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Environmental Regulations and Agricultural Competitiveness

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The cost of meeting environmental regulations can be a critical factor in determining the competitiveness of a product, since the cost advantages of producers in one country are often very slim. The existence of negative externalities means that prices are lower than would prevail if all costs were included in the prices of the products. Additional costs associated with new regulations have an effect on the continued importance of a country's agricultural exports. Governments often assist their agricultural sectors in overcoming the disadvantages through subsidies, tax breaks, technical assistance or other means. This assistance increasingly takes the form of green payments, which are currently exempt from the WTO limits imposed on domestic subsidies. Competitiveness can be either enhanced or diminished by the environmental regimes of competing nations.

Keywords: agricultural policy, agricultural trade, competitiveness, environment, environmental regulations

Introduction

Most production and consumption activities have side effects, including the creation of waste products that must be disposed of in the environment and that tend to damage and degrade natural ecosystems. Public policy measures (regulations and/or incentives) to protect and enhance the environment have a long history, but have become much more important in recent decades. Environmental concerns in the United States attained critical status during the 1960s, an era exemplified by the 1962 publication of Rachel Carson's *Silent Spring*. Subsequently, the Environmental Protection Agency (EPA) was established by the federal government. At the federal level, environmental legislation includes the Clean Air and Water acts, pesticide regulation, solid waste disposal rules, contaminated site cleanup funding, the endangered species acts, recycling provisions, etc. In addition there are many multinational activities through multilateral environmental agreements (MEAs), such as those that control trade in endangered species (CITES), ban use of chlorofluorocarbons to prevent the enlargement of the ozone hole, aim to maintain biodiversity, control greenhouse gas emissions, etc. Environmental concerns began to be incorporated in trade agreements with the inclusion of environmental provisions in the North American Free Trade Agreement (NAFTA) and the Uruguay Round of the General Agreement on Trade and Tariffs (GATT). Most other nations have environmental regulations, varying from extremely strong in most industrialized countries to very weak in a few of the least developed countries, which have neither the resources nor the will for stronger measures to protect the environment.

The term "environmental regulation" is used here to designate the wide variety of measures and tools used to prevent, control and/or mitigate environmental damage resulting from production and consumption activities of human beings. Included in such regulation are the use of police power, i.e., laws and regulations that prohibit actions that cause environmental damage or require actions that improve the environment and that are enforceable by civil or criminal actions through the courts or semi-judicial bodies; pollution taxes such as taxes on emissions; market related activities implemented through government, such as trading in emission rights; and subsidies or other incentives to induce individuals and firms to adopt methods that protect or improve the environment. Also included are measures used to reverse damages caused by past activities, such as cleanup of pollution sites, surface mine reclamation, etc.

Although much of the environmental regulation is directed at industrial production, agriculture is affected as well, especially by pesticide regulations and

clean water acts (see the technical annex for more detail). Nevertheless, agriculture continues to be a major contributor to environmental degradation (Bromley, 1966; Peterson, Boisvert and de Gorter, 2002; Srivastava and Alderman, 1993; Tilman et al., 2001). Its legacies include soil erosion; pesticide contamination and poisoning; fertilizer runoff and volatilization; air pollution and green house gas generation through dust, fossil fuel burning, land clearing, and animal flatulence; water depletion through irrigation and an accompanying soil salinization and compaction; loss of biodiversity as land is cleared and mono-agricultural production techniques used; and actual or perceived threats to health via genetically modified organisms (GMOs), hormones and antibiotics utilized in animal feeds, pesticide contamination of fruits and vegetables, etc.

