosystems (tropical hardwoods, beef grown in tropical rainforests). In a many country world, unless trade in the good in question between the two countries dominates trade with other countries, unilateral regulation tends to affect trade flows but not market failure because of the opportunity for arbitrage (See Section VII).

A fourth regulatory category is when producer inputs or consumer goods banned in one country are exported to another. Either country may take regulatory action to restrict this trade. The market failure that justifies such actions is that importers or final users of the good often do not have adequate information on the good's hazards and how they can be mitigated. The inefficiency of unilateral bans is partly a result of the ability of multinational corporations producing the banned product to shift production to another country.

The "circle of poison" concept is an example in which imported food products

with pesticide residues not allowed as production inputs in a country are banned. The initial domestic pesticide restriction corresponds to an EHS regulation aimed at domestic market failure, while the ban on pesticide-tainted imports could be interpreted as aimed at foreign market failure. Unlike transnational regulations for which there are no domestically produced counterparts, however, the circle of poison ban is subject to accusations of protectionism.

A fifth category is when both countries pollute a global resource. Corrective policies are likely to impose different costs on producers in the two countries. While food sector examples exist (Methane, a greenhouse gas, is produced from cattle and rice paddies), they are not as significant as those emanating from the industrial sector.

V. Linkages from Liberalized Trade to Environmental and Food Quality and Human Health and Safety

A. Concerns Regarding Static Trade-offs Between Trade and Environmental Quality

Most of this paper focuses on the effects of EHS regulations on trade. The liberalization of international trade policy, however, also has the potential for affecting environmental and food quality. As with the effects of EHS regulations on trade, these effects can be analyzed using alternative accounting frameworks. While producer groups tend to use a private sectoral perspective in decrying the effects of EHS regulations on trade, environmental and consumer groups tend to focus on the global, social costs of freer trade to the exclusion of its consumer benefits (such as greater product variety and lower costs).

The most obvious linkage from trade to environmental quality is the potential for weakening legitimate EHS regulations (that is, those designed primarily to correct market failure) to promote freer trade. This linkage results from the ability of producers to externalize those social costs of production that are not also private costs. Increased competition among producing countries with heterogenous resource and environmental endowments exerts pressure on producers in relatively low productivity regions to use production practices with relatively high external costs of production.

> ...countries may not know or act on their true comparative advantage. Unlike capital and labor, most environmental services do not pass through markets and hence, there are not explicit market prices to indicate abundance or scarcity. Implicit prices are established by government regulation, but the process is imperfect at best. Hence, governments may deliberately or inadvertently undervalue environmental services so as to gain a comparative advantage in world markets. The danger of undervaluing environmental services is compounded when damages are cumulative, indirect and long term (Pearson, 1987, p. 118).

Where EHS regulations already apply, freer trade may induce producing

sectors or commodity groups to lobby for their relaxation. The range of EHS regulations that could be potentially weakened as a direct or indirect result of trade liberalization is as broad as that outlined in section V. In a worst case scenario, standards for pesticides residues are relaxed[6], international standards governing the marketing of products such as infant formula are overturned, local antitoxics and recycling initiatives become pre-empted[7], local moratoria on controversial production practices (such as use of bovine somatotropin) are lifted, and bans on raw log exports are deemed protectionist (Schaeffer, 1990; Ritchie, 1990; Wysham, 1990).

Some of these concerns appear overstated. For example, while several of the Codex's standards for pesticide residues are less stringent than those of EPA or FDA (Ritchie; Wysham), Codex itself can not preempt national standards. In other cases, the federal government already has some pre-emption authority over local initiatives (Conden, 1990). Nonetheless, many states and localities have filled what they perceive to be a regulatory void at the federal level; pressure for federal pre-emption exerted by trading sectors can reasonably be expected.

The potential for federal EHS regulations to be relaxed depends in part on administrative interpretation of existing statutory language. The main principles of the GATT Standards Code are contained in Title IV of the U.S. Trade Agreements Implementation Act of 1979. Federal agencies that develop new product standards are required to take into account existing international standards and to base new

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[6]Opponents to a California proposal that restricts pesticide residues more strictly than federal standards have argued that it violates U.S. international trade obligations (Burket, 1990, p.4-5).

[7]There have been many documented cases of pesticides, pharmaceutical, and other products manufactured, but not allowed for sale, in the U.S. or Europe having adverse health effects in countries where they are marketed (Norris, 1982).

standards on existing ones if appropriate. However, international standards may not be deemed appropriate as a basis for new U.S. standards because of concern for "the protection of human health or safety, animal or plant life or health or the environment." The opening section of the Trade Agreements Act states that

> No standards-related activity of any private person, Federal agency, or State agency shall be deemed to constitute an unnecessary obstacle to foreign commerce of the United States if the demonstrable purpose of the standards-related activity is to achieve a legitimate domestic objective including, but not limited to, the protection of legitimate health or safety, essential security, environmental or consumer interests and if such activity does not operate to exclude imported products which fully meet the objectives of the activity (Rubin, p. 14).

This language would appear to insulate some domestic EHS regulations from charges of unfair trade practices.

B. Linkages Resulting from Technological Change, Scale Economics and Other Dynamic Relationships

Some linkages from liberalized trade rules to environmental and food quality are not apparent from a purely static analysis:

1) the potential for market expansion induces changes in production and shipping technologies that may affect environmental and product quality;

2) the potential for market expansion affords opportunities for private scale economies that may have social scale diseconomies.

The first linkage arises out of the interaction between trade liberalization reforms and technological innovation. While a technical innovation may be induced as result of domestic market expansion, it may also be applied internationally when trade is liberalized. This is especially true if the country where the technology originates has long shipping distances.

The food sector is distinctive in that, unlike most other traded goods, food is perishable. This attribute results in a direct linkage between trade liberalization and those technological innovations that enable food commodities to

be shipped longer distances and maintain longer shelf lives.

In Japan and many developing countries, there is a tradition of food products traveling only short distances in time and space from producer to consumer (Vogel, 1989). In Europe and especially the U.S., such traditions have been largely supplanted by food distribution systems in which commodities travel thousands of miles from producer to consumer. While these systems have been facilitated in part by transportation infrastructure, necessary components also include production, storage, and preservation technologies: early harvest of fruits and vegetables with ethylene dibromide and/or pesticide applications during transshipment, breeding of produce less susceptible to physical damage from shipping, preservation additives, nonrefridgerated dairy packaging, and irradiation.

Several of these technological innovations, however, are perceived by some consumers to be detrimental to food or environmental quality. Consumers seek visual cues as to the freshness and wholesomeness of a food product since they often do not have access to information as to where the food was produced or date of harvest, let alone nutrient levels. Production and post-harvest technologies, however, are increasingly able to mask or delay visual signs of spoilage even though loss of nutritional value has occurred.

A second linkage arises because trade liberalization may encourage domestic firms to forge cross-border agreements to reap private economies of scale and scope resulting in increased market concentration. Economic unification/integration affords opportunities for scale economies accruing to multinational agribusiness corporations. There may be social diseconomies of scale, however, if larger production units result in EHS externalities. For example, beef processing in large feedlots may increase nutrient runoff compared

to small operations and requires use of high energy feed rations controlled by hormones. Another diseconomy of scale may result from food products being shipped longer distances over longer time periods because food products become more subject to loss of nutritional value. Otherwise, measures are required to prevent such loss which are perceived by some consumers to adversely affect food quality (preservatives, pesticides, irradiation, "hard tomatoes", etc.). Finally, increasing the scale of agricultural production may diminish the sense of community in rural areas (Morris, 1988).

