ENVIRONMENTAL POLICY HARMONIZATION

Patricia J. Lindsey and Mary Bohman

INTRODUCTION

Concern about the environment played a role in the drafting of the original NAFTA document and an even larger role in its ultimate ratification, as evidenced by the environmental side accords. The expressed concerns stemmed from a number of sources, including: the dismal environmental performance of the Maquiladora sector along the Mexico-U.S. border; the increasing awareness around the globe of various threats to environmental integrity; the existence of North-South conflicts regarding the role of environmental safeguards in a trading context; environmentalists' frustration with the treatment of environmental policies within the GATT; and fears that differential standards would affect relative competitiveness among producers in the three countries. Environmental concerns had also been raised in Canada during the debate which preceded the ratification of the Canada-U.S. Trade Agreement, but those were not reflected in this precursor agreement and did not play as pivotal a role as they did with the NAFTA.

This concern in the context of North American trade liberalization is in most respects merely one expression of the heightened awareness within the global community. Trebilcock and Howse (1995) state that "The relationship between international trade and the environment has only recently attained a prominent place on the trade agenda, although it has been a concern of environmentalists for some time" (p. 331).

Agricultural and agri-food production is inextricably linked with the environment, both as a generator of environmental problems and as bearer of the consequences of others' environmental transgressions. The interrelationship between agriculture and the environment encompasses many of the inputs, such as air, soil, water, fertilizers, energy and pesticides. Choices among possible agricultural production methods have important environmental implications and there is currently considerable variation within and across the three countries with respect to environmental policies and their enforcement.

The broad objective of this paper is to take an analytical view of the potential harmonization of environmental policies pertaining to agriculture within and across North America. Following a brief review of the theoretical and applied economic literature, we provide an overview of existing environmental institutional arrangements within the three countries and within the NAFTA framework. We then turn to a more detailed look at the livestock sector and its associated environmental polices in Canada, the United States and Mexico. We finish with some concluding observations.

ANALYSIS OF HARMONIZATION

Diversity and Scale

Socioeconomic diversity is a relevant feature within the Area and clearly plays a role in harmonization prospects. At the same time, geographic diversity makes its own contribution to the potential for gains from freer trade and to the problems associated with harmonization of environmental policies. From the Arctic north to the tropical south, from rainforests to deserts, and from densely populated urban centers to uninhabited wilderness, the geographic region encompassing the North American Free Trade Area (NAFTA) is characterized by its diversity. Such variation gives rise to the potential for freer trade in a tremendous array of complementary agricultural and agri-food products as the provisions of the Free Trade Agreement come fully into force. Many of the restrictions apt to remain for the foreseeable future can be seen to arise at least partially out of the geographically diverse conditions faced by producers of similar products among the Area's growing regions.

It is sometimes said that a person's greatest strength is simultaneously his or her greatest weakness. This same principle may well apply to the NAFTA with regard to its vastness and diversity. When viewed from the vantage point of agri-food production potential, the size and variation contained within the region is a tremendous advantage. Yet when viewed from the vantage point of harmonization of environmental policies, it can be a distinct disadvantage. The nature, form and magnitude of the environmental problems faced and the set of desirable, or even feasible solutions are geographically and economically linked. Agriculture and the agri-food complex inherently span much of the geographic and environmental extent of the NAFTA. Yet while convergence to a single, all-encompassing set of environmental policies boggles the mind, looking at the problem of environmental policies and outcomes in a piecemeal fashion can be fruitful.

In terms of policy harmonization, convergence and compatibility in the environmental arena, there are different categories of environmental problems which are distinct in their implications for appropriate responses. Distinctions are made with respect to the geographic scope of the environmental effects. Such distinctions are important in general because environmental problems seem to be best addressed at the most local level which is feasible. A guiding principle is to address global problems globally and local problems locally. This is particularly relevant for agriculture where producers of the same end product face different

conditions with implications for the environmental effects of their production. They also may have quite different sets of feasible production process options across geographic regions. Even when there is a national concern, the specific manner of achieving desirable environmental outcomes is often left up to more local governing bodies.

One set of problems is those which are essentially global in nature, such as atmospheric warming. Policy guidelines to address such problems are most appropriately established on a global, or at least multinational basis. As there are explicit agreements or accords signed by many nations to address at least some of these issues and the resulting obligations of individual nations are respected under the terms of the NAFTA, the only question remaining would be whether or not the NAFTA parties are pursuing compatible approaches and if not, whether the individual countries' approaches should be made more compatible.

At the next level are cases where undesirable environmental consequences directly cross the border into the neighboring country. Canada, Mexico and the United States are particularly vulnerable given the length of the borders between the neighboring countries within the NAFTA. Nowhere is it more apparent for agriculture than where there are upstream-downstream problems with water availability and quality. Similar to this is the situation where there is a shared resource such as air or a body of water or a fishery, where the actions of those on either side of the border affect the conditions on the other. Both of these types of environmental and resource problems necessitate binational policy solutions, and examples of formal joint problem solving both pre-date and are included within the NAFTA.

