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The Environment, Government Policies, and International Trade: A Proceedings

Mathew D. Shane
Harald von Witzke

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Abstract

The environment and how Government policies relate to the environment are increasingly important issues for trade economists. The suggestion made throughout this volume is that the environment under which agriculture operates physically, legally, and institutionally plays a profound role in determining emerging trade patterns. Major efforts are underway to change the rules of international trade under multilateral and bilateral trade negotiations. The outcome of these negotiations will substantially alter the structure of trade in years to come.

Keywords: Environment, public goods, Government policies, agricultural trade, constitutional economics, GATT, Uruguay Round.

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This report was reproduced for limited distribution to the research community outside the U.S. Department of Agriculture and does not reflect an official position of the Department. This volume contains a series of papers first presented at the 1990 annual meeting of the International Agricultural Trade Research Consortium. The authors are professors at different Universities in the United States and Canada, as well as staff of the Agricultural and Trade Analysis and Resource and Technology Divisions of the Economic Research Service. Although the papers went through a process of editing and review, they were not subject to formal peer review normally required of USDA Publications. The views expressed are those of the authors and do not represent positions of any of their respective organizations.

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September 1993

Foreword

This report contains papers presented at the December 1990 annual meeting of the International Agricultural Trade Research Consortium (IATRC) in San Diego, California. The theme of the meeting was the relationship between the environment, public goods, Government policies, and international trade. The interpretation of this theme by the various authors led to analyses of issues related to both the physical and institutional environment. None of these issues and problems are easy to analyze or solve. The very fact that the Uruguay Round of negotiations under the auspices of the General Agreement on Tariffs and Trade (GATT) is still unsettled more than 24 months past the initial deadline for an agreement attests to this difficulty. However, this set of issues is extremely important and will become even more important in the future. The growing pressures on the physical environment from continuing growth and development as well as the pressures on the institutional environment from changing technology of production, communications, and trade necessitate a fundamental rethinking and restructuring of the rules under which we have done business in the past. Our collective future depends critically on whether we can realize this goal.

No effort of this sort is the result of only one or two individuals. Co-chairmen and organizers of the theme day program were Mathew Shane of the Economic Research Service (ERS), U.S. Department of Agriculture (USDA), and Harald von Witzke of the University of Minnesota. The sponsorship of the IATRC made the conference possible. Don McLatchy of Agriculture Canada coordinated the second and third days of the meetings. The financial support of ERS, USDA's Foreign Agricultural Service, and Agriculture Canada was also critical. Laura Bipes of the University of Minnesota was responsible for the logistics of the meeting. The authors of the papers presented here made this volume possible.

The proceedings is divided into three parts: the environment and international trade, policy reform and international trade, and political economy issues and international trade. The first part was the subject of the theme day. The remaining papers were presented on days two and three of the meeting.

The IATRC is a group of government and university researchers who come together twice a year to focus on issues affecting the world's agricultural economy. The ability to bring together a relatively small

group of researchers with common interests and concerns has proven to be a successful forum for discussion and debate on critical international trade issues.

The consortium is a cooperative undertaking sponsored by ERS, FAS, Agriculture Canada, and U.S. and Canadian universities. Current membership is largely from the United States and Canada with some members from Europe (UK, France, Germany, Italy, Poland, and Hungary), Mexico, Australia, and New Zealand. Membership in the consortium is subject to approval by the consortium's executive committee, but is generally opened to those involved in international agricultural trade research and analysis or its policy applications.

Mathew Shane and Harald von Witzke

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Chapter 1

Public Goods, the Environment, and International Trade

Mathew Shane* and Harald von Witzke**

A set of nonstandard issues has come to the forefront of economic analysis over the last decade. These issues, which come under the rubric of public goods and externalities and deal with environments that violate classical assumptions underlying competitive equilibrium, are increasingly becoming a major part of international trade analysis and have particular relevance to the environment, food safety, and health concerns.

Central to these issues is the question of why distortions in the economy persist even though we recognize their inefficiency and, thus, can perceive that gains can be made by overcoming them. The answer to this question lies in an understanding that, with lobbying and the political process, gains in the form of rents can be made to individuals and groups by distorting the economy. Furthermore, there are a set of problems in which the environment is such that Pareto Optimal solutions will not occur. These include situations in which a prisoners' dilemma is in force, when there are issues of assurance problems, and when noncompetitive elements are operating in a market.

Although issues related to public goods, the environment, and trade are seemingly unrelated, underlying them is a common core of analysis. Thus, food safety and environmental quality both relate to the tradeoffs

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between health concerns and achieving efficient production. Legal and social environment versus the physical environment both relate to the externalities created by the attributes of the system in which we operate. The authors interpreted the concept of the environment in two distinct ways, one relating to rules and institutions, and the other to the physical constraints to production. They found that these two aspects have a lot in common in terms of how they affect the economy.

Constitutional vs Allocative Economics

These new problems are amenable to economic analysis although of a nontraditional type and raise the question of the role of economists over the next decade or two. The traditional focus of economics has been allocative efficiency. The new issues lead to a focus on constitutional economics over allocative economics. In other words, the issues define how to set up an economic system so that the optimal social outcome is achieved in the face of public goods and externalities. The issues also direct attention to the dual role of economists in understanding the effects of technical change on the physical environment and the process of institutional change on the conceptual frameworks under which economic players operate. This refocus helps define the role of government as innovating institutions to overcome market failures rather than as a direct player in markets. The real challenge for economists is to design institutions that help overcome market failure and thereby internalize externalities. Markets are thus redefined so that the social costs are incorporated into private decisions and social and private returns become equal.

In many ways the refocus on constitutional issues is a byproduct of the demise of centrally planned systems around the world. One also might argue that the fall of the centrally planned systems was the result of their inability to function effectively in a world of increasing decentralization of information and technology.

The International Dimension of Environmental Issues

The issues of the environment, whether physical or institutional, are particularly relevant to international trade. In both cases, the issues transcend governments and national boundaries. Furthermore, international forums for dealing with these issues are only poorly formed

and suggest that global institutions such as the General Agreement on Tariffs and Trade (GATT), the International Monetary Fund (IMF), and others will have to be greatly strengthened. This action will further erode national sovereignty. As unfortunate as that may seem, the growing interdependence of the world's economies already reduces the effectiveness which domestically focused policies have on solving an individual nation's problems. Policies designed to deal with a single nation's problems face international repercussions which undermine the intent of those policies. A good example is the increasing importance of exchange rate adjustments and changes in foreign trade as the mechanism for achieving domestic macroeconomic stabilization.[1]

One of the great ironies of our modern world is that as we increasingly take advantage of the benefits of trade, our domestic policy discretion erodes, and we must continually redesign international institutions to deal with issues which national treatment alone cannot handle.

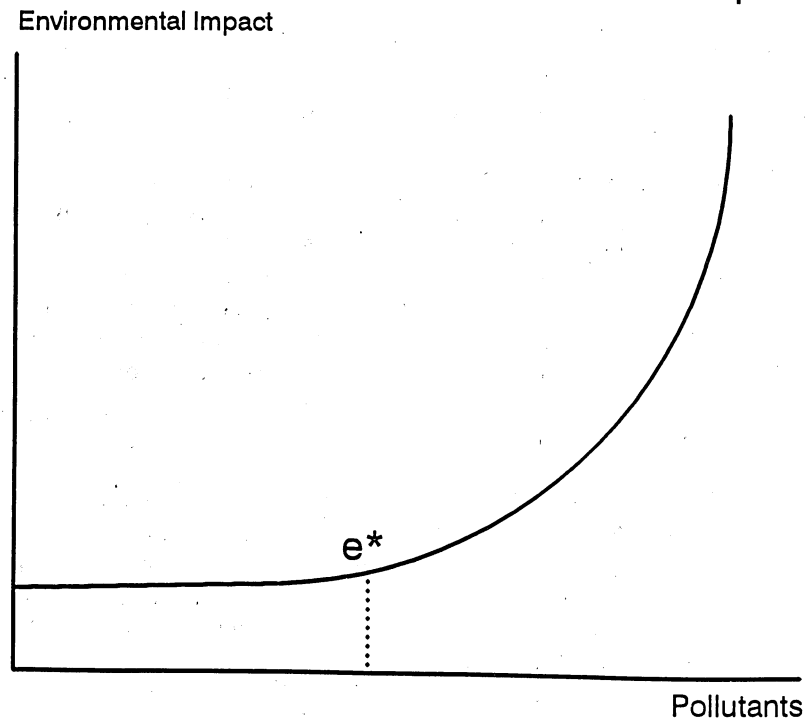
Pollution and the Environment

There is much concern about the effect of economic activity on the physical environment. A central issue is the stability of the physical environment to the increasing pollution resulting from increased economic activity and population. We have only a poor understanding of the ability of the environment to absorb pollutants. As we add more and more pollutants to the environment, can we expect the degradation response to be linear or nonlinear? If the response is linear, then as resources which were previously considered free become polluted, the economic systems will begin to increase the price of these resources leading to conservation. If, however, the response is severely nonlinear, then the potential for a catastrophic outcome becomes real because at some point the effects can be so large as to not allow sufficient time for an economic response. If such were the case, then only by early planning and control might we avoid a calamity. Such a situation is depicted in figure 1. As additional stress is placed on the environment, the environment can absorb the initial low level at low costs. However, at some point such as e*, the ability of the environment to continue to absorb further abuse diminishes rapidly and costs go up substantially. If

[1] Ed Schuh has made this point more than any other agricultural economist. See, for instance, his classic 1974 article: "The Exchange Rate and U.S. Agriculture," *American Journal of Agricultural Economics*, 56(1974): 1-13.

Figure 1

Impacts of pollution on environmental quality



the inflection point is steep enough, the environment will become a severe constraint on further economic development.

Local or Global Stability

How stable are the basic economic and environmental systems? Are the equilibrium relationships globally or only locally stable? If they are globally stable, any disruption will lead to a path of smooth adjustment. If, however, they are only locally stable, a threshold will be reached where dramatic changes will take place with unanticipated outcomes.

What really is at question is the degree to which forces are at work to bring the systems into an acceptable equilibrium without a major redesign of the system. Can we be overwhelmed by the cumulative effects of environment changes before institutions can be established and appropriate policies undertaken?

Current Critical Examples

Several current issues provide empirical examples of the potential for either outcome. Will we obtain a GATT agreement so that the conflict for international markets will not turn into a trade war? Are there other economic pressures for trade liberalization such as budget constraints in the United States and the European Community (EC) which will ensure moves toward liberalization? Does the current proposal for transforming the EC's Common Agricultural Policy (CAP) imply that the economic factors to align policies with international realities are more important than the vested interest in the current policy?

Are the current concerns with global climate change, the depletion of the ozone layer, and the encroachment on the forests issues which will be resolved before crisis sets in or not? In each of these cases, the degree to which the effects are felt in a linear or nonlinear way strategically changes the concern and approach to dealing with these. If effects are felt in a linear way, economic systems should respond in time to avert a crisis. If they are felt in a nonlinear way, such a crisis may be unavoidable.

One of the factors about externalities and public goods is that their definition depends on the unit of concern. Many environmental issues relate to the global system. Thus, the solutions must be multinational. Air and water pollution are essentially of this nature. Although a multilateral trade agreement is preferable to bilateral or trading areas, the evolution of free trade areas under most circumstances will lead to increasing trade and efficiency.

The issues of concern in this report relate to the fact that what one economic agent or set of agents does affects all other economic agents. This fact, in general, violates the assumption of private property underlying much of classical analysis. How economists will learn to design new institutions so that these "externalities" will not lead to inferior solutions will be increasingly the subject of economic analysis well into the 21st century.

Chapter 2

A Constitutional Political Economy Perspective on International Trade

Viktor Vanberg*

Introduction

The purpose of this chapter is not to enter the longstanding debate on the economics of international trade, a debate that is concerned with the economic consequences of free trade compared with various forms of protection (Vousen, 1990). Nor do I intend to enter the growing discussion on the political economy of protection which looks at the political determinants of protectionist regimes and seeks to explain the latter in terms of an equilibrium between conflicting interests in a political market (Magee, Brock, and Young, 1989). Instead, taking as undisputed what seems to me to be the main thrust of the economics of international trade and of the political economy of protection, I want to approach some of the more fundamental issues of free trade and protection from a constitutional political economy viewpoint.

Constitutional political economy focuses on the systematic interdependence between what Hayek (1969) has called the order of rules and the order of actions (that is, the interdependence between the nature of the legal and institutional framework of socio-economic-political interactions) and the character of the order of actions or patterns of behavior that result from the respective framework. As its name suggests, constitutional political economy has much in common with political economy as commonly understood. They both extend economic analysis by applying it to the political environment within which ordinary

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economic transactions take place. What makes constitutional political economy different from its better known counterpart is its special emphasis on the distinction between two levels of choice: Choices within rules (choices made within a given institutional framework) as opposed to choices among rules (choices that concern the institutional framework itself). Stated in yet another way, constitutional political economy starts from the systematic distinction between in-period choices and constitutional choices, and it directs its principal attention to the latter, the constitutional level of choice.