There is also a causal linkage from freer trade to environmental externalities through production uncertainty. A fundamental effect of freer trade is productivity gain generated through specialization in the mix of commodities produced on a farm. Given production and price uncertainty, specialization represents a change in the mix of risky activities. Changing from multiple varieties and crops to monoculture caused by trade-induced specialization may bring higher risks of crop failure from weather variability and pest infestations (Antle and Howitt, 1988, p. 86-7). The federal government, in turn, has implemented crop insurance and other policies that insulate farmers from production and price risk. Commodity specialization tends to have higher environmental costs than diversification because of increased application of pesticides and commercial fertilizers and increased soil erosion.

While there are many current examples of the potential interaction among technological change, trade, and food quality concerns, such interaction has a long history:

> ...By the end of the 1800's, the scientific community had recognized the importance of reducing disease-causing bacteria in milk...But some consumer groups argued that pasteurization would adulterate an already safe, wholesome product and would allow milk producers to abandon existing sanitary practices. Owners of smaller scale milk plants

> supported this position partly because the new technology endangered their financial solvency by providing a cost advantage to their larger competitors. Owners of the big dairy plants favored pasteurization because the technology gave milk greater shelf life and opened up more distant markets (Kuchler et al., 1989).

This early debate foreshadowed the current concerns about the non-neutral scale effects of technological change in the agricultural sector. While a technology such as irradiation may by itself be scale neutral, it may open up larger markets or otherwise complement other production inputs that are not scale neutral. In addition, the pasteurization debate is similar to the BST debate in that consumer health concerns have become entwined with producer concerns over the scale and distributional implications of the technology.

Food packaging offers another example of the conflict between trade, technology and environmental protection. Food, and especially beverage packaging trends have been toward lighter, disposable materials that reduce costs for long distance, one way shipment of containers. Denmark has required all beer and soft drink containers to be sold in returnable containers since 1981. While this measure was found by the European Court to serve a legitimate environmental objective, it could incidentally impose higher costs on importers than domestic producers. It was thus deemed a trade barrier by the Court which concluded that, in achieving a balance between trade and environmental protection, high standards of protection may have to be reduced (Shrybman, 1990, p. 25-26).

VII. Theoretical and Empirical Results of Trade and Environment Models

Environmental controls have typically been incorporated into production models either by assigning pollution as a joint output in the sector's production process or treating the environment as a factor of production. Environmental pollution may also be modeled as a pure public bad.

For many theoretical trade models, the starting point is the Heckscher-Ohlin theorem: A country will export goods whose production depends upon high inputs of factors that are abundant in the country and will import goods produced with factors that are scarce in the country (Leonard, p. 59). In a two country, two factor, two good world, trade is explained by the differences in pre-trade opportunity costs across the two countries. No trade occurs when two countries have identical tastes and factor endowment ratios, since neither would exhibit a comparative cost advantage. These results derive from the interaction between production and consumption sides of the economy, given fixed factor endowments and a general equilibrium context.

Since the 1970s, a body of literature has developed that seeks to integrate or reconcile environmental factors with classical models of international trade. In such models, a country richly endowed with environmental inputs in production will generally produce and export those goods whose production is environmentally-intensive. When other factors are identical across countries, comparative advantage can be defined in terms of environmental abundance or scarcity.

In this section, we apply some results from the literature to the previously identified categories of the more salient forms of EHS/trade disputes to gain some policy insights.

A. Models Addressing Pollution Generated by and Affecting the Environment Within a Trading Country

According to a model by Blarel (1985), free trade may result in a multitude of global Pareto Optimal solutions with different welfare distributions among trading nations. If a country's environmentally-damaging sector is import-competing, an environmental laissez-faire policy improves the terms of trade; if the sector is export competing, the policy deteriorates the terms of trade.

In Blarel's model, it is not possible to determine the trade effects of an environmental policy once output prices are allowed to adjust; the effects of allowing environmental degradation on the trade and specialization patterns of a large trading country are indeterminate. A large country that allows environmental degradation to be associated with one of its outputs through some factor of production depresses the world price of that output and reduces foreign production incentives.

When two countries exchange commodities that are <u>both</u> associated with externalities, a laissez-faire policy will distort trade patterns, forcing each country to overspecialize in the environmentally-damaging commodity. The market outcome reduces the level of goods (both private and public) that could otherwise be produced in a nondistorted situation and decreases the level of welfare attainable in each country. Under some circumstances, trade reversal may occur.

According to another model with two countries trading two goods, one of whose production generates pollution, when the pollution intensiveness of the traded goods varies across countries, increased trade may not result in welfare gains or gains may be accentuated (Pethig, 1976). If the international amounts of production of the two goods is fixed, only the location of production changes, so that pollution can be indirectly imported or exported. If the pollution-intensive commodity is exported by country A, increased trade could lower A's welfare. The

country that exports the pollution intensive good may not gain from trade, while the other country always gains. Pollution abatement goals provide an incentive for one country to expand trade and for the other country to restrict trade. However, if the same good is equally pollution intensive in both countries, the assumed fixed worldwide output ratio between the two goods prevents both countries from simultaneously tightening their environmental controls.

In another model of pollution in an open economy (Asako, 1979), there is two-way causality. First, pollution controls affect the pattern of trade through the induced reallocation of resources and changes in the structure of prices in the domestic economy. Second, the existence of international trade implies that a country is taking advantage of an opportunity that it cannot otherwise enjoy by biasing the domestic economic structure toward an area in which it has a comparative advantage. The bias has a significant effect on environmental pollution in the domestic economy. If a country first enters the world market by exporting a pollution-intensive commodity in return for a less intensive commodity, the welfare level of that country is found to <u>decrease</u> as a result of a small departure from autarky.

According to a model by Batabyal (1990), an environmental regulation's effect on social welfare can be decomposed into three constituent components: a production effect, a trade effect, and an environmental quality effect. The production effect is unambiguously negative, the environmental quality effect is unambiguously positive (assuming that an improvement in environmental quality increases utility), and the trade effect is uncertain in direction (Batabyal).

Tobey (1989) presents both a theoretical model and empirical analysis of the pattern of world trade to estimate the effects of domestic environmental regulations on trade patterns of pollution-intensive commodities. Under several

variations of the HO model, he found no significant effects of pollution control measures on trade patterns. He postulated that the magnitude of environmental expenditures in countries with stringent environmental policies are not sufficiently large to cause a noticeable effect, but recognized that the model specification may not be sufficiently accurate to uncover small changes in factor abundances and comparative advantage.

Finally, in a dynamic resources/trade model (Antle and Howitt, 1988), social costs from externalities associated with agricultural production activities result in privately optimal but socially suboptimal decisions. Antle and Howitt consider a country producing a commodity that degrades a common property resource within the country. In a closed economy, an optimal policy involves intervention in the output market to restrict production to where the marginal social benefit of consuming the product equals the marginal social cost of producing it, including the external cost.

In an open economy, however, all countries could act jointly to maximize welfare, defined as the collective sum of producer and consumer surplus across countries. Since the cooperative scenario is unlikely, each country is assumed to address its respective externality on a unilateral basis. From a small exporting country's perspective, foreign consumers benefit from being able to obtain the exported product at a world price that does not include the cost of the externality borne by the producing country. Conversely, a small importing country is able to increase consumption of the traded good, while decreasing domestic production, thus reducing its external costs. Unless compensation is forthcoming from importing countries, producing countries' only options are to bear the full costs of externalities or otherwise reduce externalities by restricting production and exports.