Trade economists and policy analysts may also be concerned with apparently local environmental problems and their regulation when trade liberalization removes what had been a second best policy solution to an environmental problem or when trade increases lead to an exacerbation of negative environmental outcomes. Similarly, the imposition of environmental regulations may have differing social welfare implications within and across national boundaries under conditions of restricted *versus* unrestricted trade. It is this set of issues for which the answers are the least clear cut in terms of harmonization and upon which we focus the remainder of this paper.

Externalities and Indirect Spillovers

As economists we tend to pay attention to only those environmental concerns which involve an externality: when an action has consequences beyond the immediate producer (or consumer in the case of consumption externalities[1]) which are not fully reflected in the price or cost. The first round effect on the environment can be considered to be a direct spillover.

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[1] Note that consumption externalities represent another way for apparently local environmental effects to cross borders, and policies in one country which restrict the sale or consumption of goods having consumption externalities can have an effect on the exporting country through alteration of trade flows.

The failure to include (as much of) the cost of the externalities for one set of producers when they are included for another set gives rise to the competitiveness concerns expressed by some industry groups. The latter can be considered to be indirect spillovers, in that the externality itself does not cross the border, yet there are ripple effects. Removal of tariffs and other trade barriers behind which the more highly regulated industries had been operating exacerbates fears of an inability to compete. Those worried about competitiveness join political forces with those who care about environmental outcomes in other countries even when there are neither direct nor indirect spillover effects for the home country environment. Together they are able to bring into the cross-national political arena issues which would normally be only the province of more local authorities.

One case for harmonization or compatibility of environmental measures even when the direct consequences are strictly local is tied to the notion of pollution havens. Where there is a discrepancy in the stringency of policies or in their implementation, it is possible that pollution-intensive firms could be enticed to locate in the more lenient country. Further, the removal of barriers to trade in the resulting products could foster such actions since the production cost advantage (under lenient restrictions) is no longer offset fully or partially by the trade restriction. This relationship has been explored theoretically by Krutilla (1991) who evaluated the potentially dual role of trade and environmental policies. Responding to the proposition that countries enjoying relatively large environmental endowments should specialize in the production of environmentally intensive goods, Pethig (1976) demonstrated for a two-country, two-factor, two-good case the necessary and sufficient conditions for this to lead to a welfare loss. His assumption is that at low levels of output there is no socially significant environmental cost whereas at some high level, environmental capacity is exceeded. Somewhere in between these two points, the environmental degradation may well reduce welfare more than it is increased by the greater consumption of private goods due to trade. The country importing the environmentally intensive good always gains. Note that these results presume a lack of environmental protection in the exporting country.

The tradeoffs at work when one or more countries impose environmental regulations in an open economy can be shown in a two country partial equilibrium model. Table 1 reports the welfare effects of regulations on a production externality.[2] The analysis assumes that both countries are large in the sense that changes in domestic supply and demand have a world price effect. Such effects influence the producer and consumer surplus results and are shown in the first column of Table 1. Imposing the environmental regulation is presumed to cause private supply to decrease (the supply curve shifts leftward). Consider the case when both countries regulate. The decrease in supply from both countries results in a higher world price. For the importing country the higher price adversely affects the terms of trade and the opposite is true for an exporting country. Focusing on market welfare, there are two opposing effects on producer welfare: producer surplus falls because of the decrease in supply induced by the regulations and increases as a result of the higher price. The net effect is indeterminate. The higher price reduces consumer welfare in both countries. Whether a

[2] Krissoff et al. (1996) clearly present the type of graphical model that underlies the signs of the welfare changes in Table 1.

country is an importer or an exporter partially determines the net welfare effect. For an importing country, consumer interests dominate those of producers and, irrespective of the sign of the change in producer welfare, the net market effect is negative. In contrast, producer interests dominate the net welfare change for an exporting country and the net effect is indeterminate. The environmental regulations have the intended positive effect on non-market welfare. The net (market and non-market) welfare effect is indeterminate.

Table 1. Market and Non-market Effects from Regulation of a Production Externality

Policy change from no regulations	Terms of Trade	Market Welfare			Non-market Welfare	Net Effect
		PS*	CS*	Net		
Both Regulate						
Importing country	-	?	-	-	+	?
Exporting country	+	?	-	?	+	?
Importing Country Regulates						
Importing country	-	?	-	-	+	?
Exporting country	+	+	-	+	-	?
Exporting Country Regulates						
Importing country	-	+	-	-	-	-
Exporting country	+	?	-	?	+	?

*PS=producer surplus and CS=consumer surplus

Where there are divergent regulations, the effects of one country's policies have indirect spillover effects on the other country. When only the importing country regulates, its own net market welfare falls, but non-market benefits are positive. As a result of the regulation indirect spillovers have both market and non-market effects in the exporting country — production shifts to the exporting country with the associated market benefits and increased pollution. When only the exporting country regulates, the effect on domestic producers is an empirical question, but pollution decreases. The spillover effects cause producer welfare to increase, but net market welfare falls. The combination of lower market welfare and more pollution lead to an overall reduction in welfare. While not shown in the table, comparisons between one country regulating and both regulating are difficult to sign. For example, when comparing producer surplus in the importing country between the case where both regulate and the case where only the exporting country regulates, the smaller price effect when only the exporting country decreases output has the opposite effect than that due to the importing country not restricting output, so the net effect depends on the relative magnitudes of the gains and losses.