The analogy with ordinary games, though not perfectly fitting, is helpful in illustrating the basic concern of the constitutional perspective. In parlor games or games of sport, we can clearly distinguish between choices of strategies within an agreed set of rules and choices among rules. We engage in the latter when we change "the rules of the game," and we presumably do so with the intention to improve the game, where with "improve" we typically mean to make the flow of the game more attractive to the players or, in other words, to make its "order of actions" more desirable to the participants. Life in society is certainly in many regards dramatically different from a game. The interests that bring us together in real social life are much more varied and most often much more serious. And we typically cannot as easily enter and exit the social groups in which we participate, as we can with games. Even so, it is just as true for our "real" social life that we interact within rules of the game which shape the order of action that emerges among us for better or worse. The laws, rules, and customs that define the institutional constraints within which we act and interact generate an overall order of actions which we, the "players," may find more or less desirable. And just as with ordinary games, the principal means by which we can hope to give our socio-economic-political arrangements a more desirable character is to seek to improve the rules of the game.

What is a constitutional political economy of international trade about? For my purposes here, I want to interpret the notion of international trade in the broad sense in which it includes all across-border economic activities; that is, all activities that involve movements of goods and services, of capital, and of persons across national boundaries. Thus, the particular subject of a constitutional approach is the rules which pertain to such across-border activities, or, as I shall call them here, the

international rules.[1] In what follows, I will first identify the two main problems which may give rise to international rules: The problem of the enforcement of border-crossing contracts and the problem of protection. The next section will address in more detail the enforcement problem in international trade, followed by a discussion of the role of international rules in dealing with protection. The concluding section provides a brief discussion on the relation between free trade--as a general principle of free movement of goods, capital, and persons--and competition among governments.

Problems and Rules in International Trade

One of the most noticeable developments in the study of social rules and institutions is the increased use of game theoretical concepts, especially the prisoners' dilemma concept. The perspective of game theory helps to sharpen a notion that has always played a central role in institutional analysis, namely the idea that rules can be usefully looked at as "social tools" which serve to provide standard solutions to recurrent problems. Just as we have tools, in the ordinary sense, for solving problems that we face recurrently, such as a saw for cutting wood, we can think of social rules as devices that help us deal with recurrent problems in social interaction, like the rules of the road that allow for a smoother flow of traffic than would otherwise be possible.

If we look at international trade from such a perspective, two problems immediately come to mind that tend to create obstacles to the realization of potential gains from trade. The first problem has to do with the fact that economic exchanges often cannot be transacted strictly simultaneously, but require one party to move first and to give up a valuable resource before the other half of the transaction can be concluded. For such transactions to be carried out, and the gains that they promise to the potential traders to be realized, the party which is to move first has to have a sufficient reason to trust in the other party's compliance. In settings where the prospective traders are involved in continuous dealings and/or directly know each other, personal trust can provide such a reason. However, if personal trust were the only remedy for the problem, the extent of the market over which trade expands would

[1] The "constitutional approach" has much in common with the theoretical perspective of German Ordo-liberalism (Vanberg, 1988). For contributions from the latter perspective to the issue of the international economic order, see Gröner and Schüller (1989), Molsberger and Kotios (1990), and Oppermann and Conlan (1990).

be very limited, and so would, in Adam Smith's terms, the division of labor which is the source of the gains that can be realized through trade.

While technological advancements, for instance in transportation and communication, are relevant in expanding the size of markets, the most important step in this process is, as economic historians like Douglass North (1987, p. 421) argue, the "development of a third party to exchanges, namely government," which enforces contracts that extend beyond the narrow bounds defined by personal trust and continuous dealings. Yet, the effectiveness of government as enforcing agent finds its own limitations in the territorially defined boundaries of national jurisdictions. And the problem arises of how in the international realm a foundation can be provided for the kind of trust that is required for potential traders to be able to realize gains from trade transaction across jurisdictional borders. The second problem in border-crossing trade is, indeed, the major theme of international trade theory, namely the obstacles that arise from the various forms of protection with which national governments intervene in the trading process.

An often noted, seeming paradox in international trade is the striking contrast between the lessons of economic theory and observed political practice. On the one side is the theory of international trade which, basically since Adam Smith's arguments on the nature and causes of the wealth of nations, teaches that free trade is the best policy if the general welfare of a nation is to be promoted (Bhagwati, 1989, pp. 23ff.). On the other hand, protectionist policies are pervasively practiced and are the rule rather than the exception, throughout history and across the world. If one is not content with simply attributing such paradox to the irrationality of politics, the question arises as to how a systematic account may be provided from within the standard economic paradigm of rational, self-interested behavior.

Game theory suggests a prime candidate for such an account, namely the concept of the prisoners' dilemma. This concept is the paradigm case for situations where the separate, rational pursuit of individual interests generates an overall outcome which makes all participants worse off than they could have been; or, in the jargon of game theory, by choosing their individually rational dominant strategies, the players produce an outcome that is inferior to what would have resulted had they chosen their individually irrational dominated strategies. Explanations of the "protection paradox" in terms of the prisoners' dilemma (PD) concept have indeed been proposed, though they come in two critically different

versions, the one diagnosing the paradox as an international PD, the other tracing it back to an intranational PD.

The international version of the PD argument can be found, for instance, in *The Evolution of Cooperation* (1984). Axelrod cites the issue of trade barriers between two industrial nations as a "good example of the fundamental problem of cooperation," arguing that, even though the countries would be better off if there were no barriers, this does not bring about free trade because "whatever one country does, the other country is better off retaining its own trade barriers." This view is dubious for at least two reasons. The first is its implied assumption that free trade is advantageous only if generally practiced, but unilateral free trade would be self-damaging to a country. International trade theory teaches in essence (that is, except for certain special contingencies) the exact opposite. Though the gains from free trade are greater the larger the set of free traders, free trade enhances the welfare of a nation even if practiced unilaterally. Or, as Jan Tumlir (1983) put it: "It is, of course, the case that free trade would benefit even a single country, or a small group of them, in a generally protectionist world. But it is also true that the extent of the benefit to each depends on the number of countries participating in the system of such trade."

The second problem with the "international PD" theory of protectionism is its implied treatment of nations as unit actors which rationally pursue their interests, a perspective that is quite common in the "game theory of international politics."[2] Such a perspective can either be interpreted in a holistic way which would be blatantly inconsistent with the methodological individualism that is generally regarded as the paradigmatic trademark of economic theory. Or, it can be read as reflecting the assumption that governments generally act as benevolent and reliable maximizers of their nations' common good. Although the latter assumption has its tradition in welfare economics, the advent of public choice theory has dramatically reduced the number of economists who continue to consider it a useful device for the study of economic policy. Public choice theory has done so by pointing to, and systematically drawing conclusions from, the simple fact that governments are made up of individual persons who have their own interests, no less than ordinary economic actors, and that they pursue these interests within

[2] Snidal (1986) refers to this view as the "realist position" in the game theory of international politics, and he claims that "(t)his conception of nation-states as interdependent, goal-seeking actors lies at the heart of strategic game analysis."

the constraints that the institutional-constitutional framework imposes on them.

The modern political economy of protection can be understood as an application of public choice theory to the realm of trade politics. By systematically disaggregating the political process into the underlying interplay of particular interests, the theory is able to provide a quite straightforward explanation for the "paradox of protection" (Frey, 1984, pp. 20ff.; Weck-Hannemann, 1989, pp. 3ff.; Krueger, 1990). This theory can show that the principal obstacles to the realization of free trade lay at the intranational (rather than the international) level, namely in the differential benefits that government can provide to special interests by granting protection for particular industries or trades. The problem of protection is indeed diagnosed as a prisoners' dilemma, but as one that has its roots on the intranational level, rather than in conflicts of interests among nations. The problem of protection in international trade is critically different from problems such as environmental pollution which may justly be classified as international PD's (von Witzke and Livingston, 1990).

The theory of protectionism as an intranational prisoners' dilemma problem (Schuknecht, 1990) explains protectionist policies as a result of rent-seeking (Tollison, 1982). It states, in short, the following: Although, as traditional trade theory argues, free trade is the "best policy" for a country overall, any particular industry can benefit from being protected against foreign competition, and, therefore, has an incentive to seek to achieve such protection. While all would be better off if nobody were protected, to seek protection is the dominant choice for each industry acting separately. Being protected is preferable independently of what is true for the other industries: If nobody else is protected, one's own protection yields a differential advantage, and so it does if a few or all others are protected as well.

From a constitutional economics perspective, the argument can be restated in terms of the distinction between the constitutional and the inperiod level of choice: If we were made to choose between alternative institutional-constitutional regimes, a free-trade regime on the one side, and a regime characterized by pervasive protectionism on the other side, we would certainly prefer to live in the former because it would promise to be the wealthier society. Such choice at the level of regimes would reflect what one may call our constitutional preferences, our preferences over alternative constitutional rules, preferences that are informed by our

perception of the working properties of alternative constitutional systems (Vanberg and Buchanan, 1989). The prisoners' dilemma nature of the problem lies in the fact that our constitutional preference for a free-trade regime does by no means assure that, in the arena of ordinary politics, we would all have an incentive to refrain from protectionist lobbying. What requires us to draw a careful distinction here is the different nature of constitutional choices among regimes as opposed to strategic choices within regimes. Advocating free trade on the constitutional level, and seeking protection for one's particular trade on the subconstitutional level of inperiod politics is not inherently inconsistent. These are simply two different levels of choice, involving fundamentally different choice-alternatives: Alternative regimes in the one case, and alternative strategies within regimes in the other.

The recognition that, if required to choose to live either in a free-trade or a protectionist environment, we would rationally choose the former, does not, for the reasons explained, imply that we could be expected to voluntarily abstain from protectionist rent-seeking in ordinary politics. Nor does it imply that, within existing regimes, characterized by varying institutional mixtures of free trade and protection, we could easily agree to support general constitutional prohibitions of protection. The interests that drive protectionist rent-seeking in ordinary politics cannot be expected to mysteriously evaporate as we move up to the level of constitutional politics. The differences between particular industries with regard to their previous success in securing protection create vested interests which, despite the overall wealth increase that movements towards a free-trade constitution should promise, may still expect to be differentially advantaged by the status quo regime. Yet, though certainly driven by interests, the dynamics of constitutional politics is not just a mere duplication of the conflicts that characterize ordinary politics. For reasons amply discussed under such labels as "veil of uncertainty" or "veil of ignorance" (Vanberg and Buchanan, 1990), the prospects for agreement are enhanced as we move to the more generalized reflections that constitutional decisions on rules command. And for the free-trade issue, in particular, a fuller account of all the direct and indirect wealth effects of protectionist restrictions may show that a constitutional prohibition of protection is likely to promise net gains and, therefore, be agreeable even for the current "beneficiaries" of protectionist regimes, because they are both producers and consumers (Buchanan and Lee, 1991).

If there are indeed constitutional interests in free trade hidden behind, or buried by, protectionist policies, the question arises of how these constitutional interests may be effectively implemented. Before discussing

this question, I want to return to the problem of enforcing contracts that cut across jurisdictional boundaries.

Protective State and Trade Protection

North (1987) draws a useful distinction among three types of trade arrangements: personal exchange, impersonal exchange, and impersonal exchange with third-party enforcement. In personal exchange, the traders possess, because of repeat dealings or otherwise, "a great deal of personal knowledge about the attributes, characteristics, and features of each other" (p. 420). This situation makes for low transaction costs, but, because such conditions are confined to dense social networks, personal exchange sets rather narrow limits to the extent of the market and, therefore, to the potential for specialization and division of labor.

Going beyond the confines of personal exchange, and entering the "world of impersonal exchange" (North, 1987), means increasing potential for specialization and division of labor and, thus, significant gains in productivity or a significant decrease in production costs. But, transaction costs significantly increase because of the increased difficulties in enforcing the terms of exchange. The emergence of an enforcing third party, namely government, allows for the reduction in transaction costs that is required if the potential gains from impersonal exchange are to be fully realized (North, 1987).

North's notion of government as a third-party enforcer corresponds to what Buchanan (1975, pp. 68 ff.) has called the protective state, in distinction from the conceptually different "productive" state, the agency through which politically organized individuals provide themselves with "public goods." The protective state ideally operates as a strictly neutral and impartial enforcer of agreed-on rules and of contractual obligations voluntarily entered into by trading parties. The state's essential function is to provide and enforce an institutional framework which facilitates voluntary trade. In other words, the protective state's proper role is to remove obstacles to voluntary exchange, such as fraud and coercion. Yet, the development of government as an enforcing agent is a double-edged sword. With the concentration of power in the hand of the state comes the potential for this power to be used to impose and enforce rules which favor certain interest groups at the expense of others. Although the protective state plays an essential role in facilitating free trade, its coercive power can also be employed to inhibit free trade through

protectionist measures. In the state as protection-granting agent, we find again the principal subject of the political economy of protection and of the theory of rent-seeking more generally.