B. Models Addressing Transboundary Pollution and Trade

In a model with internationally mobile goods, capital and pollutants, and where policy instruments may be either equipment standards or taxes (Merrifield), only the equipment standard strategy results in an unambiguous reduction in pollution flows. Attempting to reduce pollution by imposing a new tax on the output of polluting industries could actually increase the pollution because reduction in one country's emissions may be more than offset if capital movements increase other country's output and emissions. Thus, instruments matter in terms of net effects on pollution flows, income distribution and terms of trade. Another lesson is that, while an open economy does not make it impossible for either country to take effective unilateral action against a transnational pollutant, each country must recognize that some policies could increase, rather than decrease, pollution flows.

In this model, when factors are immobile across countries and both countries levy the same tax on pollution, the post-tax trade equilibrium will still feature the same equal factor proportions and equal factor prices as between countries. The effect of coordinated (equal) regulation on labor and capital factor incomes now depends on the elasticity of demand for good X and the relative capital/labor intensity of X in comparison to good Y.

However, nonuniform regulation between the countries destroys factor-price equalization. For a small country with no influence over world commodity prices, regulation injures some factor of production and benefits others. For a large country, its unilateral regulation will raise the world commodity price of the regulated product. Elsewhere in the world, the factor used intensively in the production of regulated product will benefit.

If the factor immobility assumption is relaxed, differential regulation will

cause labor or capital to move into or out of the regulated country. Multinational companies, for example, may easily transfer capital across borders where nonuniform regulation provides systematic incentives to relocate. The direction of factor migration depends on relative factor proportions in the regulated industry.

In a model by McGuire (1982), if the pollutant in question creates a common international public bad and factors are mobile across national boundaries, then unilateral or uncoordinated regulation is found to be inefficient and ultimately ineffective. When unilateral regulation is undertaken in these circumstances, precisely tailored tax, trade, or commercial policies may compensate for the incentive that industry would have to relocate to control-free havens. Ultimately, however, the leverage that one country has on world wide pollution depends on its predominance in the traded goods and on supply and demand elasticities at home and abroad.

C. Models Where Traded Products Themselves Cause Externalities

Antle and Howitt also adapt their model to the "circle of poison" issue (p. 80). Pesticide registration in the U.S. could lead to more pesticide being available in international factor markets at a lower price, so other countries would use more. This could offset domestic environmental improvement. Moreover, pesticide registrations in U.S. may raise production costs, shift excess supply, and raise product price in international markets. Production may then shift from the U.S. to other parts of world where pesticides are not restricted. Finally, the U.S. might import more products that use restricted pesticides.

We found no studies on the trade effects of regulating products whose characteristics are undesirable only to consumers in the importing country. That

situation, however, appears similar to the trade effects of competition in pollutive products, such as automobiles with varying emission standards. According to a relatively early examination of this issue, the costs associated with removing the environmentally-damaging aspects of pollutive products may be relatively less distortive than process-related costs. All products sold by competing domestic and foreign suppliers in a given national market must meet the same environmental standards. Hence, the environmental preferences and assimilative capacity in an importing country can be considered neutral with respect to international competitiveness, although trade may be affected since higher prices reduce the demand for both home-produced goods and imports (Walter, 1975, pp. 70-71).

Not all product characteristics are unambiguously negative to all consumers (such as irradiated produce). In such cases, trade models with differentiated products may be appropriate. In some models, consumers value product variety for its own sake, while in others, variety makes goods available that are closer to consumers' preferred product specifications. The effects of trade-restricting policies on consumer welfare depend on model specification, substitution relationships between foreign and domestic product varieties, and other assumptions (Vousden, 1990, pp. 172-3).

D. Policy Implications

The policy implications that can be drawn from the above models are limited by the assumptions usually imposed for tractability, the lack of empirical support, and the general omission of political economic factors. Nonetheless, their results have several implications for EHS/trade disputes:

1) Policy generalizations must be made with caution. When economies are open, changes to loosen or tighten domestic EHS regulations have indeterminate social

welfare effects.

2) The policy instrument (for example, taxes versus technology-forcing standards) and the point of intervention in production processes chosen to implement environmental, health, or safety objectives matters in terms of both potential trade and welfare effects.

3) The category of the regulation matters in that, for example, some unilateral action may have different welfare effects with respect to a purely domestic EHS problem than a transboundary EHS problem.

4) Trade effects from imposing unilateral regulations are indeterminate under many plausible conditions.

5) Whether a country is large or small in a trade sense may affect whether a country gains or loses from environmental regulation.

6) When capital is mobile, some policy instruments designed to reduce environmental damages may actually increase them globally.

7) When environmental damages are not internalized, moving from anarchy to trade may lower a country's welfare.

The indeterminacy of the above models raises empirical questions that

are hard to address for lack of data:

1) To what extent are commodity excess supply functions shifted by regulations directed at production externalities?

2) Does an EHS regulation that inhibits trade result in a net gain or loss in social welfare?

3) To what extent does an EHS regulation move the externality compensated comparative advantage against the exporter that implements it and in favor of less regulated competing exporters?

4) If a country is a substantial farm product importer as well as exporter, how much would stricter controls of chemical residues in imported foods internalize the cost of input externality regulation to the industry? (Antle and Howitt, p. 88)

E. Political Economic Factors in Government Behavior

Policy remedies to agricultural resource problems typically involve restrictions of production and thus of trade. Resource policy prescriptions will then be in direct conflict with the spirit of international trade theory, as well

as policy aimed at trade promotion. On the other hand, protectionist policies are likely to play the role of second best resource policies in the presence of production-related externalities.

Regardless of the choice of analytical perspective, economic efficiency is clearly not the only motivating force behind government behavior. While integrated trade/environment models provide some insight into the effects of specific policy choices under assumed conditions, they are limited in terms of explaining current government behavior.

> ...[T]he explanatory power of trade theory, its ability to provide insights into the actions of governments, is tenuous at best. Trade theory is norm oriented and within its own frame of reference immune from potentially divergent results of evidence from the real world...Why have governments...insisted on a great variety of trade restrictions when...nations, individually and collectively, could gain by eliminating such barriers to trade?..[T]o better understand the divergencies between norm and political action, it appears fruitful to concentrate on...(1) the broadening of economic policy objectives and their effects, independent of the particular problems of specific countries, which leads to an analysis of multiple and often conflicting optimal policies to meet a given set of targets under specific constraints; and (2) the linkages between economic and other government policies, as well as the development of international economic relations as they depend on specific power relations (Heidhues, 1979, p.125)

The public choice perspective can be applied specifically to the evolving GATT system in which export interests generate trade conflicts and import interests generate trade restrictions. "[T]he institutions that shape the relevant public choices do not bring out the appropriate economic interests, and the resulting policy choices are not those that promote economic efficiency (Finger, 1990, p. 22)."

Political economic trade models have been developed by several authors. Government objective functions may be modeled as maximizing the sum of weighted consumer, producer, and taxpayer welfare, given budget or other constraints (von Witzke and Livingston, 1990; Johnson, Mahe, and Roe, 1990). While a comprehensive

application of public choice models to EHS/trade disputes is beyond the scope of this paper (let alone empirical support for any such application), we will identify some factors to which government behavior appears sensitive. One factor is rent-seeking behavior by affected constituencies. It is clear that choices made in analyzing EHS regulations have strong distributional implications. Producers may band together in lobbies to achieve through government action what they could not achieve in the market. Those groups that have a stake in the distributional effects of an EHS policy have an incentive to determine how questions are framed for analysis, although their preferences may be expressed implicitly. To the extent that the imposition of a given policy may have a favorable effect with respect to one accounting perspective, but not another, each perspective may be preferred by a different constituent group that competes for influence in the formation of its government's trade policy.