A Case for Divergence

Before making a case for divergence, it is helpful to clarify what is meant by harmonization. The nature of environmental problems leads to two different definitions of

harmonization based alternatively on identical environmental outcomes or production practices. The popular press and producer group calls for harmonization have in mind the idea of a level playing field or equal environmental compliance costs based on similar production practices. Given the wide range in environmental externalities from the same production practices, this type of harmonization moves in the opposite direction from economic efficiency by negating any comparative advantage given by environmental assimilative capacity.[3] Harmonization of environmental outcomes would result in outcomes closer to the economically efficient level and reflect the underlying comparative advantage. But this approach does not take into account different social preferences and priorities and could be expected to exacerbate differences in the costs of regulation. It also could be expected to add to problems of regulatory inefficiency, since regulation and monitoring would be called for regardless of its necessity in terms of socially optimal environmental quality. Upward harmonization of outcomes would appear to require monitoring and regulation everywhere for that which is in need of intervention anywhere within NAFTA. Such a policy is consistent with neither equalization of costs of regulation nor regulatory efficiency.

Whether across-country relocation of the production of goods with environmental consequences makes sense or not is a function of the arguments of the social welfare function and their weights. Diao and Roe (1996) developed a general equilibrium model (two-country, two-factor, two-good) which treated pollution as a function of production inputs. The production sectors differ in their factor intensity and factor immobility is assumed, with the rich country ("North") having a greater endowment of capital. Production externalities are treated as negative arguments in the consumer utility function, and the authors run an experiment which includes a harmonized environmental policy (tax) and make comparisons with the unregulated base case. They find that whether or not a country benefits is related to whether or not it is large enough to affect price, i.e., whether it is a large or small country. Under certain sets of assumptions, harmonization of environmental policies requires income transfers among trading partners to avoid welfare transfers from the poorer to the richer partner. Unless such transfers occur, divergent policies may in fact be optimal from an equity standpoint where countries are diverse. This relates, in part, to the not entirely implausible assumption that environmental quality is a superior good.

Another theoretical case for continued divergence of environmental policies in the local effects situation links back to physical geographic (but not socioeconomic, as in the previous argument) diversity. What makes sense under one set of conditions may be impractical or otherwise undesirable under another. In addition the initial conditions prevailing in each country (or region) will generally not be the same. Thus even given the

[3] The treatment of environmental assimilative capacity as an endowment that provides a source of comparative advantage has been controversial. One the one hand, having good soil conditions that can support intensive production methods that could lead to soil erosion or water pollution elsewhere can be seen as similar to the presence of an ore body that provides a comparative advantage in trade. On the other hand, environmentalists argue that no justification can be given for increased pollution in a region just because environmental degradation has not already taken place.

same utility functions, the emphases of environmental policies will naturally differ. Bhagwati and Srinivasian (1997) analytically demonstrate that "different countries will have *legitimate diversity of...environmental taxes and standards*. This diversity will arise even if they share the same 'utility function'...: the diverse tax rates can come from differences in technology and in endowments in the broadest sense." (pp 167-8) To take one example from agriculture, it is common for different pesticides to be approved for use in different countries. Indeed, it makes little sense to go through the regulatory process to approve pesticides effective against pests which are not present in a country, or for application to crops which are not grown there. Looking at the problem a little differently, Bhagwati (1996) uses the example of dysentery in one location making clean water a priority, vs. a high priority placed on clean air in a location not subject to immediate health risks from a contaminated water supply but with air pollution problems. This can be viewed in the context of the difference between constrained and unconstrained optima: in the absence of a budget constraint, the choices might be the same or similar while in the presence of budget constraints there is a different policy choice where initial conditions and endowments are diverse. Also, in familiar marginal terms, the marginal pollution abatement dollar will optimally be spent where it will yield the greatest return (Bhagwati and Srinivasian, 1997).

It is easy to demonstrate that upward harmonization of environmental policies does not necessarily benefit the (previously) high standards country. Upward harmonization can in fact lead to lose-lose outcomes where the country raising its standards loses from the movement to a less optimal set of constraints and the higher standards country loses by having to pay higher prices for the products imported from the trading partner. Think of a restriction on effluent from food manufacturing operations in country A, which has a fairly low absorptive capacity for this type of pollutant. Before harmonization country A imports manufactured food products from country B which does not find it socially desirable to regulate effluent from this type of manufacturing, possibly due to a relatively large absorptive capacity. After (upward) harmonization, the effluent restrictions in country B increase operating costs without appreciably affecting environmental quality. The increased costs lead in turn to an increase in product price for consumers in both countries, possibly some shift in production from country B to country A, overall smaller combined production, and little or no environmental benefit. Gains may accrue to the manufacturers of effluent-restricting technology, but to few other groups in either country.