In the remainder of this section, I want to concentrate on the "pure" role of the protective state and, in particular, on the question of what the territorial confines of its jurisdictional domain imply for the problem of international trade. Put simply, the question is whether the fragmentation in national jurisdictions or, in short, the "territoriality of law" (Schmidtchen and Schmidt-Trenz, 1990), leaves obstacles to border-crossing trade, the effective removal of which would require an enforcing agent with transnational or supranational authority.

The international realm, the world of international relations, is often described as a state of anarchy, not unlike the "state of nature" in the Hobbesian sense (Oye, ed., 1986; Kratochwil, 1989, pp. 3 f.). If this characterization were adequate, one should expect that voluntary trade in the international arena would be subject to the same limitations that hamper cooperation in the Hobbesian arena. That is, we should expect that, in the terms of North's argument, any effective extension of trade beyond the confines of personal exchange would require the emergence of an enforcing agency on the international level to bring about the decrease in transaction costs that is needed for the potential gains from impersonal exchange to be realized. Prima facie evidence contradicts such reasoning. Though we have not witnessed the emergence of a world Leviathan, international trade has been successfully carried out through known history and its volume in today's world is obviously gigantic, covering the whole globe.

Coming up with an answer for why impersonal exchange is feasible in the international realm despite the absence of an international enforcing agency is not too difficult. Going back to the original issue of impersonal exchange, one can locate the essential problem in the difficulty for potential traders to make credible commitments-commitments which would assure their respective counterparts that they will indeed conclude their part of the deal. In personal exchange, such credibility derives from personal knowledge. In impersonal exchange, traders can make their commitments credible by mutually submitting to the dictum and enforcement of a third-party. Thus, as North argues, the development of government has an essential role in expanding the extent of the market and in providing for the gains from specialization and division of labor that come with it.

On a "first level," the development of government as third-party enforcer is apparently essential in providing a low-cost method for making credible commitments. Once national governments exist and we move into the realm of international impersonal exchange, the commitment problem takes on a critically different nature. On the national level, there is apparently no full-fledged substitute for government enforcement, although there have been effective "partial," nongovernment substitutes which have helped, through history, to facilitate impersonal trade, such as private commercial law, the so-called "law merchant" (Trakman, 1983; Benson, 1990). In the realm of international trade, however, a substitute for an international enforcement agency is available, namely the existing national governments. Traders can make credible commitments in international transactions if the enforcement systems in their respective home countries can be used by their foreign counterparts to enforce compliance with the terms of a contract.

The credibility that a national enforcement system provides to contractual commitments exchanged among domestic traders can easily and effectively be extended to international transactions by granting equal enforceability to contracts between domestic and foreign traders. This situation is what we observe and what allows for a rather smooth operation of international trade, although differences between different national legal systems introduce ambiguities which pose obstacles that are absent within national jurisdictions (Schmidtchen and Schmidt-Trenz, 1990). The reason why traders find it in their constitutional interest to have their domestic courts enforce foreign claims is clear. Traders who can back up their commitments by the enforcement power of their own domestic jurisdictions are more attractive trading-partners for foreigners, compared with those who cannot, and they will, therefore, encounter more and better opportunities for profitable exchange (Moser, 1990, pp. 13ff.; Vanberg and Buchanan, 1988, p. 152).

The above situation implies that the absence of an international enforcement agency need not pose a real obstacle to international trade. The credibility of commitments in international transactions can be effectively provided through national jurisdictions. The enforceability of international contracts is a direct function of the effectiveness and reliability of national jurisdictions, so that the international order may be said to be, a "reflection of national constitutional order" (Moser, 1990, p. 139; Tumlir, 1983, p. 80).

Antiprotection Commitments and Their Enforcement

Players who face a prisoners' dilemma type of situation can escape the dilemma if they can exchange credible commitments to not use their dominant "defection" strategy. Commitments are credible and effective to the extent that they introduce incentives which eliminate the dominance of the noncooperative choice. Commitments serve as constraints on behavior. They have the function of eliminating strategy-options from a player's choice set. And the prisoners' dilemma is the paradigm for a situation in which the exchange of commitments, the deliberate adoption of mutual constraints, restricting one's choice set, allows players to realize gains which otherwise would not be attainable.

I have argued above that the problem of protectionism is a prisoners' dilemma type problem, but intranational rather than international. Such diagnosis would suggest that commitments on the national rather than the international level would be required to solve the problem. If intranational rent-seeking, rather than conflicting interests on the international level, drives protectionist politics, the proper remedy would seemingly have to come from an exchange of commitments among intranational interest groups rather than from an exchange of commitments between nations. What we observe in reality seems to reflect the exact opposite: Free trade issues are typically the subject of international agreements, rather than of intranational constitutional politics.

Two questions arise in this context. First, why do we find the problem of protectionism to be a concern of international politics? Second, protection becomes a subject of international agreements; can such agreements provide effective solutions to this problem? Concerning the first question, one must remember that, although protectionism is essentially an intranational problem, a nation's economic wealth is still hurt other nations' protectionist policies. The protectionism of other countries does not change the fact that a nation's overall welfare is still better served by free trade rather than by a protectionist policy. The free-trade nation's gains from trade are clearly reduced compared with what they could be if the other countries were free traders too. Negative external effects derive from protectionist policies, and these negative effects create a mutual interest among nations in their respective trade policies. This fact alone could explain why we find protectionism to be a subject of international politics, yet the political economy of protection has added, as a further reason, the observation that, due to the dynamics

of intranational democratic politics, domestic support for free-trade commitments may be easier for politicians to secure if such commitments come in the form of a negotiated "exchange" with other governments rather than in the form of unilateral constitutional guarantees.

The second question, concerning the effectiveness of international agreements as a substitute for national constitutional prohibitions of protectionist policies, has a "yes, but" answer. Yes, international agreements could, in principle, serve the same purpose as national constitutional provisions. But, enforceability is a problem. There is no third-party enforcer to whom the contracting governments could turn to give credibility to their antiprotection commitments, and how sovereign nations should be able to create an appropriate international enforcement agency is far from clear. Such an enforcer should be powerful enough to force individual nations into compliance with agreed-on commitments and at the same time be safeguarded "against any abuse of that very substantial power" (Tumlir, 1983, p. 83). Although the recourse to the national level makes an international agency for the enforcement of privately negotiated trades dispensable, such an agency seems hardly workable for contracts among governments that would be required to act as their own guardians.

Free-trade commitments are apparently easier to achieve in the form of commitment-exchanges among governments than in the form of unilateral constitutional guarantees on the national level. And, in principle, such international commitments could serve as genuine substitutes for national constitutional provisions. The problem, however, is that their effective enforcement seems to require an international enforcement agency which does not exist and is unlikely to be created. With regard to the enforcement problem for international free-trade agreements, a proposal advanced by Jan Tumlir may promise a feasible solution, a solution which capitalizes on the fact that protectionism is ultimately a matter of intranational conflicts of interest. Tumlir's proposal (Hauser and others, 1988, pp. 226ff.; Moser, 1990, pp. 33ff.) is that internationally negotiated commitments among governments be translated or incorporated into the respective domestic legal-constitutional order in such a way that they create rights for individual citizens, enforceable in domestic courts, such as, the right to import certain goods without governmental interference. In Tumlir's (1983, p. 82) own words: "One can imagine the international economic policy commitments of a government to be undertaken in the form of self-executing or directly effective treaty provisions, creating

immediate private rights enforceable against one's own government . . . . These rights would be enforceable in national courts only, with no sacrifice of legal sovereignty."

Free Trade and Intergovernmental Competition

Protectionist measures prohibit voluntary transactions that otherwise would take place among domestic producers/consumers and foreign producers/consumers. Thus, free-trade commitments are, in the first instance, not concessions that governments make to each other. They are, instead, about the distribution of rights between governments and their citizens. They are constraints on the discretionary power with which governments can interfere in the economic activities of their citizens. They provide assurances to citizens that they can engage in economic transactions with foreigners free from politically imposed obstacles. "(I)nternational economic policy rules under which governments commit themselves to maintain freedom of and nondiscrimination in legitimate international transactions of their citizens represent important additional protection of private property rights -- 'the second line of national constitutional entrenchment'" (Tumlir, 1983, p. 83).[3]

Free trade in the general sense of free movement of goods and services, capital and persons, is a principle that is not only important with regard to economic efficiency as traditionally understood. Free trade is an essential device through which individuals can secure their rights from government encroachment, a device through which they can effectively control governmental powers. The rights of participation in collective political decisionmaking that liberal democracies provide for their citizens are, without any doubt, extremely important in keeping governments responsive to the interests of those whom they govern, as a comparison of alternative forms of government clearly reveals. Yet, public choice theory has made us aware of the limits of democratic collective choice mechanisms in large constituencies as to their capacity to establish a sensitive link between citizens' interests and governmental policies (Vanberg and Buchanan, 1990). These limits characterize the operation of ordinary politics, and they characterize in no lesser way the realm of constitutional politics.

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[3] Tumlir (1983) continues: "This reasoning leads to the conclusion that national courts, rather than diplomacy, can and should provide the necessary authoritative interpretation of the international commitments governments undertake in matters of economic policy."

With regard to constitution polities, the principle of free trade can considerably strengthen the power of control that citizens, as individuals, are able to exercise over their governments. While in their capacity as voter-citizens, they can codetermine the choice among constitutional regimes, with their vote rapidly becoming insignificant as the size of the constituency increases. Individuals are free to move with their economic activities, investments, and human capital between locations that allows them to choose individually and separately among alternative constitutional regimes. In this sense, free trade introduces an important element of competition into relations among governments. If individuals are free to move with their resources between different jurisdictions, governments must compete for these resources, in much the same way in which firms must compete for the funds of consumers, the financial contributions of investors, and the input of potential employees.

Such competition can help to establish, in the political realm, a responsiveness of governments to citizens' interests, which is similar to the responsiveness that market competition induces in the relation between producers and consumers, an observation which Tiebout summarized as follows: "Spatial mobility provides the local public-goods counterpart to the private market's shopping trip" (1956, p. 23). The right and the capacity of individuals to move resources between jurisdictions impose effective constraints on governments (Hirschman, 1981, 253ff.) and have, for obvious reasons, been important themes in contributions on federalism in general (Hayek, 1948, pp. 258, 260) and on fiscal federalism in particular (Brennan and Buchanan, 1980, 168ff.; Wiseman, 1990, p. 122). This theme has been further discussed by Breton (1987, pp. 268ff.) and others (Wildavsky, 1990, 43ff.; Dye, 1990, p. 71) in writings on federalism as intergovernmental competition.[4]

These arguments on the role of free trade in securing the responsiveness of governments do not imply that no circumstances were conceivable under which citizens, in pursuit of their constitutional interests, could agree on jointly submitting to certain limitations on the mobility of goods, capital, and persons (Kindleberger, 1986, pp. 3ff.). What is implied, however, is that the effects that such limitations have on the power of control that citizens can exercise over their governments should be properly considered.

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[4] Sinn (1989, 1990) discusses "competition among governments" as an effect of the international mobility of capital.

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Chapter 3

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

C. Ford Runge*

Introduction

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

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

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

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

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

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

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

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

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

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

Gains from Trade as a Public Good

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

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

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

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

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

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

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

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

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

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

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

Agricultural Trade, Reciprocity, and the Assurance Problem

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$W_i = W_i(q_i, z) \qquad (i = 1, \ldots. n) \tag{1}$$

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

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

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

$$\delta h_i(q_i, z)/\delta q_i > 0 \qquad (i = 1 \ldots. n) \tag{3}$$

and

$$\delta h_i(q_i, z)/\delta_z > 0 \qquad (i = 1 \ldots. n) \tag{4}$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

that is, if

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

Similarly, country B will choose 0 if

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

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

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

Models and Reality

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

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

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

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

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

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

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

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

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

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

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

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

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Chapter 4

The Growing Demand for Food Quality

Implications for International Trade

Jean D. Kinsey* and James P. Houck**

It is quality rather than quantity that matters.
Seneca (4 B.C.- A.D. 65)

Introduction

Increased concern over food quality and safety is being driven by increased affluence, by new scientific discoveries, by more sophisticated measurement, by new information about linkages between diet and health, by new food technology, and by mass communications. Consumers around the world, especially in high-income countries, are placing new demands on the foods they eat. In addition to providing physical energy and preventing nutritional deficiencies, foods now should improve physical fitness and longevity. They should deliver fresh, good taste in a convenient form. They should be grown, processed, and packaged in ways that help to preserve the environment and, above all, they should not contribute to chronic and degenerative diseases.

Food is no longer automatically defined solely as a source of positive nourishment, but also as a potential source of ill health. Individual

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nutrients and characteristics of food are evaluated by consumers for both their positive and negative contributions to health. These new concerns and demands are part of an irreversible structural change in all affluent countries. They will also become increasingly important in developing countries.