Olson (1982) focuses attention on the formation of special interest groups into coalitions and their role in obtaining a differential advantage through lobbying activities. He infers that broad based coalitions tend to consider the adverse macroeconomic effects of their lobbying efforts so that the adverse effects of the differential advantage sought are less than those of narrow-based coalitions. In contrast, narrow based coalitions tend to be more interested in the distribution of society's income to their members since resources to expand output have to be shared with the rest of society, while the benefits of the same resources spent on redistributing society's output accrue entirely to members. According to Olson, those sectors most directly affected by a given regulation are most likely to be effective in lobbying the government. Olson's informal theory of government behavior is thus consistent with assigning greatest analytical weight to sectoral effects using private values, although empirical tests of his

theory are lacking (Roe and Yelden, 1988).

Another factor affecting government behavior is the transactions cost associated with the analysis itself. (There are other, non-information, transactions costs involved in dispute resolution mechanisms). Private costs and benefits tend to be more readily estimated than social costs and benefits and sectoral effects are easier to calculate than economywide effects, the latter requiring general equilibrium models. Short term effects are easier to project than long term effects.

Finally, Heidhues points out that the process of negotiation itself gives rise to nonefficiency incentives. "Trade negotiations are conducted by government negotiators who may operate in a frame of reference different than that of economic optimization...[N]othing can be conceded without counterconcessions (p. 130)."

To summarize, the rules established through international negotiation to determine trade impacts and countermeasures are based on implicit policy weights. The weights attached by governments reflect the balance between pressures for efficiency and distribution, as well as transaction costs. That affected constituencies might influence the establishment of such analytical rules is not surprising, given the long history of government intervention in the food sector.

VIII. Unilateral and Multilateral Trade Impact Standards

Political economic factors underlying the analysis of EHS regulations are expressed through various tests of trade impact applied unilaterally or multilaterally. In the recent history of international trade, at least nine unharmonized legal and economic tests have been devised for determining whether a domestic policy invokes the need for some associated trade remedy (Hufbauer and Erb, 1988). Multilaterally-authorized relief has historically been based on a relatively high threshold of trade impact. Furthermore, trade-impact standards applied to agricultural goods have not conformed with those applied to other goods (Hufbauer and Erb). This section discuses several criteria for determining whether an EHS regulation should invoke some countermeasure.

A. Fairness

One criterion typically applied unilaterally is that of fairness. Claims of unfairness also call for unilateral concessions. A country's concept of trade fairness is likely to have origins in its domestic economic policy. In the U.S., domestic competition tends to be judged fair if competitors have advantages that are not based on merit, such as one-sided government assistance. Fairness norms reflect a country's image of its own virtues and are based on its perception of normative superiority over the country against which it is claiming unfair trade policies (Hudec, 1990).

As a trade impact standard, fairness suffers from an inconsistency between what a country considers fair in domestic versus international competition. If jobs in importing-competing industries are lost due to an outside factor, such as lower import prices from a competitor's trade promotion policy, that is considered unfair. Whereas if the same jobs are lost from an inside factor, such as

technical change, that is considered acceptable (Bhagwati, 1983, p. 732).

Fairness claims face two other complicating factors. First, although the rhetoric used in making such claims make it sound like fair competition requires a state in which governments exert no influence over markets, the modern world has not known such a state.[8] So fair competition merely excludes one-sided government assistance. The other complicating factor is that the notion of unfairness is asymmetric in that it depends on the observer's position as winner or loser (Hudec). "Unfortunately, the threshold at which the sense of fairness is perceived to be violated has been lowered significantly in recent years...(Bhagwati, p. 732)."

B. Economic Damage

Other criteria are based on measures of economic damage to a specific producing sector. Damages are typically measured in terms of private export value losses to sectors affected by the regulation. Multilateral remedies or unilateral retaliative measures are typically designed to redress the specific adverse trade impact. Since claims are based on actual damage, remedies are formulated by estimating the market value of the damage. Damages criteria are based on private, not social, values and sectoral, not economy wide effects.

For policies affecting goods not traded on international markets (like subsidies for nontransportable natural resources), this criteria may be particularly apposite because remedies based on claims of economic damage do not require a baseline of international market prices for the resource itself. Examples of such policies include the Canadian government selling its stumpage

[8]The U.S. government, for example, has long had extensive sectoral involvement in its economy, with both direct and indirect forms of export encouragement (Cooper).

rights at bargain prices, U.S. subsidies for surface or groundwater rights for irrigation, and the Mexican government selling natural gas to domestic fertilizer manufacturers at bargain prices (Hufbauer and Erb).

C. Distortion

Other criteria are based on a determination of trade distortions--whether a country's policy is expected to result in movement towards or away from Pareto Optimality within the accounting boundaries of that country. Unlike the damages criterion, the distortion criterion requires a determination regarding whether prevailing price signals in the absence of the regulation reflect social values. A policy intended to alter the market price signals otherwise facing producers, thus drawing productive resources into (or out of) that sector, might be deemed trade-distorting if otherwise prevailing market prices are accurate guides to social values. For example, a government might furnish transportable natural resources at bargain prices, either by selling its own rights or by imposing price controls on private owners. On the other hand, a policy established ostensibly to correct one or more sources of market failure might be deemed to be not intentionally trade-distorting, as discussed in Section III.

One practical issue regarding this criterion is what benchmark to use for the social valuation of inputs and outputs. International market prices are preferable to domestic prices, in cases where the two diverge. However, world food prices may also be misleading indicators of social value since world markets are affected by the sum total of many governments' interventions in their agricultural sectors, as well as surplus conditions for several commodities (Kozloff, 1989).

A trade distortion criterion depends on an internationally accepted

definition of what constitutes market failure. While many western market economies might agree to a common definition, others may not, especially those with previously centrally-planned or with developing economies. It has been suggested that GATT negotiators recognize that countries differ in their viewpoints on the inability of markets to price some natural resources (Sutton, 1989).

Under this criterion, a distortion (for example, a pesticide residue standard) is typically subject to retaliation even if it exerts only a slight impact on trade and retaliative action is precisely designed to offset the implicit subsidy. The usual remedy of imposing a countervailing duty requires some benchmark (such as observed or adjusted world price) against which to compare the distortion, as determined by producer or consumer subsidy equivalents or some other measure. This criterion tends to apply a social welfare accounting perspective flexibly in that measures like subsidy equivalents are not able to incorporate distortions associated with all government policies. EHS regulations also do not lend themselves to tariffication as easily as do other government distortions, although the effect of environmental regulations on effective rates of protection has been estimated (Pasurka, 1985).

D. Intent

A related criterion is intent as evidenced by statutory or administrative language or other evidence gleaned from the development of the policy (Sutton, 1989). Mercantilist intent may be hard to determine, especially since regulatory bureaucracies must interpret statutory language to implement policy. Legal language may be insufficient to establish intent, given that legislative/administrative processes of policy development may be subject to

lobbying by domestic producer or consumer groups (suggesting intention to establish a trade barrier) or by domestic or international environmental groups (suggesting a lack of trade barrier intention). Also, a policy may have several unprioritized objectives associated with it in legal documents or its enabling language may be vague.

For EHS regulations, a possible test of intent is whether comparable market failure reduction could have been achieved using an alternative policy instrument or point of intervention in the production process having smaller trade effects. An example is an environmental objective that can be met either through market incentives or technology-forcing standards.