Empirical Studies

One characteristic finding of theoretical analyses of the problem of environmental regulation in countries linked through trade is that under many circumstances the outcomes (trade, social welfare, environmental) are ambiguous and are dependent upon the relative strength of positive and negative effects (Copeland and Taylor, 1995). The analysis presented in Table 1 illustrates the difficulty of finding definitive theoretical results. Further, harmonization across heterogenous countries or locations is not typically found to be the optimal policy approach. Other generalizations which are worth considering are: 1) it makes a difference for social welfare outcomes whether a country is "large" or "small;" 2) importer

vs. exporter status affects the desirability of environmental regulation from a welfare standpoint; and 3) rich countries are likely to choose higher levels of environmental quality than are poorer countries, *ceteris paribus*.

Probably the most pertinent example of harmonization of environmental policies across countries is to be found in the EU set of environmental Directives. These were developed as a part of the deepening of the economic and political integration process. One Directive that has been relatively well studied for agriculture is the Nitrate Directive, which was passed in 1991 (Leuck, et al., 1995). The Directive sets forth timetables, some processes and standards, and has an 8 year phase-in period. It also allows for variability of application within a country (mandatory compliance in designated "vulnerable zones" and voluntary compliance elsewhere) and for individual countries to have stricter standards than those established under the Directive. Leuck, et al. (1995) found that implementation is likely to both alter the distribution of livestock production within the EU and to mildly reduce aggregate EU livestock production. Social welfare assessments were not reported.

Little empirical support beyond anecdotal evidence has been found for the theoretically supportable argument that (differential) environmental regulations reduce or enhance international competitiveness (von Moltke, 1993, Jaffee, et al., 1993). Nor is there conclusive evidence that differences in environmental policies across countries play a meaningful role in industrial migration decisions or otherwise systematically affects the location of production for environmentally intensive goods, where one would most expect to see the effects (Low, 1993, Tobey, 1993, and Jaffee et al., 1993). In general, these results are attributable to the relatively low share of environmental compliance costs in total costs of production.

If, as it appears, that environmental policy differences do not necessarily lead to a redistribution of competitive advantage and may or may not lead to meaningful alterations in the location of production, the desirability of policy harmonization from a social welfare standpoint should be carefully assessed for the agricultural and agri-food sectors within North America.[4] The problem, of course, is that the specificity regarding subsectoral markets, policies and environmental effects which is necessary for even a crude assessment of social welfare outcomes is not compatible with the kinds of assumptions which are necessarily made in order to construct and solve (computable) general equilibrium models. At the same time, failure to consider the trade-offs across subsectors can lead to poor policy choices and/or difficult negotiations. Stated differently, it is neither enough to know merely that "country A gains at country B's expense" on a macro level nor that "producers of X gain at the expense of consumers, taxpayers and the environment," as these conclusions may well be reversed in a different market or location. As Bhagwati (1996) points out, the absolute and comparative advantage effects of environmental policies may not be the same, an effect which argues against making easy generalizations of competitive and welfare effects. Quantitative and theoretical modeling exercises at the economy-wide, sector-specific and location-specific level each have a contribution to make to the policy dialog, without any one

[4] This question has relevance for those production processes having local, as opposed to global or cross-border, environmental implications.

approach being capable of providing a definitive answer regarding the desirability of policy harmonization.

We turn now to an overview of the environmental provisions in the NAFTA and in other relevant arenas to provide some of the institutional context for this discussion of harmonization/convergence/compatibility of environmental policies. This is followed by a closer look at an individual agri-food subsector.

ENVIRONMENTAL PROVISIONS IN TRADE AGREEMENTS

Formal co-operation on North American environmental issues predates the FTA and NAFTA. Previous treaties and agreements have generally focused on management of joint resources such as the Boundary Waters Treaty between the United States and Canada (1909) and the United States and Mexico (1944). Similarly, disputes regarding environmental pollution between the NAFTA countries are not new and have concerned border regions. Although previous disputes have not focused on agriculture, future environmental conflicts involving the sector are likely, e.g., along the U.S.-Mexico border where agriculture is a major user of increasingly scarce water, and where fertilizers and pesticides in irrigation drainage contribute to water pollution (CEC, 1996a).

NAFTA Institutional Arrangements

NAFTA is the first trade agreement to explicitly address concerns about the linkages between environmental regulations and competitiveness and to raise the issue of harmonization. Four aspects of the NAFTA and the environmental side agreement, the North American Agreement on Environmental Cooperation (NAAEC) affect the conduct of members and relate to harmonization. First, a number of principles are set out. Importantly, each country retains sovereignty over domestic environmental policy and has the right to maintain its own environmental standards. Countries also have the right to participate in international environmental agreements and provisions of those agreements take precedence over those in the NAFTA. Countries can change their regulations as long as modifications do not result in less protection of the environment, and the agreement encourages harmonization through raising environmental regulations to the highest existing level among the member countries. Environmental policies cannot create a barrier to trade. Only the later statement, against using environmental regulations as disguised trade barriers, is enforceable. The contrast between having recourse to a dispute settlement process when regulations create a trade barrier on the one hand, and unenforceable principles for high levels of environmental protection on the other, stems from the reality that the NAFTA, including the NAAEC, was negotiated as a trade agreement and not as an environmental treaty.