Growing demand for higher quality foods leads to a higher demand for effective government regulation of food quality and safety. This situation paves the way for more nontariff trade barriers (NTB's) even as international trading partners try to harmonize standards across international borders to promote freer trade. This chapter briefly outlines trends in NTB's and discusses the potential economic effects of the demand for food quality attributes on international trade. Then, various approaches to phytosanitary regulations within and among nations are discussed. Finally, a model for arranging food quality characteristics along a continuum is presented as a basis for thinking about quality (appropriate) regulation and when it might lead to a deliberate or inadvertent NTB.

Phytosanitary Regulations and Trade

With increased economic integration of world economies, including expanding trade in foodstuffs, the question of the phytosanitary characteristics of traded products becomes important in several dimensions. International agencies concerned with human health and consumer rights develop and exchange information about potential and real hazards accompanying traded products. The Food and Agriculture Organization (FAO) of the United Nations (UN) and the International Organization of Consumer Unions (IOCU) are examples of institutions that focus on both economic and ethical issues concerning trade in food and other agricultural products in developing countries. The political reality of the need to protect consumers' health, and producers' income, forms the core of many debates in international trade negotiations. Meanwhile, around the world, the demand for safe and wholesome food ratchets upward as does the demand for and supply of a larger variety of food in more convenient forms.

As the value of consumers' time increases, their demand for health and safety regulations also increases. In the food sector, the demand for value-added services shifts out as the value of household time increases relative to the price of these services and the demand for "insured quality"

increases with income and the labor force participation of both men and women (Waldorf, 1964). Busy consumers do not have time to educate themselves about each newly discovered risk, ingredient, and attribute. They want to know their food is safe, whether imported or not. This demand transcends the private marketplace to a demand for government regulations. It opens the door to an infinite variety of phytosanitary trade issues. Just a few examples over the past few years are the European Community's (EC) ban on beef treated with growth hormones and its prohibition of pork variety meats from the United States, the U.S. rejection of Australian beef contaminated with pesticide residues, recent U.S. and Canadian disputes over "equivalent" meat inspection, the alleged contamination of Chilean grapes imported to the United States, and the United Kingdom's requirement that all fluid milk be packaged on premises authorized by a local inspector.

The General Agreement on Tariffs and Trade (GATT Article XX(b)) includes a longstanding agreement that phytosanitary regulations, imposed by a given country to protect the health and safety of its domestic consumers, are acceptable and are not to be considered official trade barriers (Bredahl and Forsythe, 1988). A dilemma occurs when we cannot tell if such a regulation genuinely protects the health and safety of consumers or if it masquerades as such to protect the economic interests of domestic producers. The latter, or course, is an illegitimate nontariff trade barrier.

There is also an institutional dilemma. The GATT has traditionally concentrated on decreasing tariffs through multilateral trade agreements. Over the last 20 years, the importance of this function has diminished as more and more countries formulate bilateral trade agreements and as tariffs have decreased from an average of 40 percent to 8 percent (Nogues and others, 1980; Litan and Suchman, 1990; Laird and Yeats, 1990). In the latter respect, the GATT has been extremely successful. In the place of tariffs, however, has come a dramatic increase in nontariff trade barriers. Only some of these NTB's are related directly to phytosanitary concerns. With bilateral agreements and with GATT's apparent inability to deal with current nontariff trade barriers in the agricultural sector, there is a great need for an impartial international dispute settlement mechanism for exporters who believe they are unfairly blocked from trade by another country's health and safety standards.

Independent courts or arbitration panels have been established to hear disputes between individual countries. The European Court has settled

several disputes among member countries in the EC. A new panel, formed to oversee U.S./Canadian trade under the 1988 Free Trade Agreement, has already arbitrated some disputes. The GATT's Standards Code, aimed at harmonizing international standards, has worked fairly well in the industrial sector, but has not provided guidance for agricultural product standards. The code has never been accepted for such guidance by trading countries. How individual countries might surrender sovereignty in the health and safety of their citizens to an international court is hard to imagine. However, they often find that their economic interests are reasonably well served by an arbitration judgment.

A large part of the problem is that negotiating positions are based on extensions of national rules and policies that are extremely diverse (Bredahl and Forsythe, 1988). Simply arranging the issues and the information in ways that render them negotiable would be a major step toward harmonizing phytosanitary standards (Winham, 1986, p. 85). In this vein, alternative ways to identify, discuss, and analyze nontariff trade barriers growing out of increased demand for high-quality food are the main topics in the balance of this chapter.

Nontariff Barriers to Trade

The decline in average tariffs levied by developed countries can be attributed largely to concessions made during numerous multilateral trade negotiations within the GATT (Nogues and others, 1986; Laird and Yeats, 1990). As tariffs have declined, nontariff trade barriers have proliferated. Nontariff trade barriers include a variety of measures deliberately designed to protect domestic industries. In doing so, they distort trade. They are often administered and applied from deep within national bureaucracies, escaping widespread notice and transparency (Houck, 1986, chap. 8). Nontariff trade barriers include voluntary export restraints, embargoes, antidumping duties, import quotas, variable levies, countervailing duties, and a host of other measures. These "type I" measures deliberately restrict the quantity or alter price/cost relationships of traded goods (table 1).

"Type II" nontariff trade measures restrict trade inadvertently or incidentally to their primary purpose. They differentially restrict trade only when the standards in the importing country are stricter than those

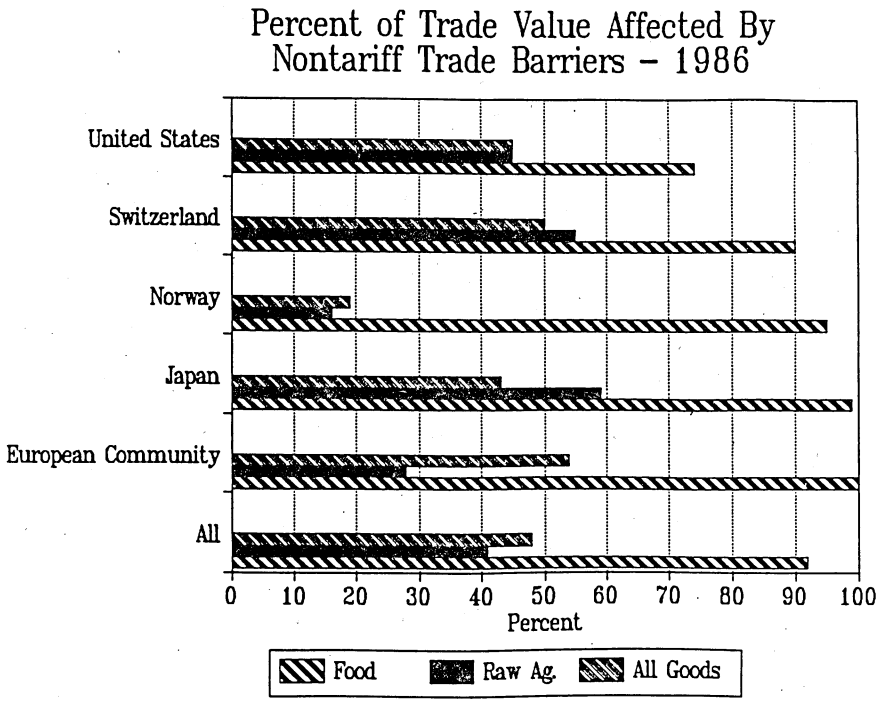
Table 1--Classification scheme for different forms of nontariff trade measures on imports with food products recording the highest increases

Type I measures (trade-distorting intent for imports)	Type II measures (secondary trade-restrictive intent)
A. Quantitatively operating: 1. Global import quotas 2. Bilateral import quotas 3. Restrictive licensing 4. Liberal licensing 5. Voluntary export restraints 6. Embargoes 7. Government procurement 8. State-trading practices 9. Domestic-content regulations	A. Quantitatively operating: 1. Communications media restrictions 2. Quantitative advertising restrictions
B. Operating on prices/costs: 1. Variable import levies 2. Advance deposit requirements 3. Antidumping duties 4. Countervailing charges 5. Subsidies to import competitors 6. Credit restrictions on importers 7. Tax benefits for import competitors 8. Discriminatory internal freight costs 9. International commodity agreements 10. Orderly marketing arrangements*	B. Operating on prices/costs: 1. Packaging and labeling regulations* 2. Health and sanitary regulations* 3. Safety and industrial standards 4. Border tax adjustments 5. User taxes and excises 6. Customs clearance procedures 7. Customs classification procedures 8. Customs valuation procedures 9. Exchange restrictions 10. Disclosure regulations 11. Government-provided entrepreneurship research and development financing and related aids for import-competing industries.

* Most likely to be associated with food.
Sources: Laird and Yeats (1990) and Walter (1972).

of the exporter, making the imported products unacceptable to local consumers and regulatory agencies. In practice, "type II" regulations often can be designed intentionally to discourage imports of products that compete with local producers. Although this case violates the spirit and the rules of the GATT, both intentional and inadvertent "type II" nontariff trade barriers will probably increase as nations' food quality standards ratchet upward.

Figure 1



Source: Laird and Yeats, 1990.

Using data from a variety of sources, Laird and Yeats (1990) traced the percentage of transactions (frequency) and the percentage of import values (coverage) that were subject to NTB's between 1966 and 1986 in 18 OECD countries. Over all developed countries, the frequency increased from 17 percent to 54 percent of all transactions being affected with food products recording the highest increases, from 36 percent to 89 percent. After food, raw agricultural products experienced some of the largest increases, especially in textile fibers and crude animal and vegetable materials.

In value terms, NTB's affected 56 percent of food imports in 1966 and 92 percent in 1986. Nontariff trade barriers affected 25 percent of the value of all imports in 1966, almost doubling to 48 percent 20 years later. In raw agricultural products, NTB's grew from affecting 4 percent of the value to 41 percent. NTB's are very prominent in the international food trade. Figure 1 shows the percentage of the traded value of food, raw

agricultural products, and total goods affected by NTB's in 1986. As high as these figures may look, they undercount total NTB's. Nontariff barriers which actually prohibited trade from occurring were not counted because no transactions could have been made.

About 17 percent of U.S. import transactions were subject to countable NTB's in 1986. Of these, about 30 percent were "type II" NTB's. Of the products covered by "type II" NTB's, food accounted for 34.5 percent of the transactions in the United States compared with about 25 percent in Japan (Laird and Yeats, 1990, p. 318). In both countries, about 16 percent of all transactions subject to "type II" NTB's can be attributed to raw agricultural products (fig. 2).

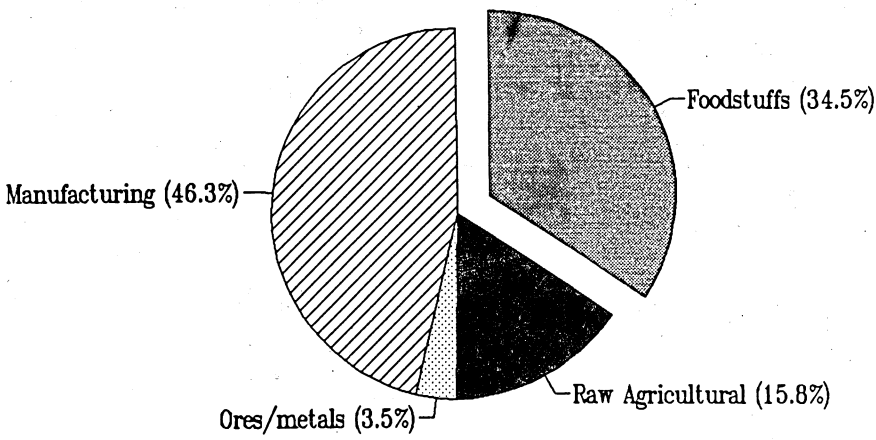
We cannot tell what portion of the "type II" NTB's are directly attributable to health and safety standards, but packaging, labeling, advertising, and disclosure regulations are often closely related to health and safety concerns. Many of the NTB's that apply to food and agricultural products are "type II" in nature. Sixty percent of NTB's on food and 95 percent of those on raw agricultural products were of "type II" in the United States in 1986 (fig. 3). That is, they could be interpreted as secondary barriers, measures whose primary purpose is not to protect domestic industries from foreign competition but to protect domestic consumers generally or provide them with truth in labeling, advertising, or packaging.

A big problem in trade negotiations is to determine when "type II" NTB's are intentional and when they are secondary. If a health and safety standard exceeds that demanded by domestic consumers or is more stringent than that applied to domestic suppliers, it is clearly intended to restrict trade. If so, such a standard is "unfair," and a potential exporter should be able to appeal its use to a mutually agreed upon arbitrator. However, an arbitrator can function only if there is an internationally accepted code of trade and an enforcement mechanism.

Although determining the intent of a trade barrier would be the main function of an international court, one might ask if and when the intent really matters. A health and safety standard demanded by domestic consumers, in line with their demand for high-quality food, which inadvertently bans or limits imports of lower quality products, serves as a de facto barrier to trade. This standard will be part of the market demand signal to trading partners. They must either provide that quality at a competitive price or relinquish that market.