Conceptual Underpinnings

The creation of waste products during production (consumption) causes costs, which are not borne by the producer (consumer) but by other persons or society in general (hereafter the discussion focuses on production but the reader should remember that the concepts also generally apply to consumption). These externalities are not reflected in the prices of the products, but are borne by those not involved in the particular economic transactions (see Zilberman and Marra, 1993). Air and water pollution are typical examples of externalities that producers, including farmers, create. The major effect of the externalities is that the prices of the products are lower than they would be if all costs were included. This results in more of the product being demanded and produced, and more environmental damage occurring. Thus, creation of externalities can be viewed as a form of indirect subsidization of the producer, an environmental subsidy since it is the environment and general public that suffer as a result. Environmental regulations are applied to reduce or eliminate undesirable externalities such as pollution and act to internalize the costs, to make the prices more closely reflect the total costs.

The existence of externalities affects competitiveness since the indirect subsidies they provide to producers both enable them to charge lower prices and make their products more competitive. Elimination of externalities through their internalization will tend to raise prices of the products, making them less competitive, at least if producers in other countries are not affected by a similar process of internalization. Furthermore, even when both countries have similar regulations, competitiveness may be affected if one country is more efficient in carrying out its regulatory regime or does not enforce it equally. In addition, many countries attempt to mitigate the effects of their environmental regulations on costs through various types of subsidies,

including faster tax write-offs for pollution equipment, direct payments or other incentives. The latter include the green payments made to farmers, payments explicitly exempted by the WTO rules, which attempt to limit domestic subsidization of agricultural production in ways that distort trade. The United States, for example, has used cost sharing for soil conservation and other practices through the Soil Conservation Service (SCS), now Natural Resources Conservation Service (NRCS) since the 1930s (Batie, 1998). These subsidies tend to have long-run effects from improved efficiency through protecting and enhancing the productivity of the soil or other natural resources. The subsidization of water from irrigation facilities provided by the public also enhances productivity and competitiveness, at least in the short run.

Agriculture and the Environment

Agricultural production and related activities produce significant externalities, i.e., have important negative effects on the environment. These externalities affect the natural resources used by farmers (land, water, air) or the health of humans or other living organisms. One critique, for example, says, “This eutrophication and habitat destruction would cause unprecedented ecosystem simplification, loss of ecosystem services, and species extinctions” (Tilman et al., 2001, 281). Soil erosion and other forms of soil degradation are results of farming activities, primarily crop production, although livestock production also can be a factor, as in the case of overgrazing. Water quality is affected by siltation resulting from erosion and by runoff into streams or percolation into groundwater of agricultural chemicals or animal wastes. Air quality is adversely affected by wind erosion, burning of fossil fuels, land clearing through burning, and odours produced by concentrated livestock production. Biodiversity is diminished when farming activities such as land clearing or wetland drainage destroy the habitat of wildlife, fish, insects, etc. or when poisoning from pesticides occurs (Carson, 1962).

The effects of agriculture on the environment have been subject to considerable research (Bromley, 1996; Claassen et al., 2001). Bromley recognizes both positive and negative externalities associated with agriculture and classifies them into three categories, those with amenity, habitat or ecological implications. This article is concerned with the negative implications, since these are the ones leading to most of the regulations that affect competitiveness. Claassen et al. (2001) list a number of negative environmental impacts produced by agriculture. Principal among these are water quality problems caused by sediments (soil erosion), runoff of water with dissolved nutrients, especially nitrogen but also phosphorus, and herbicide/pesticide contamination of water. They report research indicating that sediments are a major

source of water quality problems and that there are high concentrations of nitrogen in water as a result of fertilizers and animal wastes; this elevated concentration of nitrogen causes, for example, eutrophication in the Gulf of Mexico and other water bodies – an estimate is that 15 percent of the nitrogen and 3 percent of the pesticides used in the drainage area make it into the Gulf of Mexico. Some 37 percent of the groundwater tested by the U.S. Geological Survey has at least minor traces of the principal herbicides used in farming. Reductions in water levels from excessive pumping of groundwater can lead to subsidence and loss of productivity, while improper irrigation procedures cause salinization and/or waterlogging of land. Claassen et al. also say that “soil particulate, farm chemicals, and odor from livestock are in the air we breathe” (2001, 2). They further indicate that of the 643 species on the federal list of endangered species, agriculture has contributed to 380 being on that list. Wetlands conversions, an average of 31,000 acres per year during the period from 1982 to 1992, have been an important factor in that loss of biodiversity.