Second, each party is obligated to enforce its own environmental laws, to monitor compliance and environmental outcomes, and to make this information publicly available.

The NAAEC provides the authority to impose sanctions when a country does not enforce its own laws. The process to apply for sanctions is similar to the panel process for dispute settlements under the NAFTA.[5] The differences are that private citizens and Non Governmental Organizations (NGOs) can initiate complaints and a request for a panel must be approved by two-thirds of the countries or as a practical matter both of the countries not cited in the complaint. Penalties include fines or having a country suspend its NAFTA provisions for certain goods from the country found to be persistently violating its own environmental laws. Johnson and Beaulieu (1996) point out the irony that having no environmental protection or actively enforcing low levels of protection would meet NAFTA obligations while partial enforcement of high standards potentially subjects a country to sanctions.

Third, the NAAEC established the North American Commission for Environmental Cooperation (CEC), a tri-lateral regulatory agency having monitoring, enforcement, and dispute settlement powers. The CEC manages the process to impose sanctions for failure to enforce environmental regulations. The CEC also has a mandate to provide input into NAFTA Chapter 20 dispute settlement panels that touch on environmental issues.[6] As part of a Chapter 20 dispute, the CEC may create working groups of experts and make recommendations to solve the dispute. The provisions, written after NAFTA was negotiated, were designed to complement its dispute settlement process. The CEC is also charged with evaluating the environmental consequences of NAFTA implementation and reporting on actions taken by each country related to the environmental agreement.

Fourth, the NAFTA agreement on sanitary and phytosanitary measures and standards-related measures addresses environmental issues in agriculture. These technical measures are discussed in the paper by Bredahl and Holleran in this volume. Of note for the current discussion is that the measures are also based on the principle of national sovereignty, and countries have the right to set their own standards subject to restrictions to prevent them from being used as disguised trade barriers. The sanitary and phytosanitary measures recognize that, for environmental issues, national boundaries may not set the relevant borders. For example, in establishing restrictions on live animal trade because of disease, the NAFTA makes regions and not countries the relevant geographical area.

Dispute Cases with Environmental Implications As of May 1997, NGOs or private citizens had filed nine complaints with the CEC about failure to enforce environmental laws.

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[5] Special provisions for the applications of sanctions against Canada are included in the NAAEC because the Federal and Provincial governments share responsibility for environmental regulation and dispute responsibility in some areas. Briefly, if Canada fails to comply with a decision a court case must be filed in the relevant Canadian jurisdiction.

[6] NAFTA contains several dispute settlement processes. Chapter 20 covers disputes not related to unfair trade practices and is intended to cover most environment related cases. Chapter 19 sets rules for Binational Panels arbitrating domestic countervailing duty and anti-dumping cases. However, unlike Chapter 20, the NAAEC does not establish a process to provide input into Chapter 19 cases.

Although the small number makes generalizations risky, the fact that seven of the nine cases involve the United States or Canada suggests that more stringent environmental laws, perhaps combined with better information about environmental conditions and compliance, give rise to complaints. Also, there is some indication that the NAFTA process is being used as a tool in contentious domestic environmental disputes. CEC complaints are a new way for organized environmental groups to attempt to force compliance with a country's laws outside of the established domestic channels.

The three cases against the United State claim that the government failed to enforce the Endangered Species Act, did not satisfy laws regarding timber disposal, and did not conduct a proper environmental review prior to expanding a military base. The two cases concerning Mexico relate to an environmental impact report about expansion of a port and pollution of the Magdalena River. One of the four cases filed against Canada concerns enforcement of pollution laws in Quebec for agriculture, primarily the hog industry. The three other Canadian cases have possible implications for agriculture. A complaint filed by an environmental group claims that the government did not follow laws to evaluate the environmental impact of the Old Man River dam which has been a contentious environmental issue. When completed this dam will provide water for irrigation. Another complaint was filed by a private citizen who claimed that water pollution laws have been violated resulting in pollution of a lake in Alberta. This complaint states that, "The anaerobic polluted water may come from any of a variety of sources: agricultural wastes, oil and gas production and processing, sewage and waste treatment, landfills and so forth. Some of these activities are poorly regulated by the Alberta Government and some are essentially unregulated (such as agricultural wastes, since agriculture and agricultural processing are exempt from the Alberta Environmental Protection and Enhancement Act)." (CEC, 1997) The complaint met the criteria for official review, but was not heard because of an ongoing court case in Alberta on the same matter. The fourth case involves protection of fisheries in British Columbia.

Formal disputes based on technical regulations related to the environment and agriculture have already been heard under NAFTA. These disputes focus on whether regulations to protect the environment of a country create barriers to trade. One potential case involves U.S. Food and Drug Agency (FDA) regulations requiring zero tolerance for salmonella in poultry which could adversely affect exports of Canadian game birds (CEC, 1996a). It remains to be seen what kinds of evidence are accepted in this context as convincing justification that an action represents legitimate protection rather than protectionism, or *vice versa*.