Figure 2

Percent of U.S. Type II NTB's
Applied to Various Products, 1986

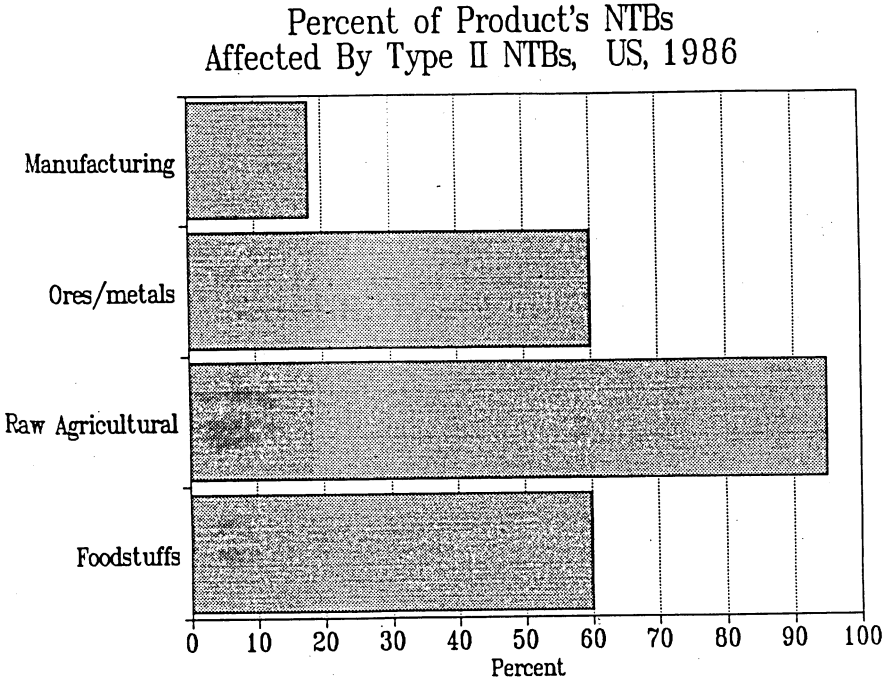


Source: Laird and Yeats, 1990.

What follows in this section is a relatively simple way to view the trade effects of a "type II" NTB within the familiar partial equilibrium demand and supply context. For simplicity, assume that D and S in figure 4 are the domestic demand and supply schedules for a food product (Q) with a given set of health and safety attributes (A). The international price for this product, with the given attributes and initial quality standards is P_1. In this case, imports will be equivalent to line ab.

Now imagine that new, higher quality standards are mandated by domestic authorities for the health and safety attributes of the final product. In terms of figure 4, per unit costs increase and the supply function shifts to

Figure 3

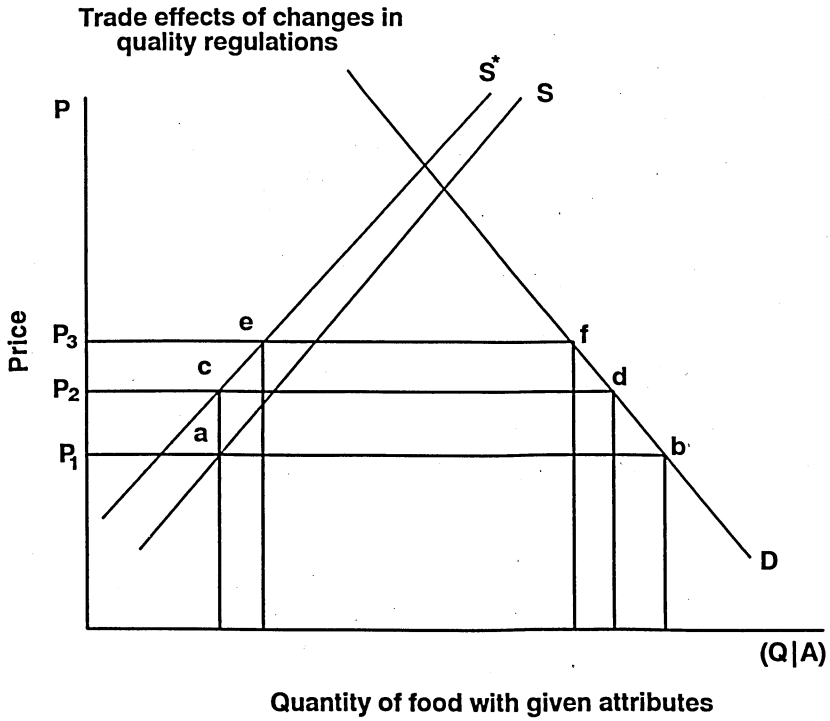


Source: Laird and Yeats, 1990.

S^* inside the country. If foreign sellers also can accommodate the new regulations with the same cost increases, then the international price of the product with the new quality standards will move up to P_2. This price increase will shrink the total quantity demanded of the basic product somewhat (from b to d), but will allow domestic sellers to produce asmuch as before, the fall in quantity demanded being absorbed from imports which now are equal to cd.

If foreign sellers cannot match the domestic industry's costs in providing the new quality standards, then the international import price will increase beyond P_2, to perhaps P_3. Foreign sellers will be crowded out because total demand quantities fall and because domestic supplies

Figure 4



expand (from a to e) behind the differential cost structure of the new requirements. In figure 4, imports fall from ab to ef.

As long as the new requirements are equally mandated on domestic and foreign goods and are defensible using widely agreed upon criteria concerning health and safety, these regulations are not NTB's in the discriminatory sense. However, if the standards are written or applied so that foreign goods must meet stricter or costlier regulations or must sustain higher trading costs not associated with actually creating the higher quality required, then a discriminatory NTB may be said to be in place.

Thinking of quality attributes as commodities themselves rather than as product characteristics mandated by regulation is often useful. These quality attributes can be argued to have their own supply and demand functions which are subject to market forces, to government regulation, or to both. Once the price and quantity of a set of quality attributes are

determined per unit of the basic commodity, then further economic analysis can proceed.

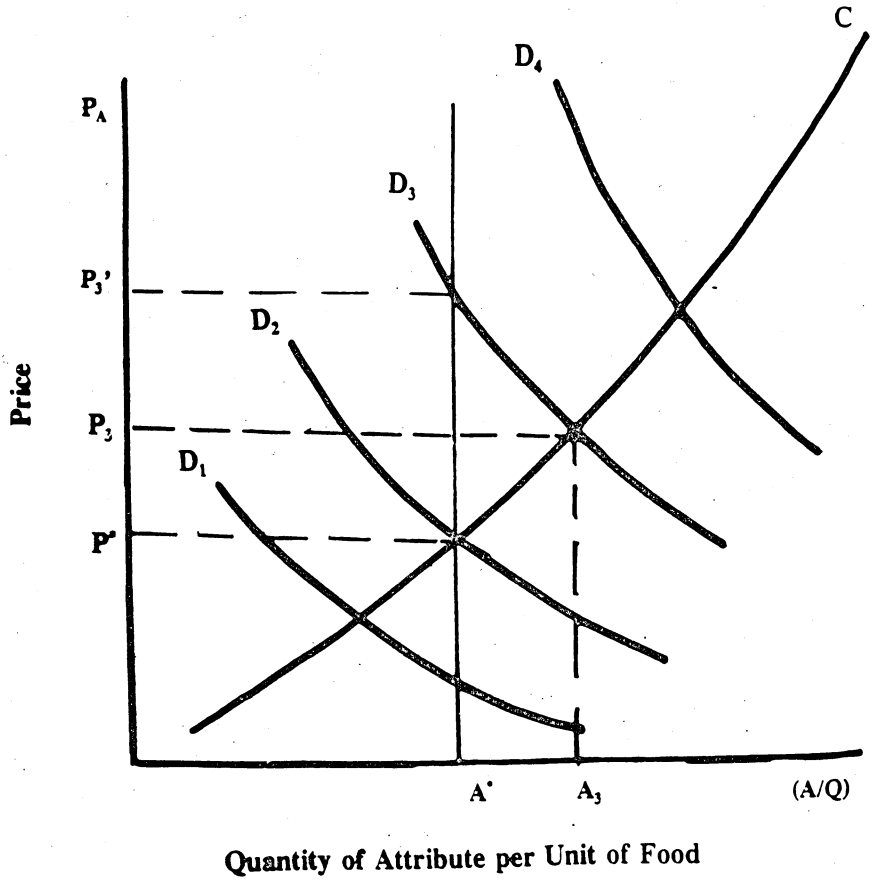
Consider figure 5 where C is a single marginal cost curve (supply function) for providing quality attribute A per unit of a basic food product, Q. In this instance, A could be various levels of safety such as a gradual reduction in chemical residues in a food product. Or A might be the number of quality inspections conducted per unit of output as a food product was processed. This function, C, is consistent with the rising marginal and average cost curves hypothesized by von Witzke and Sheldon (1990) in a recent paper focusing on suppliers' incentives to cheat on quality standards when market information is asymmetric.

The various demand functions, D, represent consumers' private willingness to pay for various amounts of A at differing incomes. Because improved quality and safety are superior products with respect to income change, the demand for them will shift up and out as people and nations become more affluent (Falconi and Roe, 1991). If market information about quality attributes of products is evenly distributed between buyers and sellers, and if these quality attributes are not collective or public goods (that is, nonrival or nonexclusive (Randall, 1983)), then the intersections of the various demand curves and cost (supply) functions will signal market equilibriums for A per unit of Q as incomes and quality increase; little government regulation is required. However, if information about quality attributes is asymmetrically distributed with consumers having less, on balance, than producers, or the quality attribute is a collective good, then a modified view of this market process is sensible.

First, one might plausibly expect that as the demand curves for superior quality and safety per unit of product shift out, they will become less elastic. Then, following the reasoning advanced by von Witzke and Sheldon (1990) concerning markets in which information about quality is asymmetric, the higher, less elastic demand curves should increase the incentive for sellers in affluent markets to charge buyers for higher quality attributes than are actually present. This suggests the need for minimum quality standards in such markets. Suppose we are considering the situation reflected by D_2 in figure 5. A minimum quality standard of, say, A^* might be sensible. This standard would prevent sellers from cheating on quality below the open market value of P^*.

Figure 5

Demand for Quality Attributes per Unit of Food and Quality Regulation



If the quality attribute being demanded is perfectly transparent to consumers (information is symmetrical), there would be no need for the minimum standard to change as incomes and demand increase. If, however, the quality attribute is not transparent to consumers, or it is

nonexclusive or nonrival, they might reasonably insist on an increase in the quality standard set by their regulators, and A^* would drift to the right, say to A_3. In the absence of a minimum quality standard at A_3, with demand D_3, sellers could charge up to P_3' for A^* and capture $(P_3'-P^*)$ in excess profit. Sellers could also charge prices in between P_3' and P_3, deliver quality somewhat higher than at A^*, and still capture excess profits. This action would lead to both higher prices and higher quality in the products, but less quality than would occur with full symmetry of information. If D_3 were even less elastic than shown here, the opportunities for sellers to cheat by charging higher prices to higher income consumers would only increase.

In the context of international trade, foreign suppliers who can meet standard A_3 at the internally driven price will be able to sell in this market. Those who cannot will seek outlets with less stringent quality standards. Hence, the ratcheting up of demand for high-quality foods will surely segment international markets further, making multilateral trade negotiations even more difficult than they are now.

Tobey (1990) suggests that markets for environmentally dirty products will open up to countries or producers who operate and trade in territories with low-quality standards. Thus, some producers in high-quality markets will be at a competitive disadvantage in selling to developing countries. The same is likely to happen with respect to trade in foodstuffs. In figure 5, for instance, suppliers who met quality standard A_3, could not profitably sell in a market where demand was represented by D_1. Markets will become more segregated, and both low and high demand for the attribute A will be de facto barriers to trade, but will not necessarily be considered discriminatory NTB's.

As long as income and preferences (influenced by education and information) drive the demand for food quality, and as long as an affordable domestic supply or suitable substitutes continue to be available, the outcome will be the same whether these trade barriers are intentional or inadvertent. The costs of supplying the higher and segmented qualities must be evaluated in terms of foregone resources and their relationship to the benefits realized by the world's consumers in healthier, longer, and more productive lives. Estimating these benefits is a complex and lengthy analytic process, beyond the scope of this chapter. But they cannot be ignored in the total scheme of trade negotiations. Some benefits of safety and quality are important even when the market demand is not sufficiently high to command them.

The approach taken by various nations to setting minimum quality standards and enforcing them can become a contentious matter in negotiations. The way governments intervene to correct apparent market failures caused by the public goods nature of food quality and safety (and information about them) depends upon the relative weights given to government costs, consumers' health, and producers' income in a society's overall welfare function. As various studies of the political economy of trade negotiations have shown, harmonized standards (or ways to enforce standards) do not necessarily lead to freer trade. Moreover, the gains from trade partly depend on how special interest groups are represented in a society's utility function (Roe and Graham-Tomasi, 1990).