Effects of Regulations on Competitiveness

Relatively little research has been carried out on the effect of environmental regulations on the competitiveness of agricultural products in international markets, perhaps because for some time it was not an important issue. Environmental regulations have been an important topic in trade and competitiveness for industrial and mineral production since at least the early 1990s, when they were a major concern in the development of the North American Free Trade Agreement and became an issue in the Uruguay Round of the General Agreement on Trade and Tariffs (GATT); they are very important in the current, Doha, round of World Trade Organization (WTO) negotiations (see Huang and Labys, 2002, for a general discussion of the issues, Colyer, 2002, for a discussion of the NAFTA issues, Esty, 1994, for GATT issues and concerns, and ICTSD and IISD, 2003 for WTO processes). Gardner wrote: “To date, the effects of environmental regulation on trade on trends in U.S. productivity and costs have not been significant” (1996, 228). Similarly, Krissoff et al. state: “The few empirical studies based on these concepts have found many of the linkages between trade and the environment to be weak or the effects small” (1996, i). The revised EPA livestock waste disposal regulations described in the technical annex, however, have important implications and have induced analyses of their effects or potential impacts on trade, location, costs and allied issues. Gardner viewed the possible impacts of increased regulation as substantial, but thought the political forces for the environment were too weak to be able to produce much stronger legislation, at least in the absence of strong evidence that the regulations would be cost effective.

Much of the recent work has focused on the pork industry, due largely to some severe environmental problems that have developed in that industry as it has become characterized by very large production units and regional concentration of production, although poultry and other concentrated livestock operations also are of concern. This concentration of production has led to problems in disposal of the manure due to limited land for disposal as well as problems such as spills from manure holding facilities due to heavy rains and flooding. Amponsah and Qin, in an analysis of the competitiveness of the pork industry, noted that “greater environmental regulation ... could increase costs of producing hogs in the United States leading to lower hog production” (2000, 249).

Hayenga et al. (1998a) analyzed the competitiveness of the world’s major pork exporting countries, specifically the United States, Canada, Denmark and the Netherlands. Their chapter on the United States (1998b, 66-67) had a paragraph on environmental concerns but did not determine the specific impacts of environmental regulations on competitiveness (Hayenga et al., pp. 66-67). They did note that environmental issues and problems are apt to affect the location of pork production in the United States, with anticipated shifts from areas with current high levels of concentration, North Carolina and Iowa, to “areas like Oklahoma, Utah and Colorado” (67).

Metcalf (2002) specifically examined the expected impacts of environmental regulations on the competitiveness of the United States, Canada and the European Union with a mathematical “equilibrium displacement model” which determines changes in expected exports for estimated environmental regulation costs. His findings are that while there are expected increases in costs from environmental regulations in the United States, these will not harm the country’s competitive position, mainly because the EU is expected to impose more costly programs. He states: “Although environmental regulation is expected to increase in the U.S., this does not significantly affect the competitiveness of U.S. exports. The relatively more stringent regulations that may be imposed by the European Union actually help to improve the short-run competitiveness of U.S. pork producers” (237).