NAFTA and GATT/WTO Provisions

The NAFTA and the GATT both focus on preventing environmental regulations from acting as unnecessary trade barriers and the sanitary and phytosanitary and standards provisions of the NAFTA are modeled after those in the GATT. Members of the NAFTA can also bring disputes on trade policies with environmental implications to the World Trade Organization (WTO). Notwithstanding the similarities, the NAFTA contains broader

coverage on environmental policy than do the provisions under the GATT agreement. The GATT does not contain any provisions regarding enforcement of domestic environmental regulation or mechanisms for citizen complaints. The GATT does not allow trade barriers based on production processes, as exemplified by the tuna-dolphin case. The NAFTA contains a statement of principle that regulations on process are relevant, but this has not yet been tested through a formal dispute.

NAFTA vs. European Union

In contrast to the NAFTA, the European Union (EU) contains deeper harmonization of environmental regulations. This reflects both general EU economic integration and an explicit statement by EU members that environmental protection is a fundamental value. The EU has made an explicit choice to deepen the integration of the member countries and agreements have been reached regarding overall objectives, but timing and many specifics are allowed to vary among countries. The exception is minimum standards (though they may be achieved differently) and those elements which would serve to impede trade within the EU. Key to the success within the EU of such harmonization measures is that the Directives require each country's government to enact statutes to implement the EU-wide policies. No such authority is contained within the NAFTA provisions.

As mentioned above, the EU has enacted a set of environmental Directives that cover cases, like nitrates, where there are direct spillover effects outside of the originating country and cases, like the package recycling and recyclability Directive, where the non-local effects are less direct but have direct trade implications. In both cases, there is significant scope for higher than minimum standards on a country-by-country basis and some flexibility in implementation. Other aspects are less flexible. For example, in order for food and other products to be sold within the EU, their packaging will have to meet the recycling/recyclability requirements regardless of country of origin (Latriche and Lindsey, 1994). Here, compatibility of regulations is a meaningful trade issue and the Directive was designed to foster the free flow of products across borders while maintaining a certain level of environmental protection. Lower income countries within the EU are allowed a longer phase-in period. The Nitrate Directive also includes a phase-in period, but makes its distinctions among local areas (which do not necessarily correspond to national boundaries) in which nitrate pollution is a problem. Here the differences have to do with mandatory vs. voluntary compliance.

Contrast the above situation with that of the NAFTA, where economic and political integration is not a goal of the member countries. For technical regulations, harmonization or mutual recognition of certain standards or practices could make implementation more straightforward and improve the free flow of goods and services (e.g., the EU-wide symbols regarding the recyclability of packaging and the presence of recycled materials). Such harmonization/compatibility could also contribute to freer trade. Yet, the absence of authority under the NAFTA to compel subnational governing units within each member country to recognize mutually agreed symbols or practices is problematic for this type of harmonization,

and even at the national level the Canadian-U.S. working groups set up under the FTA are instructive regarding the difficulty of this task.

LIVESTOCK INDUSTRY EXAMPLE

Environmental regulations in the livestock industry provide an illustration of the implications of harmonization of environmental regulations for competitiveness and environmental quality. Three main points from the general discussion are examined. First, examples of environmental policies are given to show the differences between harmonization of environmental effects and regulatory burden. Second, policy regimes in the NAFTA countries are discussed showing the substantive differences in regulations that occurs both within and across countries. Last, costs of compliance with environmental regulations for the livestock industry are low.

Two Types Of Harmonization For Livestock Waste Management Environmental Policies

The livestock industry is a major agricultural contributor to pollution. Negative externalities from the livestock industry potentially occur at all stages of production and processing. At the primary production level, externalities result from animal waste products, animal disposal, and animal welfare. Pollution from processing is tied to wastewater disposal and worker health and safety. Our analysis focuses on regulation of water pollution from waste management. Externalities from the livestock waste can create a number of serious problems such as pollution of groundwater by nitrate emissions (from excess nitrogen), eutrophication of surface waters by phosphate emissions, acidification by ammonium emissions, contamination by heavy metals such as cadmium, copper, mercury, lead and zinc originating from concentrated feedstuffs, contamination by pathogenic micro-organisms, and odour problems. Pollution from nitrogen has received the most attention since it affects human and animal health. Infants under six months of age are susceptible to a potentially lethal blood disorder called methaemoglobinaemia, caused by large amounts of nitrates in drinking water. Links between excessive nitrate levels and stomach cancer are more controversial. Phosphorus is the other major environmental indicator because it is the limiting nutrient in euthrophication of surface water.