Health and Safety Protection Policies

Governments respond to consumer/citizen demands for protection from harmful products in three fundamental ways: (1) laissez-faire, or free market competition, (2) legally binding grades and standards, enforced by government inspectors or by consumers through civil or criminal suit, and (3) "soft law," which sets legal standards but depends on the cooperation of economic agents for enforcement. An international example of the third is the Codex Alimentarius established by the United Nations. It provides a set of minimum safety standards for traded goods which serve as voluntary guidelines.

Legally binding standards are enforced via regulatory law where producers are held liable for unsafe products by government agencies or by property rules whereby consumers seek redress through the courts. Protection through government agencies usually is designed to prevent accidents from happening by preventing harmful products from reaching the market. The attitude of Japanese consumer protection agencies, for example, is to prevent accidents before they occur by eliminating risks from consumer products (Vogel, 1990). That particular consumer protection philosophy dictates very strict product standards, and it substitutes for elaborate redress systems often followed by Western civil courts and consumer complaint bureaus. Prevention and redress represent fundamentally different approaches to consumer protection, illustrating why harmonization of methods of providing safety will not happen readily.

There are four basic methods to develop and implement international food standards (Gerard, 1987; Deville, 1978; Patterson, 1990): (1) nations agree on a particular standard of identity for a specific product which is then enforced at the national level, (2) an institutional structure is established to develop standards that can be submitted to participating nations for their approval and/or compliance, (3) existing international governmental agencies such as FAO or OECD develop technological standards as with the Codex Alimentarius, and submit them for individual country approval, and (4) nations recognize each other's consumer protection methods as providing equivalent standards.

The first has proven largely unworkable. The second might evolve through a history of case law developed by international courts. This method is being used in bilateral negotiations with limited success. The third is in place and has been used in EC harmonization, but it has been widely criticized for its inferior quality standards. The fourth method has been pursued with some vigor in recent trade negotiations. For example, in the United States, most safety standards are based on inspection and certification of production or processing methods. This method is seen as a more efficient way of ensuring quality products than either the European or Japanese method of inspecting final product characteristics.

The United States has proposed that trading partners agree to honor each others' phytosanitary standards as long as they provide an "equivalent" level of safety. U.S. trade negotiators have argued, for example, that the inspection and certification of meat and poultry processing plants in the United States should be accepted as providing a level of safety which is "equivalent" to specific tolerances of microbial contamination set in other countries. Agreeing to accept each other's safety standards and/or opening up each other's processing plants to foreign inspectors for certification would go a long way toward harmonizing the various methods of ensuring food safety.

Two of the three major goals for the GATT Committee on Trade and Agriculture during the Uruguay negotiations were to (1) harmonize health and safety regulations and (2) base processes and production methods on equivalent standards (Bredahl and Forsythe, 1988). However, the question of ensuring equivalence remains contentious as the meat quality disputes between the United States and both Canada and the EC illustrate.

Since harmonizing around specific levels of quality attributes and around the methods of ensuring safety seems difficult, perhaps nations could talk about appropriate regulations and enforcement mechanisms (both domestic and international) based on the degree to which food quality attributes, or their diminution, would increase the public welfare.

Food Quality Attributes and Quality Regulation

Food quality attributes can be placed along a continuum that encompasses attributes related to nutrition, safety, health, longevity, and even aesthetics. This continuum goes from the most negative, potentially lethal attributes to the most positive and desirable ones. It provides a way to identify other parallel continuums of various regulatory concerns with collective public and private goods and NTB's (fig. 6). Moving from left to right, from negative quality attributes to increasingly positive ones, the public goods nature of these attributes changes and tends to diminish. That is, the attributes move from being nonexclusive and nonrival collective goods (bads) to exclusive and rival private goods. Eliminating or decreasing the negative characteristics at the left end can be considered a public good. Few countries could object to regulations that reduce the risks of death and long-term illness. Such regulation secures individual expectations about the protection of his/her person from physical attack, invasion, and nuisance (Randall, 1983). The benefits to public regulation of such negative attributes are especially high because many of these attributes cannot be made transparent or exclusive at a reasonable cost. In addition, regulations that preserve or improve the health and longevity of the population, if consistently administered, can hardly be seen as an unfair NTB. Secure property rights provide only a sounder basis for conflict-resolving trade (Randall, 1983).

At the far right side of figure 6, the quality attributes can be classified as (almost) pure private goods. They are typically "transparent" to consumers. They can be known and identified through sensory perception, conventional wisdom, or voluntary or mandatory information labeling. The costs of making these attributes exclusive are relatively low. Therefore, as Randall (1983) argues, any "externality" that may be present will not persist. The private market will determine the efficient quantity exchanged.

These exclusive and rival attributes require little government regulation in the form of inspection, but some agency must still be accountable for the truth of the information on the labels and in the advertising. These attributes need not become trade barriers except that discriminatory affluent consumers will demand this superior quality. If they cannot discern the quality readily, they will also demand government certification of the quality. (A^* in figure 5 drifts to the right.) With adequate or symmetrical information, however, the laissez-faire approach should work well to control the domestic and international markets for these attributes.

Any country restricting imports on the basis of these positive and transparent attributes could quite easily be seen as invoking a deliberate NTB. Some examples from the EC can be mentioned. In 1976, Germany tried to ban the import of Cassis de Diyon from France because it had less than the minimum amount of alcohol (25 percent) for fruit liquors sold in Germany (Venables, 1986; Fallows, 1988). In 1980, the Dutch tried to ban French brioche for not having the right shape and, therefore, likely to mislead consumers. Belgium, similarly, tried to ban the import of margarine not displaying a cubic shape. All these cases were heard and settled in the European Court. A minimum of labeling would clearly make these attributes transparent and consumers' demand could determine the efficient amount purchased in the private market.

The quality attributes in the middle of the continuum are not always transparent and are often nonexclusive and nonrival. These conditions cannot be corrected at reasonable costs with current technology. Products with these attributes will cause the most activity in NTB negotiations, especially negotiations about acceptable levels of risk and how to regulate those risks. Debates about zero tolerance versus de minimus standards versus cost/benefit analysis are underway in the United States and will be magnified at the international level. Imprecision in scientific measurement and uncertainty about the outcome from exposure to newly discovered risks further complicate these debates and decisions. The outcome from exposure to allegedly hazardous substances is different in various climates and depends on the rest of the diet as well. For example, because sulfur dioxide is used to preserve wines in France, and French people drink a lot of wine, it seems reasonable to restrict the use of sulfur dioxide in other foods because cumulative effects could be harmful. In countries where little wine is consumed, this action may not be important (Fallows, 1988).

Figure 6

Continuum of food attributes

				Convenient, tasty, conveys status
			Extends life, expands vigor	
		Improves health		
+	Improves nutrition Sustains health			
–	Risk of cancer or early death			
	Short-term illness			
Lethal	Illness or long-term disability			

Public goods nature - Examples

Negative: Public goods (not transparent) (nonexclusive and nonrival)	Semipublic goods: Effects uncertain (semi-transparent) (nonexclusive and/or nonrival)	Private goods: (transparent) (exclusive and rival)
Bacterial pathogens	Pesticide residues	Ingredients, prices,
poisons, toxins, carcinogens	fats, cholesterol hormones, additives, antibiotics	taste, color, origin, calories, size, shape

Nontariff trade barriers

NTB's uncommon Wide agreement on regulations	NTB controversial Inadvertent trade barriers increasing	Trade barriers inadvertent or blatantly discriminatory

Food quality attributes in the center of the continuum include nutritional characteristics such as saturated fat, cholesterol, carotene, and other nutrients claimed to have especially helpful or harmful effects on health. The extent to which changes in people's consumption of food attributes are public or private goods depends heavily on the amount of information available and the cost of exclusion, and on consumers' and governments' preferences for longrun risk aversion.

The most appropriate government regulations for these particular attributes depend on how much the social benefits of restrictions exceed the private benefits of freer and wider choice. We know from public goods theory that those goods (attributes) that carry large negative benefits (externalities) will be overprovided unless taxed or restricted in some way. With the wide range of opinions about the seriousness of the negative externalities in the middle of the continuum, harmonization of these attributes will probably not be widespread. Rather, a more segregated market, similar to the one depicted in figure 5, will likely result. Accusations among nations concerning deliberate NTB's will be most abundant over these attributes. The 1989 EC ban on hormone-treated meat is a good example. The recent coalition of U.S. soybean producers and U.S. consumers against tropical oils could be seen as a private market-induced NTB. Restrictions of imported foods based on detectable pesticide residues could also move into the private goods range with adequate information and effective demand for pesticide-free produce.

Along the continuum, attributes generally become more transparent, more positive, and more likely to be a private (exclusive) good. As the costs of exclusion and information decrease, chances increase that the private benefits of free choice will exceed the social benefits of restriction. The need for restrictive regulation diminishes, but it is replaced with the need for truth in labeling and some public oversight to ensure its credibility. The more transparent the attributes, the more efficiently the private markets for them will operate. Likewise, the more transparent and credible government quality regulations are for domestic sellers, the more obvious it will be when quality-related trade barriers are intentionally discriminatory.

Conclusion

Increasing incomes in developed countries will continue to expand the market demand for high-quality, safe foods. This phenomenon alone will tend to segment world trade and create inadvertent trade barriers. It will be accompanied by some increases in restrictive regulations demanded by money-rich, time-poor consumers. These market-induced developments should not be confused with deliberate, discriminatory NTB's that are created primarily to protect the interests of domestic producers and may or may not improve the quality of generally available food.

Such discriminatory NTB's, based on quality or product attributes, may raise the monetary returns to domestic producers by restraining imports. But if they do not also increase the quality of the generally available food supply (especially in terms of the attributes at the left end of the figure 6 continuum), then too many negative attributes will probably continue to be provided and marginal social costs will exceed marginal social benefits despite government regulation.

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Chapter 5

Effects of Domestic Environmental Policy on Patterns of International Trade

James A. Tobey*

Introduction

The potential for domestic environmental regulations to produce trade distortions has a strong element of a priori plausibility. Proposed environmental regulations are, in fact, often opposed vigorously on the grounds that they will impair the international competitiveness of domestic industries. This chapter provides an ex post assessment of the effect of environmental regulation on patterns of international trade using the well-known Heckscher-Ohlin-Vanek (HOV) model of international trade. Several empirical tests are undertaken, but no systematic evidence of deviations in world trade patterns is detected. The primary reason seems to be that the costs of pollution control have not loomed very large, even in heavily polluting industries. However, because the incremental costs of pollution abatement increase at an increasing rate, the prospects for more significant trade effects following the introduction of more stringent pollution controls cannot be ruled out.

The trade effect of environmental controls is one of several macroeconomic effects on the domestic and international economy that

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have been discussed in the United States and other industrialized countries since the late 1960's when many important pollution control programs were introduced. Other issues of concern include reductions in domestic productivity and increases in inflation.

A careful review of the literature indicates that these effects have been relatively modest. Although many researchers initially pointed toward the introduction of environmental regulations as the primary cause of the slowdown in U.S. productivity in the 1970's, studies show that they accounted for only about 8 to 30 percent of the slowdown (Denison, 1979; Crandall, 1981; Christainsen and Haveman, 1981). There is also little evidence that environmental regulations have had a large effect on inflation. Leontief and Ford (1972) and Pasurka (1984) find that environmental protection costs have had only small effects on prices. As Pasurka (1984, p. 389) observes, "it is unlikely that a significant amount of the inflation experienced by the United States in recent years was caused by the costs of meeting environmental regulations."

A survey of the literature similarly shows little reason for concern over the distorting effect of environmental regulations on trade. The adoption of costly environmental control measures will alter the international structure of relative costs with potential effects on patterns of specialization and world trade. These trade effects have been explored in some detail, making use of standard models of international trade (Asako, 1979; McGuire, 1982; Pethig, 1976). Environmental control costs encourage reduced specialization in the production of polluting outputs in countries with stringent environmental regulations. In contrast, countries that fail to undertake an environmental protection program should increase their comparative advantage in the production of items that damage the environment.

Some studies have made use of existing macroeconometric models to assess the likely magnitude of the trade effects of environmental controls (D'Arge, 1974; Robison, 1986; OECD, 1985). These studies use estimates of the costs of pollution control programs on an industry basis to get some sense of the effects of these programs on trade and payment flows. They generally find small, but measurable, effects.

Other studies, relying on ex post evaluations of the historical evidence, have not been able to confirm the predicted trade effects of environmental policy. One methodology for addressing this issue involves the study of trade and foreign-investment flows for several key industries

and countries. These "location of industry" studies (Leonard, 1988; Pearson, 1987; Walter, 1985) have found little evidence that pollution-control measures have exerted a systematic effect on international trade and investment. Leonard (1988) observes that the differentials in the costs of complying with environmental regulations in industrialized and industrializing countries have not been sufficiently large to offset larger political and economic forces in shaping international comparative advantage.