A 1989 case involving U.S. accusations directed at Canadian regulations restricting exports of unprocessed salmon and herring may offer some guidance in determining intent. Shortly before a hearing on a proposed retaliatory list of Canadian products, Canada replaced its export restrictions with a set of conservation-based landing regulations (Bureau of National Affairs, 1989). In rendering its decision, a panel convened under the U.S/Canada Free Trade Agreement used a "primarily aimed at" test to determine whether the measure was a genuine environmental policy or a disguised trade barrier. The panel also was unconvinced that the measure, which raises production costs, would have been imposed on all Canadian boats primarily for conservation reasons. Finally, alternative methods of monitoring catch rates that had smaller trade effects were available (Runge, 1990a).

Even when intent is determined, this criterion, by itself, only implies the legitimacy of the accusation of an unfair trade barrier and does not determine the level of remedial action. An economic remedy must still be pegged to some measure of injury or distortion.

E. Scientific Consensus

Some disagreements over differing EHS regulations may be precluded or resolved based on scientific consensus criteria regarding adequate levels of protection of environmental or food quality and human health and safety. Even though an EHS regulation that is supported by scientific consensus distorts trade, it may increase national and perhaps global social welfare.

The use of the scientific consensus criterion elevates the role of scientific experts in trade policy. Experts seem eager to assume this role, as evidenced by a forthcoming meeting of the International Society of Regulatory Toxicology and Pharmacology "to review international regulations and to determine how differences [among countries] may be managed so that a judicious, scientifically justifiable plan can be adopted by all countries (Carr and Coulston, 1989, p. 203)."

The U.S. position on sanitary and phytosanitary regulations in the Uruguay round of GATT negotiations is based heavily on "sound science."

> The U.S. has proposed that when a measure differs from a recognized international standard or an accepted international standard is lacking, the measure must be based on information or data collected in a legitimate scientific manner and reflect a scientific approach to risk assessment. ...The U.S. position is that domestic standards which are stricter than international standards would be considered justifiable on the basis of legitimate differences in such factors as dietary intake, climatic conditions, human, animal or plant pest profiles, and risk management....The GATT does not and, from the U.S. perspective, should not have the authority to force any country to change its regulations regarding health-related trade restrictions, provided they are based on sound science (Foreign Agricultural Service, 1990).

Critics argue, however, that the term sound science is a misnomer because it implies a consensus (Wysham, 1990). When there is scientific uncertainty, consumers appear unwilling to relinquish control over food and environmental quality to experts (Association for Consumer Research, 1990). Generating

scientific consensus regarding measurements of pollution emission rates or ambient environmental conditions is easier than the level of damages to producing or consuming sectors. It is very difficult to generate scientific consensus regarding the human health and safety effects of a given level of pollution reduction within a country, let alone among countries, partly due to the state of knowledge over the often long term, subtle, and chronic effects of human exposure to different substances.

F. Risk Assessment

Where scientific consensus on the necessity of a given regulation to protect environmental quality or human health and safety is not possible, risk assessment has been proposed. The key characteristic of risk assessment is its probabilistic nature, in that the outcome of a risk assessment process is stated in terms of a probability and the underlying data commonly require numerous assumptions with associated confidence intervals (Caswell, 1990, p. 62).

The outcome and interpretation of a risk assessment is highly sensitive to stated or unstated assumptions. For example, a GATT negotiating group on agriculture drafted language that incorporates effects on both consumers and producers in using risk assessment to determine the appropriate level of protection:

> Contracting parties shall ensure that their sanitary or phytosanitary measures are based on an assessment, as appropriate to the circumstances, of the risks to human, animal, or plant life or health, taking into account risk assessment techniques developed by the relevant international organizations.
>
> ...In the assessment of risks, contracting parties shall take into account available scientific evidence; relevant processes and production methods; relevant inspection, sampling, and testing methods; prevalence of specific diseases or pests; ecological and environmental conditions; and quarantine or other treatment.
>
> ...In assessing the risk and determining the appropriate level of sanitary or phytosanitary protection, contracting parties shall

> take into account as relevant economic factors the potential damage in terms of loss of production or sales in the event of the establishment or spread of a pest or disease, the costs of control or eradication in the importing contracting party, and relative cost effectiveness of alternative approaches to limiting risks (Negotiating Group on Agriculture, 1990, p. 5).

As a policy tool applied in resolving EHS/trade disputes (and environmental/economic conflicts in general), risk assessment has been subject to at least three criticisms. First, risk assessments relating to human health are typically conducted on the basis of a single population. However, there are both intra- and international differences in human susceptibility to substances in food.

> Actual usage and therefore intake will vary from country to country and among special groups within countries, according to dietary habits, the climate and quality of temperature controls (influencing use of preservatives), the characteristics of traditional products, and so on...The nutritional status of people is also relevant: malnourished people may be at greater risk from a potential hazard than those in good health (Association for Consumer Research, 5.3.1).

Second, the quantitative level of risk that is perceived to be acceptable by consumers is based on many factors other than risk assessment. The demand for protection standards is driven by perceived risk, not quantitative risk assessment. The discrepancy between perceived risk and "objective" risk assessment can be partly resolved by appealing to consumers' relative lack of information about relevant probabilities. Consumers, however, demonstrate concerns about a broader range of risk characteristics than can be captured in risk assessment (Caswell; Zeckhauser and Viscusi, 1990; Senauer, 1989). One study, for example, found that providing public information about the risks of nuclear power did not result in convergence of public perception and expert judgement about the risks involved (Liu and Smith, 1991). Smith (1989) concludes that existing models of individual response to environmental risks are inadequate.

Third, concepts of risk vary widely across trading countries, not only in terms of what constitutes acceptable risk, but also the concept of risk itself. For example, there is no word for risk in Japanese (Vogel). Cultural endowments may give rise to revealed preferences among a country's population for safety-related qualitative characteristics of food products that are not differentiated in international market transactions. Since perceptions and attitudes toward risk are shaped by heterogenous cultural endowments, "...different societies can--quite legitimately--reach different decisions about the levels of risk they are prepared to carry (Association for Consumer Research, 5.5.3)."

G. Social and Economic Need

In contrast to scientific consensus, social and economic need criteria have been proposed for the approval of new technologies that may have international trade effects. The EC is considering this for judging approval of production-enhancing substances, including hormones, antibiotics, and other products. If accepted, the criterion would subject technological innovations to a "nonobjective" test in addition to international criteria of safety, quality, and efficacy (Kelch and Raney, 1989, p. 36). In the case of BST, EC officials fear that its widespread used could exacerbate the surplus of dairy products and force smaller producers out of business. Applying this criterion to bovine growth hormones has generated fears among producers that virtually any technological innovation could be banned, since most are designed to enhance yields or reduce costs. According to a legal analysis, socioeconomic concerns are not relevant in determining whether a ban violates the GATT standards code (Rothberg). The criterion, however, is supported by some consumer interests (Ritchie; Association

for Consumer Research).

In terms of developing trade impact tests and remedies, there appears to be a conceptual inconsistency between the scientific consensus and socioeconomic need approaches to test whether a domestic EHS regulation is "fair". This inconsistency is analogous to determining whether, for example, economic damages from water pollution are based on human perception or scientific measurement of water quality. The inconsistency raises the further question how to appropriately value countermeasures once unfairness is determined, that is, whether valuation should be based on the primacy of consumer revealed tastes and preferences or physical science data.

IX. Institutional Mechanisms Proposed for Reducing EHS-Related Trade Disputes

The above tests of trade impact, by themselves, do not constitute mechanisms for resolving EHS/trade disputes. They need to be placed in some procedural context. Policy issues that must be addressed relate to burden of proof, unilateral vs. multilateral action, and institutional reform versus creation of new institutional structures. In this section, we evaluate some existing institutions that might serve as models for EHS/trade dispute resolution mechanisms.