Several policies for livestock waste management regulate the environmental outcome rather than the production process.[7] Harmonization, should it take place, would be of environmental quality rather than of cost equalization. An example of this type of policy is

[7] Livestock waste management produces both point and nonpoint source pollution. Our objective is to analyze existing regulations in terms of harmonization and not optimal regulations.

mandating that farmers dispose of manure in a way that does not cause nitrogen or phosphorus to end up in surface or ground water. For example, in order to spread manure, a farmer must show that land planted to a specific crop could absorb the amount of nutrients present in the manure. The regulations establishing manure management plans also restrict harmful practices such as spreading manure during high rainfall periods or close to surface water. In some jurisdictions, farmers must document their actions by filing manure management plans.[8]

The cost of complying with manure management plans varies as a function of each farmer's specific soil conditions, amount of rainfall, and proximity to surface water. For example, the British Columbia Code of Agricultural Practices legislates that manure disposal must not exceed an amount such that the soil can absorb the nutrients. The long rainy season represents the largest constraint to spreading and most farmers have had approximately three months manure storage capacity, which is less than that implied by the regulations. In British Columbia, construction of additional storage for a 100 cow dairy herd costs between C$12,000 for a clay pit in favorable soil conditions to C$120,000 for a concrete lined, covered pit. Thus the costs differ according to environmental conditions, even with the same regulations in place. Note that these same variables affect the amount of the externality associated with production of a unit of manure.

Another example of a policy in the spirit of harmonization of environmental outcomes is special standards for regions that are environmentally sensitive. For example, coastal zones in the United States will face stricter management standards for the livestock (including poultry) industry than elsewhere. This policy is expected to lead to higher costs for coastal livestock and poultry producers.

Other policies for waste management require farmers to satisfy common production practice standards and, if there was harmonization, would lead to equalization in the costs of compliance. These policies result in variation in environmental outcomes. Examples of such policies are minimum acreage per animal unit and specific requirements detailing waste handling facilities. For example, in Quebec regulations require farmers to have a minimum land area per hog. The cost of compliance can differ according to land values, but variation across farmers should be less than with regulations that mandate equal environmental outcomes. However, the amount of pollution will vary depending on the absorptive capacity of the soil (Savard et al., 1996) and both the timing and amount of rainfall.

Regulations in NAFTA Countries

Under any plausible criteria for harmonization, existing environmental regulations paint a clear picture of diversity both within and across national boundaries. In addition to

[8] In practice, while the goal of manure management plans is to prevent excess nutrients from entering surface or groundwater, differences in how the regulations are implemented exist. For example, some regions (e.g., North Carolina) only regulate nitrogen while other regions (e.g., Ohio) have guidelines for both nitrogen and phosphorus.

national environmental regulations, all three NAFTA countries empower local governments with the ability to establish and enforce environmental regulations. The devolution of regulatory power within each country suggests the irrationality of trying to impose a common set of standards across the three NAFTA countries, particularly in view of their extreme diversity in environmental conditions. Given the acceptance of differences in local regulations, it would be difficult to then argue for harmonization across national boundaries by any of the member countries.

Canadian Regulations While both federal and provincial governments in Canada have ministries with responsibility for protection of the environment, provincial environmental laws play the most important role including those laws affecting agriculture. Local governments have authority over environmental regulation related to agriculture through powers to regulate air, water, and noise pollution as well as the power to protect sensitive areas. Local governments have been increasingly active in establishing and enforcing regulations (CEC, 1995). Water quality regulations illustrate the nature of shared responsibility for the environment in Canada. Federal laws establish regulations to protect surface water quality. Under separate legislation, the federal "Fisheries Act" prohibits discharging substances into water that can harm fish and has been used to control agricultural pollution. Groundwater is regulated at the provincial level and both provinces and municipalities regulate the quality of drinking water.

For waste management, the types of policies vary across provinces. As discussed previously, Quebec has regulations on animal units per hectare. Both British Columbia and Ontario have regulations on manure management that focus on environmental objectives rather than specific practices. Education of farmers has been an objective in both these provinces. For example, Ontario has Environmental Farm Plans with an educational objective to identify concerns and introduce changes in farm management (CEC, 1996b).

U.S. Regulations A large number of federal government agencies have responsibility for environmental regulations. Every state also has agencies with the power to set standards, implement, and administer laws, develop education programs, and monitor compliance. Several state agencies have been delegated authority to administer federal programs including the Clean Water Act which contains provisions relating to agricultural nonpoint discharges.

The Clean Water Act in the United States directs states to identify and remedy water quality problems such as those caused by manure. Differences in policies across states and local municipalities exist. In addition to regulations constraining farmer behavior, some state governments provide subsidies for investments to meet regulations (e.g., an improved manure storage facility). Evidence exists of substantial differences in subsidies among states (Trebilcock and Howse, p. 125). There is also national-level regulation by the Environmental Protection Agency of animal feedlot operations large enough to meet the criterion for point as opposed to nonpoint source pollution, while smaller operations are exempt.

Mexican Regulations The authority to protect the environment is embedded in the Mexican constitution and this power has been expanded over time and now encompasses the

preservation and restoration of ecological equilibrium and specifically includes pollution prevention.[9] NAFTA provisions for disclosure appear to expand the public's right to information about pollution discharges. Regulation of water quality is governed by the National Water Law which gives the National Water Commission (part of the Secretariat of Environment, Natural Resources, and Fisheries) responsibility to protect surface and groundwater and include land use as a factor determining water quality.