Identification of Pollution-Intensive Commodities

A commodity's relative pollution intensity can be defined by the pollution-abatement costs incurred in its production. The direct pollution abatement costs are reported by the U.S. Department of Commerce (1975) and the Environmental Protection Agency (1984). In addition to the direct pollution abatement costs, we also need to consider the abatement costs embodied in intermediate goods purchases, which are the indirect pollution abatement costs. By multiplying direct pollution abatement costs by the total expenditures I-O (input-output) table, others have generated an estimate of total (direct and indirect) pollution abatement costs per dollar of industrial output.

Commodities termed pollution-intensive are defined as the products of those industries whose abatement costs in the United States are equal to or greater than 1.85 percent of total costs. The cutoff of 1.85 percent results in a set of industries that are generally considered the most polluting (metals, chemicals, and paper industries) throughout the world.[1] There is also a considerable difference between the pollution-abatement costs in these industries and in those of the remaining group of industries.

In table 1, the input-output industries defined as pollution-intensive are matched to commodities according to three-digit Standard International Trade Classification (SITC) codes and aggregated into five commodity groups, including paper and pulp products (paper), mining of ores (mining), primary iron and steel (steel), primary nonferrous metals (nfmetals), and chemicals (chems).

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[1] This cutoff does not include the petroleum industry. Petroleum is excluded because the dynamics of this industry during early to mid-1970's were heavily influenced by extraordinary circumstances affecting the availability and processing of crude oil.

Table 1--Pollution-intensive input-output industries' pollution abatement costs as percentage of total costs

I-O industry	SITC	Description	Direct and indirect pollution abatement costs as percentage of total costs
Mining:			*Percent*
5	281	Iron ore, concentrates	2.03
6	283	Ores of nonferrous base metals	1.92
Primary nonferrous metals:			
38	681	Silver, platinum	2.05
38	682	Copper	2.05
38	683	Nickel	2.05
38	685	Lead	2.05
38	686	Zinc	2.05
38	687	Tin	2.05
38	689	Nonferrous base metals, n.e.s.	2.05
Paper and pulp:			
24	251	Pulp and waste paper	2.40
24	641	Paper and paperboard	2.40
24	642	Articles of paper	2.40
Primary iron and steel:			
37	671	Pig iron	2.38
37	672	Ingots	2.38
37	673	Iron and steel bars	2.38
37	674	Universals, plates	2.38
37	675	Hoops and strips	2.38
37	676	Railway material	2.38
37	677	Iron and steel wire	2.38
37	678	Tubes and fittings	2.38
37	679	Iron, steel castings	2.38
Chemicals:			
27	513	Inorganic elements	2.89
27	514	Other inorganic chemicals	2.89
28	581	Plastic materials	2.36

n.e.s. = Not elsewhere specified.
Source: Kalt (1985).

The Heckscher-Ohlin-Vanek Equations

The HOV equations are a multifactor, multicommodity extension of the Heckscher-Ohlin model of international trade. They have been used in three different ways. The factor content studies and cross-commodity regressions use measures of factor intensities and trade to infer factor endowments. The third methodology and the approach taken in this study regresses trade in a specific commodity across countries on country resource endowments. In that resource endowments are the explanatory variables, such regressions reveal the direct influence of resources on trade in a specific commodity. Because this study seeks to reveal information on the most pollution-intensive commodities across countries, the cross-country analysis is chosen as the most appropriate approach.

A set of 11 resource endowments for the year 1975 is used to explain net exports of the most polluting industries under the HOV model. These endowments are provided by Leamer (1984) and include the following:

1. CAPITAL (CAP). Accumulated and discounted gross domestic investment flows since 1948, assuming an average life of 15 years.

2. LABOR 1 (LAB1). Number of workers classified as professional or technical.

3. LABOR 2 (LAB2). Number of literate nonprofessional workers.

4. LABOR 3 (LAB3). Number of illiterate workers.

5. LAND 1 (LND1). Land area in tropical rainy climate zone.

6. LAND 2 (LND2). Land area in dry climate zone.

7. LAND 3 (LND3). Land are in humid mesothermal climate zone.

8. LAND 4 (LND4). Land area in humid microthermal climate.

9. COAL (COAL). Value of production of primary solid fuels (coal, lignite, and brown coal).

10. MINERALS (MINLS). Value of production of minerals: bauxite, copper, fluorspar, iron ore, lead, manganese, nickel, potash, pyrite, salt, tin, and zinc.

11. OIL (OIL). Value of oil and gas production.

With the endowments from Leamer, the HOV model can be summarized by the following equations:

$$N_{it} = CST_{i0} + b_{i1}V_{1t} + b_{i2}V_{2t} + \ldots + b_{i11}V_{11t} + \mu_{it} \qquad (1)$$

where N_{it} are net exports of commodity i by country t, V_{kt} are endowments of resource k (k = 1...11) in country t, b_{ik} are the coefficients which indicate the total effect (production and consumption) of an increase in a resource on net trade of a specific commodity, μ_{it} is the disturbance term, and CST_{i0} is the equation's constant term. The constant term embodies one resource endowment or country characteristic which all countries are assumed to possess identically and which has a nonzero value.

If the environmental endowment, measured by the stringency of environmental regulation, has an effect on trade patterns, then the set of 11 endowments in equation (1) is incomplete.[2] In this case, estimation of the HOV trade equations implies a specification error involving an omitted variable. Several approaches are taken to test the effect of the environmental endowment on trade patterns under the HOV model when cross-country quantitative data on the environmental endowment are not available. In the first, a qualitative variable is included in equation (1) to represent the omitted variable. In the second, an omitted variable test is conducted. In the third, a fixed-effects test is undertaken.

[2] Although pollution emissions are a joint product of the production process, they can also be interpreted as an input, or endowment, in the production function because they can be viewed as one of the various uses of the environment. Because use of the environment is typically a public good, the environmental endowment has no price attached to it and will be used freely by industries until pollution control measures are introduced. Thus, a country's environmental endowment can be measured by its stringency of pollution control measures.

HOV Tests of Trade Effects
Introducing "Environmental Endowments" in the HOV Model

To test the pollution-haven hypothesis under the first approach, I estimated the following equation under ordinary least squares (OLS):

$$N_{it} = CST_{i0} + b_{i1}V_{1t} + b_{i2}V_{2t} + \ldots + b_{i11}V_{11t} + b_{iE}D_{Et} + \mu_{it} \qquad (2)$$

where D_{Et} is a qualitative variable measuring the stringency of pollution control measures in country t based on a 1976 survey by the United Nations Conference on Trade and Development (UNCTAD) (Walter and Ugelow, 1979).

The degree of environmental stringency is measured on a scale from 1 (tolerant) to 7 (strict); the mean score for developed countries is 6.1, while for developing countries it is 3.1. There are observations for 23 countries: 13 industrialized and 10 developing countries (table 2).

Table 2--Index of the degree of stringency of environmental policy (7 = strict, 1 = tolerant)

Industrialized countries	Index	Less developed countries	Index
1 Austria	4	1 Chile	4
2 Australia	5	2 Colombia	5
3 Benelux	3	3 Cyprus	1
4 Denmark	5	4 Israel	4
5 Finland	6	5 Liberia	1
6 Germany	5	6 Malta	1
7 Japan	7	7 Nigeria	2
8 New Zealand	5	8 Panama	4
9 Netherlands	5	9 Singapore	6
10 Norway	6	10 Spain	4
11 Sweden	7		
12 UK	4		
13 USA	7		

Source: Walter and Ugelow (1979).

The OLS regression results are presented in table 3 (absolute value of the t ratio is shown in parentheses beside the estimated regression coefficient). In no instance is the t ratio found to be statistically significant on the measure for the stringency of environmental policy in the five regressions of net exports of polluting industries.

Aside from the Walter and Ugelow index, no cross-country data or synthetic measures of the stringency of environmental policies are available. However, to extend the analysis to a larger group of countries, I estimated equation (2) using a dummy variable (equal to one for industrialized countries with enforced environmental regulations, and zero for developing countries without enforced environmental regulations) for a group of 58 countries: 17 industrialized and 41 developing. The dummy variable was not statistically significant in any of the five equations.

Omitted Variable Test

A second approach to testing the effect of pollution control measures on trade patterns investigates the bias in the regression residuals when the variable representing countries' environmental endowments are not included in the HOV equations.

Table 3--Equations **(D.F. = 10)**

Variable name	Mining (R^2=0.99)	Paper (R^2=0.96)	Chems (R^2=0.93)	Steel (R^2=0.89)	NFMetals (R^2=0.92)
CAP	-192 (2.4)	177 (1.6)	583 (5.6)	1,537 (2.6)	-89 (1.0)
LAB1	735 (1.9)	-267 (5)	981 (1.9)	-1,434 (5)	-550 (1.2)
LAB2	-111 (3.2)	-25 (5)	-154 (3.5)	54 (2)	44 (1.1)
LAB3	-15 (0.6)	50 (1.5)	-49 (1.6)	84 (5)	69 (2.5)
LND1	385 (1.5)	278 (8)	521 (1.6)	237 (1)	-254 (9)
LND2	-104 (7)	-192 (1.0)	-31 (2)	503 (5)	-247 (1.5)
LND3	1295 (2.8)	100 (2)	-268 (5)	-2,898 (9)	-414 (8)
LND4	435 (9)	6,089 (9.2)	-2,003 (3.2)	-1,374 (4)	-589 (1.1)
COAL	-78 (6)	-110 (6)	-283 (1.6)	-83 (1)	88 (6)
MINLS	338 (1.6)	330 (1.4)	88 (4)	26 (1)	715 (3.7)
OIL	-30 (1.6)	-110 (4.3)	-20 (8)	-142 (1.0)	17 (8)
D	-10,314 (3)	2,454 (1)	-1,531 (1)	98,844 (4)	48,658 (1.3)
CST	-5,669 (1)	-168,370 (1.0)	-107,110 (7)	-697,020 (8)	-122,980 (9)

Consider first a simple HOV equation with one known and one unknown independent variable. Let x_{t2} represent a factor endowment for country t. Under the null hypothesis that the environmental factor (x_{t3}) has no effect on the pattern of trade, the equation specifying net exports (N_t) may be written as:

$$N_t = \beta_1 + \beta_2 x_{t2} + \dot{\mu}_t \tag{3}$$

The alternative to the null hypothesis is represented by the following equation:

$$N_t = \beta_1 + \beta_2 x_{t2} + \beta_3 x_{t3} + \mu_t \tag{4}$$

If equation (3) is correct, the least squares estimators of β_1 and β_2 using equation (3) will be unbiased and efficient for all sample sizes. If equation (4) is correct, the estimation of equation (3) will still generate an unbiased estimator or β_2 given the following assumption:

A1: The omitted variable is not correlated with any of the included independent variables.

If we except assumption A1, estimation of equation (3) when the omitted variable (x_{t3}) does not equal zero will not affect β_2. Its presence will, however, be embodied in the constant and disturbance term. Solving for $\dot{\mu}_t$, the following equation can be derived:

$$\dot{\mu}_t = \beta_3(x_{t3} - \bar{X}_3) + \mu_t \tag{5}$$

Under the null hypothesis that x_{t3} has no effect on the pattern of trade so that $\beta_3 = 0$, $\dot{\mu}_t$ is a consistent estimator of μ_t. Under the alternative case where pollution control measures have an effect on the pattern of trade, so that $\beta_3 \neq 0$, then (given assumption A1) $\dot{\mu}_t$ provides a consistent estimate of equation (5).

A methodology to test the effect of pollution control measures on the pattern of trade may now be presented. Under the alternative hypothesis that equation (4) is correctly specified and assuming it also has all the properties of the classical regression model, then the sign of μ_t is expected to be random. Therefore, the expected sign of $\dot{\mu}_t$ in equation (5) is the same as that of $\beta_3(x_{t3} - \bar{X}_3)$. β_3 is expected to be negative if pollution control measures reduce net exports of pollution-intensive commodities.

To determine the sign of $(x_{t3} - \bar{X}_3)$, consider the distribution of the stringency of environmental regulations, x_{t3}, over the world. Industrialized, high-income countries have environmental endowments greater than the population mean $\bar{X}_3$, and less-developed countries have environmental endowments less than the population mean. Thus, the pattern of sign of $\bar{\mu}_t$ under the alternative hypothesis depends on the distribution of x_{t3} over countries. Because the distribution suggested above, the proportion of error terms that are positive for developing countries is expected to be significantly greater than the proportion of error terms that are positive for industrialized countries.

Let T_n represent the true proportion of errors for countries in group n (where n=1 corresponds to industrialized countries and n=2 corresponds to developing countries). The null hypothesis (H_0) states that the proportion of errors that are positive is the same for both industrialized and developing countries. The alternative hypothesis (H_1) states that the proportion of such errors is greater for developing countries than for industrialized countries.

$$H_0: T_2 = T_1$$
$$H_1: T_2 > T_1$$

A nonparametric statistical procedure was chosen to conduct the statistical test because it requires few assumptions regarding the distribution of the error terms. Under the null hypothesis, the test statistic may be given as (see Yamane, 1967):

$$A = \frac{R_2 - R_1}{[T \times (1-T)[(1/IxJ_2) + (1/IxJ_1)]]^{1/2}}$$

where $R_n = S_n/(IxJ_n)$ represents the proportion of estimated errors that are positive, "I" equals the total number of commodity groups (=5), J_n equals the total number of countries in country group n, and S_n equals the number of estimated error terms for countries in group n that are positive.