A. Harmonization

Under the umbrella of multilateral mechanisms for institutional reform, one of the most commonly discussed means of minimizing future EHS/trade disputes is international harmonization, which is to make EHS regulations the same across countries. Like other concepts discussed in this paper, harmonization means different things when applied to different EHS/trade contexts. One broad distinction is between harmonization of physical standards us opposed to principles that govern who shall bear the costs of achieving EHS regulations.

With respect to the former, harmonization as a principle needs to be further specified with respect to how it is to be applied to specific EHS regulations. EHS standards may be cast in terms of ambient standards specifying permissible levels of pollution in ambient media, emission and effluent standards, environmentally-related product standards, and exposure standards. Depending on which is targeted, harmonization may have very different effects on trade and national welfare.

The major question usually associated with harmonization is the level of strictness of the harmonized standard, as in recent EC unification discussions:

> It is likely that the EC will harmonize standards at strict levels, but not at the level of the member state with the strictest level. Relatively strict tolerance levels for pesticide and herbicide residues are in effect in northern tier countries while more lenient tolerances are in effect for southern tier countries, because southern agroclimatic conditions require more extensive use of pesticides and herbicides (Kelch and Raney, 1990, p. 29).

In other words, strict compliance with a harmonized standard would impose greater production costs on southern tier than northern tier countries.

Perhaps the strongest economic argument that can be made for international harmonization relates to environmentally-related product standards for internationally traded goods:

> Uniform product standards reduce the cost of adapting products to different markets, allowing longer production runs at a lower unit cost. Uniform product standards (and testing procedures)...are easier to establish when scientific opinions on a health hazard are uncontroversial and when the costs of adapting products to separate markets are high (Pearson, 1987, p. 116)

Based on this argument, internationally uniform product standards would appear more workable for those product attributes that can be controlled through design or input choice in homogeneous production processes than, for example, pesticide residue standards for food products.

Besides what to harmonize, where to peg harmonized standards, and who will do it, is the question of the conditions under which harmonization leads to an internationally efficient allocation of resources. Harmonization of <u>product</u> standards may lead to a divergence rather than a convergence of marginal social benefits and costs across countries demonstrating different preferences for product attributes. The most extreme version of product harmonization is an outright ban. This is exactly what occurred in the beef hormone dispute between the U.S. and EC. The ban could have been limited to those countries concerned with food hormones as a safety issue, but because of the need to harmonize, the

ban among member states led to an EC-wide ban (Kelch and Raney, 1990).

While harmonization of environmental standards in production processes appears to promote fairness and may also result in greater trade flows than in its absence, it does not neutralize the trade effects of differential national environmental endowments. A given level of environmental quality may be achieved at very different cost in different countries. Internationally uniform emission or ambient standards would not harmonize environmental control costs and competitive positions internationally even if that were a desirable objective. Also, the policy instruments used to achieve roughly homogeneous standards may be very different.[9] Moreover, social benefits associated with ambient standard depend upon extent and vulnerability of receptors and values attached to environmental services. A major shortcoming of strict harmonization is thus the lack of recognition of heterogeneity in environmental endowments.

B. Equivalency

As a response to criticisms of strict harmonization, "equivalency" has been proposed as a related concept that enables two countries' regulations to have the same degree of EHS protection, but be quantitatively different:

> The principle of equivalency is an integral part of the U.S. position concerning the harmonization of national regulations. This principle allows for the recognition of different circumstances under which countries protect their plant, animal, and human health. In the U.S. view, the test of whether a standard is acceptable under the strengthened GATT rules would be if it provides an equivalent guarantee of health protection, not whether it is identical to a national or the international standard. Thus, international

[9] In a cross-country study of pollution regulations (Kopp et al., 1990), the authors found it difficult to make apples-to-apples comparisons across countries. To the extent that comparisons could be made, they found regulations to be similar with larger differences in implementation strategies.

> harmonization efforts would allow recognition of differences in climate, soil, dietary patterns, and other factors to be accounted for in justifying the scientific basis for a national regulation (Grueff and Bylenga, 1989, p. 39).

An EC proposal also accepts principles of equivalency and Japan has argued for allowances for the differences in sanitary conditions, geographic conditions, and dietary customs (Kelch and Raney 1990, p. 31).[10]

Implementation of the equivalency principle would require some procedure either for determining equivalency within GATT rules or for settling disputes arising over equivalency. The former would allow uniform application, but would impose major rulemaking requirements. Under the latter, GATT would become involved only when equivalency of national regulations is called into question (Hillman, p. 128).

It remains to be seen whether equivalency offers real advantages over harmonization as a mechanism to mitigate EHS/trade disputes. The test of "equivalent guarantee of protection" could be applied differently by different countries. For example, suppose two countries impose soil erosion standards of 5 and 10 tons per acre per year, respectively, each of which restricts soil loss to one half its natural replacement rate. The standards are interpreted by one country as not strictly harmonized but equivalent. Actual damages from future

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[10] The proposed principle of mutual recognition retreats further from harmonization than the concept of equivalence.

> ...Where harmonization is not needed or cannot be reached, the principle of mutual recognition of national regulations and standards will be invoked. Mutual recognition means that each EC member country will accept the standards of other members as equivalent to their own. This strategy is fundamental to the success of the harmonization process, because it means that any product legally manufactured in one EC country will have access to all other member states' markets (Kelch and Raney, 1990, p. 29).

The looming threat of reciprocal recognition of varying national regulations may induce EC member states to agree on harmonized rules for most food and agricultural products before the borders fall in 1992.

soil production loss or downstream water pollution are quite different, however, leading the other country to claim that the erosion standards are not even equivalent.

Similar problems could arise over testing the equivalency of regulations effecting human health. In the food sector, there is both natural and cultural variation among populations in health responses to food components and contaminants. Applications of the equivalency principle could become mired in questions over the legitimacy of cultural preferences and tastes as a basis for differing national regulations.

The equivalency principle also exposes a possible conflict between the goals of trade and environmental protection. Welfare gains from trade arise when factor endowments differ among countries and determine specialization in production. Factor endowments that determine a country's comparative advantage include both natural endowments, such as the environment's assimilative capacity, and social and political endowments, such as the regulatory environment. Both types of endowments can affect production costs.

Under strict harmonization of an environmental regulation, differences in environmental endowments are likely to be reflected in differing production costs, preserving comparative advantage. In contrast, equivalency might allow a difference in environmental endowments to be offset by less strict regulation, justified by the claim of equivalent protection. The resulting difference in production costs would be less than under harmonization, resulting in foregone gains from trade.

Thus, the test of what constitutes a legitimate EHS regulation versus disguised trade barrier may simply be replaced by the question of what constitutes a legitimate national endowment. Taken to an extreme, allowing differing

regulations to negate differences in national endowments for purposes of achieving equivalency could obviate the comparative advantage rationale for gains from trade.

C. Polluter Pays Principle

While the equivalency principle recognizes differences in national endowments, it still requires that EHS objectives be the same, even though demand for environmental or food quality varies across countries. Thus, some observers have called for harmonization of the principles that govern who shall bear the costs of achieving EHS objectives. In one country, a polluter may pass such costs on to customers while, in another country, the government may assume part or all of such costs.

The EC's adoption of the "polluter pays principle" (PPP) is a step toward international harmonization of such cost principles.[11] Given the same global environmental quality result, there is potential for a social welfare improvement under PPP relative to physical harmonization (for the same reason that domestic pollution taxes have potential for social welfare improvement over quantitative emission standards).