While in general the federal government plays the dominant role in environmental regulation, states have authority over establishing and ensuring compliance of water pollution regulation. There is an overall trend in Mexico towards increasing the role of state and local governments in the formulation and enforcement of environmental regulations. Therefore, local regulations are likely to play a large role in livestock waste management if projections for expansion of intensive feeding operations prove accurate. The government provides some subsidies for pollution control, but they are directed towards air pollution.

Compliance Costs for Regulations

Many North American livestock markets are highly integrated, especially between Canada and the United States (e.g., beef and pork). The strong linkages between national markets mean that differences in environmental regulations potentially affect competitiveness. However, to date environmental regulations have not been the source of trade disputes. The relatively small cost of regulations to producers for the livestock sector doubtless contributes to the ability to live with policy diversity thus far. Cost estimates for the United States serve to illustrate this point.

While no single measure is ideal, estimates of regulatory costs in the United States calculated in different ways each yield modest values on a percentage basis. The Bureau of Economic Analysis estimates the costs of pollution abatement for feedlot operations in 1990 equal to $12 million. Combined with USDA data for livestock on feed (cattle, sheep and lambs and hogs/pigs), this works out to 0.2 percent of the value of the animals. Ingo Walter's input-output based calculations using data for 1968 to 1970 found direct and overall environmental control "loadings" for livestock and products entering international trade flows to be 1.28 percent direct, and 1.98 percent overall (percent of final sales). More recently Jaffe, et al. estimated that the 1991 gross annual pollution abatement and control costs as a percent of value of shipments for all industries was 0.62 percent, those with "High" abatement costs include paper and allied products with 1.27 percent, chemical and allied products with 1.38 percent, petroleum and coal with 1.8 percent and primary metal with 1.51 percent. Jaffee, et al.'s estimates are consistently below Walter's.

This said, costs for individual producers can be expected to differ substantially from any overall averages, and differential costs faced by similar producers in partner countries could make a difference at the margin. Yet, when viewed in the context of other relevant

[9]The CEC report, "Status of Pollution Prevention in North America" contains a description of the evolution of Mexican environmental law.

production cost and policy variability across regions and countries, the case for concern over competitive advantage or disadvantage due to diverse environmental regulations is not compelling.

CONCLUSIONS

Tremendous diversity exists in the types of environmental policies within each of the NAFTA countries. This diversity is largely consistent with efficient economic policies because of the wide range of environmental conditions in Canada, the United States, and Mexico and possible differences in demand for environmental quality. All three NAFTA countries foster diversity in regulations within their own borders by providing local governments with jurisdiction over some types of environmental quality, including water quality. This is very different from national agricultural policy programs that are familiar to stakeholders within agriculture.

The NAFTA and its environmental side agreement (NAAEC) respect domestic sovereignty over environmental policy as long as the policies do not create trade barriers. Against this background permitting differences in environmental policies is a statement of principle that countries should not lower environmental standards and should pursue upward harmonization of policies. However, no details are provided as to the type of harmonization envisioned.

While a citizen complaint has been filed under NAFTA about failure to enforce environmental laws affecting the pork sector, differences in environmental regulations have not yet led to trade disputes for agriculture, and this could continue in the long run. One plausible reason for the lack of disputes is that, for all but a few industries, the costs of environmental regulation are relatively small. Agriculture is not an exception to this general statement. In addition, the diversity in regulations within Canada, the United States, and Mexico, would make it difficult to argue that differences in regulations across country boundaries provide a justification for a countervailing duty. Finally, there is no evidence to date of a 'race to the bottom' to lower environmental standards in an attempt to cause production to relocate.

When trade disputes do occur, the nature of environmental policies calls for region-specific solutions. Because of the specificity of problems and solutions, it is important to make use of subsector- and geographic-specific information when evaluating sectoral environmental policies. This is likely to be a troublesome issue for any disputes over technical regulations relating to environmental problems.

However, there are some areas where harmonization or policy coordination could lead to more efficient outcomes. The experience of the EU provides lessons about where to push for harmonization of domestic policies within the economic integration process. The recycling example stands out in this context as one in which harmonization facilitates trade and is compatible across countries. Clearly environmental problems located in border

regions also require policy coordination, but all three NAFTA countries have been working together in this area for many years, and this process is already facilitated by the NAFTA.

Future research that provides information on the market and nonmarket effects of existing policies would help manage and evaluate the environmental policy diversity that will exist in the long run. There is also a need for additional information specific to agriculture on the types of policies that exist and their environmental impacts. Ideally this would include detailed studies on sectors where producers have expressed concerns about costs of compliance with environmental regulation and its competitive consequences.

Overall, the case for harmonization of environmental policies pertaining to agriculture within North America is not strong, and the diverse conditions and specificity of optimal policy responses together with devolution of regulatory authority within the NAFTA countries suggests that convergence is neither likely nor socially optimal for environmental problems having no direct cross-border effects.

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