Other recent studies also have examined the impacts of environmental regulations on the pork industry, especially on its cost and location in the United States, without analyzing the effects on international competitiveness, although often recognizing that regulations do have international implications (Kaplan and Johansson, 2003; Leuck and Zering, 2003). Major conclusions are that costs increase and that they are affected by the types of manure management systems used as well as by the availability of land for disposing of the manure in an environmentally friendly way. Leuck and Zering, for

example, find that manure handling costs amount to 2.6 percent of cost for a marketed hog in North Carolina and 1.2 percent in Iowa, levels that could certainly be a factor in international competitiveness. They also note that cost savings for manure handling help account for increased pork production in the western areas of the United States. Kaplan and Johansson have similar findings but also note that the USDA can help fund improvements in manure handling systems through its Environmental Quality Incentive Program (EQIP). Ribaud et al. (2003) indicate that these improvements are sufficient to offset the costs in many of the scenarios they examined. Adhikari, Harsh and Cheney's (2003) analysis concludes that environmental compliance costs have minimal effects on location of production within the United States.

The literature, while not conclusive, indicates that the costs of environmental regulations are generally relatively small and do not tend to be significant in terms of competitiveness, a conclusion reached earlier by Krissoff et al. (1996). Despite this, they can be significant and can be a factor in the location of production and, hence, international competitiveness. One factor that tends to mitigate the effects, at least in industrialized countries with strong research capabilities, is the tendency to develop innovations that minimize the costs of regulation (see Krissoff et al., 1996; Porter and van de Linde, 2002; Ribaud et al., 2003).

Green Subsidies

Subsidies for environmental goods or practices, generally termed green payments, can take a wide variety of forms. Such payments are common in the EU, while the United States has assisted farmers through cost sharing of conservation practices since the 1930s when the SCS was established. These payments are exempt from the limits on domestic subsidies developed for the Agreement on Agriculture (AoA) during the Uruguay Round of the GATT, an exemption that would continue under many of the proposals made for the current, Doha, round of WTO negotiations (Cooper, Peters and Claassen, 2003)¹. Many developing countries, however, view these as just another way that the industrialized nations subsidize their agriculture in ways that are detrimental to the agriculture of the third world (Devadoss, 2002; Hoekman and Anderson, 2000). The U.S. program was not developed to affect competitiveness, but nonetheless has impacts on the ability to export commodities through both reductions in costs to farmers as well as enhancing the productivity of the agricultural resource base. The EU and Japan, however, have more extensive programs and have complicated WTO negotiations through the concept of multifunctionality of agriculture, which includes more than just agricultural

production and protecting the environment (see Paarlberg, Bredahl and Lee, 2002; Peterson, Boisvert and de Gorter, 2002).

When the U.S. farm act was up for renewal in 2002 there was a failed attempt to extend the scope of conservation payments to farmers through a proposed Conservation Security Act, which would have shifted a substantial part of agricultural income support to a more broadly based system of conservation payments. Lohr (2001) argued that this was essential for the development and competitiveness of the organic food sector in the United States because the EU subsidizes its organic farmers. Organic farming has grown much faster in the EU and comprises a larger share of agriculture than in the United States, 2.9 percent compared with only 0.2 percent. Lohr concludes: "The superior competitive position held by EU organic farmers is due to direct agri-environmental payments and cannot be overcome through pure market mechanisms" (2001, 4). The U.S. Congress, however, decided to stay with the existing programs, which heavily subsidize conventional grain producers, a situation that some analysts and most developing countries consider to result in the dumping of grain by the United States, i.e., the selling of grain at below the cost of production (see, e.g., Ritchie, Murphy and Lake, 2003). However, while these U.S. programs affect competitiveness, they are not environmental subsidies.

Non-tariff Barriers

Many nations impose non-tariff barriers (NTBs) on trade for a variety of reasons and, while the AoA from the Uruguay Round required tariffication of most of the non-tariff barriers to trade in agricultural goods, many NTBs still exist under various provisions of the GATT/WTO agreements, such as Article XX, or are utilized despite the prohibitions.² A U.S. report (USTR, 2003a) on foreign trade barriers has a non-exhaustive list of more than 50 countries plus the EU and Arab League that have NTBs affecting U.S. exports, most with one or more NTBs that constrain agricultural and food exports. The most common ones affecting agriculture are sanitary/phytosanitary provisions designed to protect human, animal and plant health (see, e.g., Rosson, 1998). These are legitimate if they 1) are based on science and 2) apply equally to domestic and all foreign producers. Thus, the United States, for example, requires certification that an area is free of particular pests or diseases for the area (country) to export citrus or some other fruits, vegetables, melons, etc. that are also produced in the United States. The purpose is to prevent the introduction of pests or diseases that would devastate domestic production. Thus, everyone banned the import of beef from England at the time of the mad cow disease outbreak, and the United States recently banned imports of beef from Canada after one diseased cow