Different EHS policy instruments may be compared with respect to their relative trade neutrality. According to theory, only the PPP is trade neutral; departures have trade effects. A major criticism of the PPP is that its implementation requires extensive data, not only on measures of pollution, but also on environmental control costs across countries.

Another criticism of the PPP is that its distributional implications are

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[11] The term "principle" as used here means that the PPP is a goal that EC members have, so far, honored more in the breach.

ambiguous because it is path dependent. Any prescription depends on the initial endowments in place as the starting point for analysis. Because the PPP is not time neutral (outcomes depend on whether or not pollution has already occurred), it tends to support the status quo (Livingston and von Witzke, 1988, p. 15).

According to Pearson, a principle that is preferable to the PPP is to establish ambient environmental quality standards on the basis of a local calculus of costs and benefits, and to support these with effluent and emission standards on individual sources in a least-cost fashion. However, this is at least as hard to translate into policy as the PPP because of extensive information requirements. In addition, it is not applicable to transboundary pollution, in which case benefit/cost analysis conducted at the national level is too narrow.

D. Information-Based Institutional Mechanisms

Many domestic EHS regulations are justified on the basis of lack of information available to the importing country on qualitative characteristics (Sankey, 1989). This is a special problem for developing countries with goods that may pose EHS concerns. Institutional mechanisms that have been proposed to address these concerns include testing, certification, labeling and other approaches based on providing information either to the importing country or to the final user.

Five developing nations recently proposed creation of a working group to GATT to control the export of domestically prohibited products. The nation's proposed that when prohibiting the sale of any product on domestic products, countries should also consider prohibiting exports. It was suggested that export be permitted only after relevant authorities in the importing country had already given "prior informed consent (Sankey, p. 101)."

In 1987, the U.N. adopted the London Guidelines for the Exchange of Information on Chemicals in International Trade. The Guidelines provide that signatories notify each other whenever a chemical is restricted, so that other can assess risks and take necessary action. At the request of an importing country, the exporting country is required to provide information as to why a chemical is banned (Sankey, p. 104).

Even when multilateral information-based institutional mechanisms are adhered to, domestic institutions are often not sufficient to ensure that the information reaches the final user. Local officials may be bribed; different languages may be used on warning labels; and chemicals may be remixed after being imported.

International rules also relate to who bears the burden of providing information to product consumers. According to an EC position, if the health or safety risk occurs at the point of production, the producing country would have the right and responsibility to regulate it. Whereas if the risk occurs at the point of consumption, the consuming country would have the right and responsibility to test and certify the product's safety (Kelch and Raney, 1990, p. 31).

Labeling in the context of the GATT Sanitary and Phytosanitary agreement has been criticized as an inadequate substitute for direct controls over foodstuffs. Criticisms of heavy reliance on labeling for consumer protection include: children and many adults cannot read labels, information is limited when several languages are used, some foods are not easily labeled, and labels can be misleading (Association for Consumer Research).

E. Legal Issues

Regardless of whether physical standards or cost allocation is the basis for harmonization, there is the question of which party bears the burden of proof regarding deviations from the norm. The question of burden of proof is important since it implies an initial state with respect to the international allocation of property rights. A recent U.S. position on the issue is as follows:

> In cases where domestic standards differ from recognized international standards, the U.S. believes that it should be up to the importing country to demonstrate the scientific foundation of its own standard. In cases where the equivalency of a measure is under question, the burden of proof would fall on the exporter (Foreign Agricultural Service, 1990, p. 3).

Because burden of proof requirements impose heavy information and legal costs on a country, the determination of burden of proof may be as hotly contested as an EHS standard itself. According to a recent legal note on the GATT standards code, re-allocating the burden of proof is warranted. Both U.S. and EC case law assign the burden of proof to the regulating nation. The Code, however, assigns the burden to the non-regulating party who must always prove a negative, that is, conclusively demonstrate that consumption of a particular food stuff poses absolutely no health risk to the consuming nation (Rothberg). A similar argument, however, can be made for a regulating party who must prove that an EHS regulation poses no potential adverse trade effect. In the case of the Danish law requiring returnable beverage containers, the burden was on Denmark to prove that its measures were "not disproportionate to achieve a legitimate aim." This burden was not satisfied, even though the European Court found that a recycling regime would not achieve the same standard of resource conservation and that exemptions were available for small distributors and test marketers (Shrybman, p. 26).

Another legal issue affecting resolution of EHS/trade disputes is the mechanism for internal compliance. Regardless of whether harmonization or

equivalency is chosen, trade representatives must be able to "deliver the goods" in terms of securing their respective countries' compliance with trade agreements. While an international standard may influence national legislation, it achieves actual efficacy only after its integration in the domestic legislation of a country under some juridical form. The acceptance of an international standard by a signatory and the integration of the same standard within the state's internal law must be distinguished. The integration of a standard requires a previous legislative instrument which makes the standard mandatory, the form of which depends on the constitutional rules in force. These vary from country to country (Delville, 1978; Gerard, 1978).

X. Policy Recommendations, Summary, and Prognosis

A. Policy Recommendations

Our recommendations are offered with consideration to both the processes and the outcomes of EHS/trade disputes, maintaining a balance between countries' domestic EHS and international trade policy objectives, and the unlikelihood that highly specific prescriptions will apply to all cases discussed in this paper.

1) Select domestic policy instruments to implement EHS regulations that are as "trade neutral" as possible, given that strict trade neutrality is realistically unattainable.

To implement this recommendation first requires that national governments analyze the various policy instruments available (given prevailing property rights allocations) and alternative points of intervention in production processes. Governments would then address domestic sources of market failure as close to the source of the failure as possible, rather than through trade policy instruments. Market-incentive type policy instruments over command and control instruments that are more likely to act as trade barriers.

Lack of information about a food product could be reduced by testing, certification, and/or labeling. In some cases, it may suffice to require label information about food quality or origin for both domestic and imported products. In extreme cases, instituting a ban on an imported food product may be unavoidable.

2) Where multilateral dispute resolution mechanisms already exist, implement reforms to enhance their effectiveness without compromising national sovereignty.

There are incremental improvements that could be made to specific mechanisms, such as with Standards Code. Two reforms may help. First, interested parties should be prohibited from voting in dispute settlement procedures. Second, jurisdictional issues should be clarified to prevent countries from

skirting code obligations through artful legislative drafting (Dick).

To contain fairness claims, Hudec (1990) has three suggestions:

A) Seek to disprove the normative validity of claims. The problem is that it is hard to prove that a level playing field exists.

B) Remove advantages that cause unfairness claims such as trade barriers. The problem is that there are numerous differences among national economies, so harmonization is difficult.

C) Conduct a series of negotiated limitations based on avoidance of mutual destruction. Other governments can use same fairness concepts against one's own exports thus harming one's own exporters who then become an offsetting political force. Limits on fairness legislation should thus appear when losses to exporters are greater than gains to local producers. The success of this approach for the U.S. depends on other governments actually applying U.S. fairness concepts to U.S. exports. The power imbalance among trading nations, however, may thwart this occurrence.

3) In reforming multilateral institutions, increase opportunities for public information and participation, especially among those interest groups concerned about social welfare effects not reflected in market transactions.

With respect to both harmonization and dispute resolution processes, there are several reforms that may reduce transactions costs associated with public resistance in the long run, although transactions costs may be increased in the short run. In general, such processes should be made more democratic and transparent in the sense of providing more public information about them and opening up participation on technical committees to a wide range of (nonindustry) groups. The requirement that trade agreements be voted up or down in Congress as a complete package tends to discourage public debate unless there is ample opportunity for debate to have occurred prior to the agreement being reached.