was found in a herd; similarly, U.S. beef exports were affected by the discovery of one cow with the disease, which was slaughtered in 2003 (Veneman, 2004). Sometimes, however, such provisions might be used as a way to protect domestic producers, a situation that is difficult to identify (Beghin, Bureau and Park, 2003; O’Conner, 2003; see Colyer, 2000 for specific examples of sanitary/phytosanitary provisions that affect poultry trade).

Purely environmental concerns are sometimes treated in a similar way, i.e., through import bans for products that are produced in ways not considered to be environmentally sound, have characteristics thought to be environmentally harmful, or are associated with endangered species. Again, under Article XX of the GATT agreement exceptions to the rules prohibiting trade barriers are allowed for the protection of human, animal and plant health and life, but the interpretation of this provision is open to question and its use by an individual country is controversial. The U.S. bans on imports of tuna not caught in a dolphin-safe manner and of shrimp not caught in ways that protect sea turtles are examples of the use of non-tariff barriers for environmental reasons. These domestic regulations were protested through the GATT system, with the United States losing an appeal in the tuna case but winning, partially, in the shrimp case (Colyer, 2002; Eglin, 1999, Esty, 1994). The EU ban on imports of beef fed with hormone feed additives and its virtual ban, through a moratorium and labeling requirements, on food from genetically modified organisms are similar provisions with, at least for the latter, environmental reasons or implications – part of the reason being a fear that native species might cross with the GMO – although the main reason seems to be health concerns. It is not known if long-term problems might result from consuming such products; although there is no science to support the claim that they are harmful the EU invokes the precautionary principle as a justification, since there is proof neither that such foods are safe nor that they are harmful from a long-run perspective. In addition, the EU has NTBs that affect U.S. poultry exports (processors use a weak chlorine solution to wash poultry and the EU does not permit this), animal byproducts from animals not intended for human consumption, certain by products from cattle, sheep and goats due to mad cow disease fears, some gelatin products, and triple super phosphate, which does not meet EU solubility requirements (USTR, 2003a). Similarly, Brazil and Argentina have NTBs that prohibit U.S. poultry and other exports, as do a large number of countries. Thus, such bans can be effective means to overcome the comparative advantage that foreign producers might have. The United States has protested the EU moratorium on GMOs and filed a complaint with the WTO, claiming that it is an illegal restraint on trade (USTR, 2003b). Clemens and Babcock (2002) document the difficulty experienced by U.S. beef producers who

want to export non-hormone treated beef to the EU. The costs and difficulty associated with obtaining certification make it nearly impossible for the United States to compete, and a once profitable market has been lost. Taylor, DeVuyst and Koo (2003) examine the effects of GMO bans on the potential exports of U.S. wheat and find that, unless a good system of identity preservation is implemented to keep GMO and non-GMO wheat separate, U.S. exports will suffer.

Other Measures

Certification and/or labeling of products as to origin or characteristics, such as organic or dolphin safe, are approaches that can act either as trade barriers or trade promoters. A label identifying a GMO food is probably a “barrier” to trade since, at least in the EU, such foods are considered inferior; there are virtually no GMO foods on grocery shelves in the EU since it is believed that consumers would not purchase them (Carter and Guerre, 2003). In July 2003, the European parliament passed stronger legislation requiring labeling and traceability of GMO foods, to become effective early in 2004 if approved by the member states (Alvarez, 2003; ICTSD, 2003). U.S. officials and producer groups have criticized the requirements as a trade barrier and the United States is threatening to file a dispute about this with the WTO.