This could be accomplished by requiring the U.S. Trade Representative to conduct public hearings in advance of developing the U.S. negotiating position.

With respect to Codex, standard-setting procedures could be opened for fuller public participation. In particular, there could be requirements for consumer representation on technical expert and advisory committees (Association for Consumer Research).

Given the perception that international harmonization negotiations with potential EHS impacts are being made away from public scrutiny, such negotiations could also be made subject to open meeting and full freedom of information requirements (Association for Consumer Research).

Another way to enhance public participation is by establishing less formal communication opportunities between experts and nonexperts. For example, Dutch authorities are developing a scheme for assessing biotechnology that involves gathering data on risks from experts and opinions from affected groups. A dialogue is then set up between consumers and other groups having an interest in the issue (Association for Consumer Research). Opposing views, of course, will not necessarily converge as a result of this process.

4) In developing new multilateral dispute resolution mechanisms, seek institutional models that are appropriate to the various categories of EHS/trade disputes.

In Section V, we distinguished several categories of domestic EHS regulations with respect to their effects on international trade. Because different EHS regulations have qualitatively different trade and welfare effects, countries have varying incentives to preclude or resolve EHS/trade disputes multilaterally or noncooperatively. Each category of EHS regulation may require a different institutional framework for multilateral cooperation.

For certain types of disputes over traded consumer goods, international adoption of a recognized system of "green" product symbols may be appropriate. Some transnational pollution issues may be amenable to institutions modeled after the Montreal Protocol regarding chlorofluorocarbon emissions (Runge, 1990b). However, traded consumer products that pose health concerns or purely domestic environmental externalities may require other models. For example, differing domestic environmental regulation might be subjected to environmental audits (similar to human rights audits) conducted by a neutral third party (Sand, 1990). The point is that differing national incentives to agree to multilateral approaches must be considered in designing such approaches in order for cooperation to occur.[12]

5) In cases where a national EHS regulation deviates from an internationally harmonized standard, seek resolution processes that balance trade and welfare interests.

Because trade and welfare may be affected in opposite ways by a given resolution of an EHS/trade dispute, national governments face political trade-offs in terms of domestic distributional and efficiency implications of the resolution. One way for dispute resolution mechanisms to allow national governments to balance trade and welfare objectives is by explicitly recognizing national differences in environmental endowments and consumer tastes and preferences, including cultural differences in the concept of risk. National differences could also be considered in assigning burden of proof requirements for unfair trade practice accusations. To balance national sovereignty and trade concerns, the burden of proof could perhaps be assigned as follows: If the EHS standard is stricter than the

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[12]Multilateralism, however, is not an end in itself. A recent theoretical inquiry found that international cooperation on environmental protection tends to be easier to achieve when the gains from cooperation over unilateral measures are relatively small, and vice versa (Barrett, 1991).

international norm, the burden is assigned to those who want to weaken it. If the standard is less strict than the international norm, the burden is assigned to the country that promulgated it. This system may deter countries from undervaluing their environmental endowments which would otherwise cause a general lowering of environmental standards.

In addition, EHS concerns could be incorporated ex ante into international trade decisionmaking by (1) requiring environmental, health, or safety assessments of proposed trade-related actions and (2) amending international trade agreements to recognize the legitimacy of national laws aimed at environmental protection, not just human, animal, or plant health (Christensen, 1990).

B. Summary

While the political atmosphere over EHS/trade disputes focuses on trade effects, theoretical models indicate that trade and social welfare effects of EHS regulations may diverge. When economies are open, relaxing or tightening EHS regulations have indeterminate net social welfare effects under many plausible conditions in integrated environment/trade models. Policy instruments and points of intervention matter in terms of both trade and welfare effects. Observed government behavior in trade negotiation, however, is not consistent with welfare maximization in most theoretical models.

National or subnational EHS regulations can be categorized in terms of how they affect international trade. The distinctions are relevant to determining appropriate tests of trade impact and remedies. Conversely, international trade can affect environmental quality and human health and safety through several pathways, some of which flow from scale economies and specialization afforded by trade. Because of this potential for two-way causality, the social welfare

changes from the outcome of an EHS/trade dispute are not obvious without further analysis.

Different producer or consumer groups involved in an EHS/trade dispute have incentives to frame analysis of the dispute in ways favorable to their interests. In particular, distributional and efficiency effects tend to become blurred by charges and countercharges. The analytical perspectives that underlie the charges (private versus social values, states of the world compared, bounds of system being analyzed) are rarely articulated explicitly.

The legitimacy of a national EHS regulation, from the perspective of warranting actions to remedy adverse international trade impacts, is difficult to determine. A variety of economic and legal tests have been used with varying success. While the presence of market failure appears to be at least a necessary condition for legitimacy, there is not international agreement over what conditions constitute market failure. Countries vary in their initial prevailing property rights assignments, political environments that determine what policy instruments are acceptable, and nonefficiency objectives associated with EHS regulations.

Even if an EHS regulation has the effect of reducing some source of market failure, it may still fail some test of trade impact. Tests that have been applied unilaterally or multilaterally use criteria based on fairness, economic damage, distortion, and intent. Whether a regulation is too strict or lax has been tested according to criteria based on scientific consensus, risk considerations, and social and distributional effects. Unless there is agreement on tests of trade impact, it seems unlikely that institutional mechanisms such as harmonization or equivalency will be successful.

C. Prognosis

While the above recommendations may provide guidance for more specific improvements in EHS/trade dispute resolution mechanisms, our summary suggests that the near term potential for substantially reducing the severity or number of such disputes is not high. There are several reasons for this. One is that the sheer volume of international trade is growing with increased potential for conflict between those domestic constituencies supporting protection of environmental quality, health, and safety and those advocating more liberalized trade. At an analytical level, this can be expressed as an inconsistency in accounting perspectives--what are considered costs and benefits--that are used to justify decisions in each policy arena. While national representatives are not likely to be maximizing global Pareto Opimality in international trade negotiations, whatever balance they seek between EHS and trade objectives is rarely explicitly articulated. Second, the understanding of causal linkages between trade and environment (while much progress has been made) is still limited by relatively simple models and lack of empirical support. Third, most tests of trade impact that form the basis for countermeasures either impose heavy information requirements or provide insufficient guidance to international adjudicatory bodies. Finally, while disputes themselves increase the transactions costs of trade because of delay, so may remedial institutional mechanisms. For example, harmonization, regardless of what form it takes, requires costly information to be assembled on physical and/or economic effects of alternative regulations.

Given that the potential for adverse trade effects from EHS regulations may be comparable in magnitude to other non-tariff barriers, this prognosis from a purely trade perspective may seem bleak. It must be remembered, however, that international trade is merely a means, not an end. Any given resolution to an

EHS/trade dispute has national and global welfare effects that potentially diverge in direction from trade effects. The implication of this is to perhaps lessen the level of concern over the effects of EHS regulations on trade.

Much of the policy debate over EHS/trade disputes has been obfuscated by failure to disentangle trade from welfare effects. The goal of designing improved tests of trade impact and dispute resolution mechanisms should not necessarily be to pre-empt such disputes. If net social welfare maximization is the overarching goal, then it can be promoted by a balancing of trade and EHS objectives that may only be possible through the dispute resolution process itself. Rather than seeking to prevent disputes, the policy goal should be to resolve those that arise in a manner that maximizes social welfare, subject to distributional and transactions costs constraints.

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