The label “organically grown” could promote trade since many people prefer and are willing to pay a premium for such products (Lohr, 2000; Rodriguez and Epperson, 2001). Although there is no science that proves they are superior products, perceptions are important. Eco-labeling also is becoming important and has potential to both improve the environment and enhance international trade (see, for example, Athearn, 2003; Dawkins, 1996; Dobbs et al., 2003; van Ravenswaay and Blend, 1997). Eco-labeling remains controversial and may be viewed as a trade barrier. Dawkins, for example, concludes: “By definition, ecolabeling imparts preferential access.... Such discrimination may conflict with GATT’s Most-Favoured Nation rules and certainly generates new competitive pressures among producers” (1996, 4).

Conclusions

The costs of meeting environmental regulations tend to be relatively small for most agricultural products. Nonetheless, they can be critical factors in determining the competitiveness of a product since the cost advantages of producers in one country are often very slim. Thus, additional costs associated with new regulations can have a critical effect on the continued importance of a nation’s exports and on its share of the international market. Governments, however, often try to assist

their industries in overcoming the disadvantages caused by such added costs through subsidies, tax breaks, technical assistance or other means. In agriculture this assistance increasingly takes the form of green payments, which are currently exempt from the limits imposed on domestic subsidies permitted for agriculture – the United States and the EU have largely avoided the impacts of such limits by having set them high enough to avoid immediate problems and then converting their subsidies to indirect forms. In addition to green payments as a mechanism to address environmental protection, there also has been a selective but sometimes subversive process of erecting non-tariff barriers based on environmental protection issues. It is often difficult to determine if such measures are actually in place to protect the environment or to protect domestic producers. They tend to be effective devices for achieving environmental objectives and can also be effective measures to alter competitiveness.

Competitiveness can be either enhanced or diminished by the environmental regimes of competing nations. The existence of negative externalities means that prices are lower than would prevail if all costs were included in the prices of the products. This is a form of environmental subsidization and can give an advantage to the country with less strict environmental regulations. However, when regulations are revised to internalize such costs, the country imposing the regulations can have its competitive edge reduced or eliminated.

Historically, agriculture tended to be exempted from regulations, including environmental regulations, but with a greater emphasis on environmental issues and problems this has changed to some degree, especially in the more industrialized countries of the world. Agricultural producers are now faced with increased regulation, with its consequent negative consequences for costs and competitiveness. However, these consequences are often mitigated through subsidies that enable agriculture to remain competitive in export markets. The United States and the EU have revised their subsidy schemes to allow them to continue to make large payments to farmers through the blue and green boxes of the WTO Agreement on Agriculture. This is especially important as the use of export subsidies is increasingly being limited. It is, however, a sophistry to assume that the indirect (income support) subsidies do not distort agricultural prices and trade (International Development Committee, 2003). This is, nonetheless, the position advocated by both the United States and European Union.

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Endnotes

1. Under current WTO procedures, domestic agricultural subsidies are divided into three categories, labeled amber, blue and green boxes. Those in the green box are designated as non- or minimally trade distorting and are not subject to limitations. Conservation and environmental payments to farmers are included, but they must not exceed the costs that farmers incur for implementing the subsidized activities. However, direct income support payments to farmers that are decoupled from current production also are part of the green box (Josling et al., 1994).
2. Article XX allows environmental exceptions to trade barriers that 1) are necessary to protect human, animal or plant life or health or 2) relate to protection of exhaustible natural resources. They may be imposed if they are to protect the imposing country's own environment, and if the country can show that a trade-distorting measure is required for the purpose and that the least-distorting type of intervention is being used (IISD and UNEP, 2000). The requirements are strict, but subject to differing interpretations.

The technical annex to this paper, pages 87–90 is available as a separate document.

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