T is an estimate of the true proportion under the null hypothesis. The best estimate of the true population proportion is constructed by combining the observations for both industrialized and developing countries as follows:

$$T = (S_1 + S_2)/(Ix(J_1 + J_2))$$

To perform the omitted variable test, I arranged a set of 58 countries in three groups (table 4). Group one consists of industrialized, high-income countries. Environmental regulatory costs in this group are predicted to generate a comparative disadvantage in the production of polluting commodities. Group two is composed of upper-income developing countries and semi-industrialized nations without a stringent

Table 4--Country observations, 1975

Country (group 1)	GDP per capita[1]	Country (group 2)	GDP per capita[1]	Country (group 3)	GDP per capita[1]
	1975 *dollars*		1975 *dollars*		1975 *dollars*
Australia	5,919	Argentina	3,159	Afghanistan	380
Austria	4,994	Brazil	1,978	Burma	312
Benelux	5,569	Chile	1,834	Colombia	1,596
Canada	6,788	Costa Rica	1,835	Dominican Republic	1,443
Denmark	5,969	Cyprus	1,811	Ecuador	1,300
Finland	5,192	Greece	3,360	Egypt	929
France	5,864	Hong Kong	2,559	El Salvador	1,005
Germany	5,758	Ireland	3,067	Ghana	952
Iceland	5,201	Israel	4,154	Honduras	871
Japan	4,904	Italy	3,870	India	472
Netherlands	5,321	Malta	2,154	Indonesia	536
New Zealand	4,769	Mexico	2,276	Jamaica	1,763
Norway	5,419	Panama	2,026	Korea	1,530
Sweden	6,749	Peru	1,860	Liberia	830
Switzerland	6,082	Portugal	2,397	Libya	6,680
United Kingdom	4,601	Singapore	2,875	Malaysia	1,532
United States	7,132	Spain	4,032	Mauritius	1,260
Average	5,661	Turkey	1,738	Nigeria	1,179
		Yugoslavia	1,960[1]	Paraguay	1,186
		Average	2,567	Philippines	912
				Sri Lanka	661
				Thailand	930
				Average	1,002[2]

[1] 1977 GNP per capita, from World Bank, 1979 *World Development Report.*
[2] Excluding Libya.
Source: Heston and Summers (1984).

environmental program in 1975. Group three is composed of middle to low-income developing countries, also without stringent environmental programs.

A summary of the results when equation (1) is estimated using this set of 58 countries is shown in table 5. One cannot reject the null hypothesis that $T_2 = T_1$ in the comparison of industrialized countries with any combination of the developing country groups. These results reenforce the earlier finding that used a qualitative variable to represent the environmental endowment and which also found no effect of pollution control measures on HOV trade patterns.

Fixed Effects Empirical Test

A reasonable explanation for the empirical results above may be that the magnitude of environmental expenditures incurred by the industrialized countries in the late 1960's and early 1970's was not sufficiently large to cause a noticeable effect on trade patterns between countries with and without environmental protection programs. The cross-section HOV model may not be sufficiently precise to identify these small changes in factor abundances and comparative advantage. Thus, the effect of domestic environmental policy on trade may be getting lost in the "noise." By examining the change in trade patterns before and after the introduction of environmental measures in the industrialized countries,

Table 5--Positive residuals

Country group	Paper	Steel	Chems	NFMetals	Mining	[1]S_n	[2]J_n	[3]R_n	[4]A
1	7	9	5	8	11	40	17	0.47	--
2	5	10	9	5	6	35	19	.37	-1.32
3	10	18	15	5	11	59	22	.54	.96
2 + 3	15	28	24	10	17	94	41	.45	-.15

--=Not applicable

[1]S_n is the number of errors for group n that are positive.

[2]J_n is the number of countries in group n.

[3]$R_n = S_n/(IxJ_n)$.

[4]"A" is the test statistic comparing group 1 countries against groups of developing countries. An absolute value of 1.65 for the test statistic in the normal distribution corresponds to a probability of 95 percent.

one might be able to detect the hypothesized shifts in trade patterns in response to environmental policies that do not show up in the equations using data from a specific point in time. Such a methodology would also be effective in capturing the effect of environmental policy even if there was a significant lag in the impact of pollution controls on international competitiveness.

Although endowment data are available only for 1975, most resource endowments change little over time. At least for the most polluting industries, one might argue that the most important endowment change during 1970-84 was the increase in environmental regulations. Consider then a HOV model where the change in net exports over 1970-84 is linearly related to the change in factor endowments over the same period. Under a "fixed-effects" specification, assume that, except for the environmental endowment, the change in factor endowments equals zero. In this case, one is left with the following equation:

$$\Delta N_{it} = E_t + \mu_{it} \qquad (6)$$

where ΔN_{it} are 1984 minus 1970 net exports of commodity i by country t. E_t is the Walter and Ugelow (1979) measure of the degree of the stringency of environmental policy in 23 countries in 1977. Because these countries generally did not have enforced environmental programs in place by 1970, the level of environmental policy given by this index is a reasonable proxy for the change in environmental policy. Finally, μ_{it} are the random error terms.

Results of the OLS estimation of this model are shown in table 6. If environmental policies reduce countries' international comparative advantage in the most pollution-intensive commodities, then the sign on the environmental endowment coefficient should be negative and significant. Only in the chemicals group does the significance of the coefficient approach a conventionally accepted level of confidence. The

Table 6--Equations (D.F. = 22)

Variable name	Mining (R^2=0.03)	Paper (R^2=0.0+)	Chems (R^2=0.05)	Steel R^2=0.0+)	NFMetals (R^2=0.04)
E	-54155 (1.1)	-2298 (0.1)	78007 (1.9)	49437 (0.4)	-65593 (1.1)

sign, however, is positive, and once again does not support the hypothesized effect of pollution control measures on trade patterns.

Alternative Structural Forms

Another possibility for the above results may be that the commodity groups studied flagrantly violate the assumptions of the HOV model. For example, the HOV model assumes identical homothetic tastes, meaning that individuals facing identical commodity prices will consume commodities in the same proportions. In this cross-section study, with countries at widely different levels of development, this assumption may not be reasonable. To allow for nonhomothetic preferences, consumption across countries is assumed to be a linear function of population and national income. In this case, per capita net exports (n_{it}) become a linear function of per capita resource endowments (v_{kt}) as given by the following equation:

$$n_{it} = b^{*}_{i0} + \left(\sum_{k=1}^{K} b_{ik} v_{kt}\right) \qquad (7)$$

where $b^{*}_{i0} = -c_{i0}$, and c_{i0} is a parameter that relates consumption of commodity i in country t to country t's population. As before, b_{ik} indicates the total effect of an increase in a resource on net trade of a specific commodity.

The second relaxation of HOV assumptions allows for scale economies in the production process. All of the pollution-intensive commodity groups are associated with relatively large-scale production processes. In particular, Hufbauer (1970) has found that the production of paper products is subject to large economics of scale and the production of nonferrous metals subject to diseconomies of scale. To allow for scale economies, I use a model that Murrell (1990) derives and that follows Krugman and Helpman (1986) closely. I assumed that each good can be produced in an infinite number of varieties and each variety exhibits economies of scale, at least at low levels of output. In this case, the exports of good i by country t, x_{it}, are specified as follows:

$$x_{it} = \sum_{k=1}^{K} b^{*}_{ik} v_{kt} (1 - G_t/G_W) \qquad (8)$$

where G_t is the national income of country t and G_W is total world income. Equation (8) cannot be derived from the Heckscher-Ohlin theory, and the asterisks on the coefficients of the equation are a reminder that these coefficients are not equivalent to b_{ik} in the previous HOV models.

The HOV model was tested under these two alternative specifications. Again, the tests did not support the hypothesis under review.

The HOV model also assumes that commodities move internationally at zero cost of transportation, and that there are no other impediments to trade. However, transportation costs and tariffs are important elements in these industries and may significantly affect an individual country's composition of trade. This finding would not present a problem for the tests undertaken above if these trade impediments are not distributed across countries in the same pattern as environmental controls. In the absence of empirical evidence (trade impediments are very difficult to measure for large sets of countries), there is no reason to believe that their distribution would be closely correlated with the stringency of countries' environmental controls.

Interpretation of the Empirical Results

The empirical results that I found support other similar efforts which find that environmental management has had relatively little effect on productivity, inflation, and trade. From an environmental perspective, this finding is comforting, for it means that there is little force to the argument that we need to relax environmental policies to preserve international competitiveness. The primary reason seems to be that the costs of pollution control have not, in fact, loomed very large even in heavily polluting industries. Existing estimates suggest that control costs have run on the order of only 1 to 2-1/2 percent of total costs in most pollution-intensive industries (Kalt, 1985). The HOV model is probably not sufficiently precise to capture these small increments to costs; their effect on international trade is likely to be swamped by the much larger effects of changing differentials in labor costs and swings in exchange rates, for example. Moreover, nearly all the industrialized countries have introduced environmental measures--and at roughly the same time--so that such measures have not been the source of significant cost differentials among major competitors (Kopp and others, 1990). Nor has

there been a discernible movement in investment in these industries to the developing countries because major political and economic uncertainties have tended to play much greater roles in location decisions than have the modest savings from less stringent environmental controls (Leonard, 1988).

The Potential for Effects

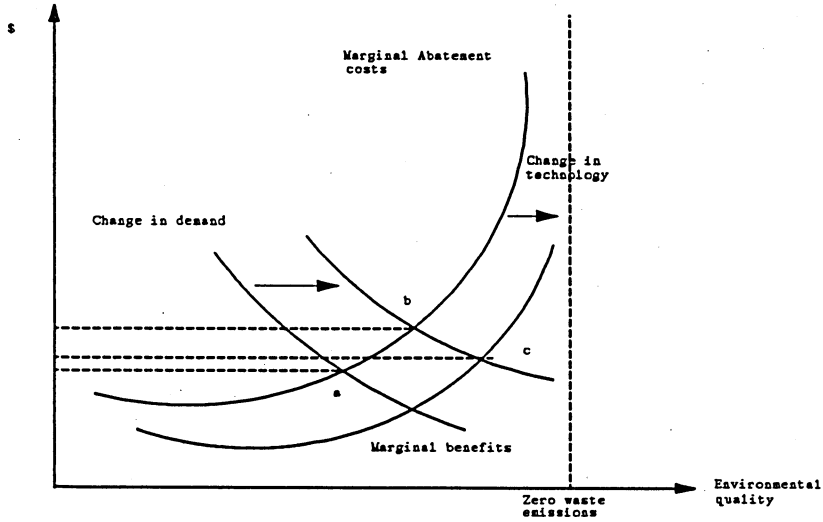
The incremental costs of pollution abatement have been relatively small in the past, but what about the future? The marginal costs of pollution abatement increase slowly at first, but increasingly greater levels of environmental quality can be achieved only at increasingly greater costs. The small effects so far on productivity, inflation, and trade seem to suggest that, for the present, we find ourselves on the relatively flat portion of the marginal abatement cost curve where additional increments in environmental quality are achieved at little extra cost. However, there is some evidence that there are fewer opportunities for inexpensive increments to the level of environmental quality than there have been in the past.

Oates and others (1989) have estimated marginal abatement cost curves for controlling a common air pollutant (total suspended particulates) in Baltimore under the command and control approach and an incentive-based case. In both cases, the marginal abatement cost curves are fairly flat over a low range of environmental quality levels, but eventually begin to rise steeply as emissions are increasingly reduced to achieve greater levels of environmental quality. Further, the intersection of marginal benefits and marginal costs of pollution abatement is located at the base of the steep portion of the marginal cost curve, implying that further shifts in the demand for environmental quality would entail large increases in control costs. One could speculate that more stringent environmental legislation (such as the recent revision of the Clean Air Act) might push industry to a new point on the marginal cost curve that would require significantly greater emissions control costs on the margin. This outcome is represented by the movement from point "a" to point "b" in figure 1.[3]

[3] It has been estimated that the recent amendments to the Clean Air Act will increase clean air spending by about $30 to $35 billion a year by the year 2005. Annual environmental compliance expenditures are now on the order of $90 billion a year.

Figure 1

Increase in demand for environmental quality with technological change in pollution abatement



One might also speculate that in the same way that the "limits to growth" arguments of the 1970's were flawed, so are predictions of economic catastrophe following the introduction of tougher environmental legislation. The limits to growth literature predicted a collapse of the world system based on the following implicit assumptions: an iron law of resource use in which industrial production uses up resources in a fixed manner, no technical progress, and no substitution of inputs in production (Forrester and Meadows 1972). Because of these unrealistic assumptions, the gloomy limits to growth modeling exercises were never taken seriously by economists.

I also believe that the possibilities for alternative production techniques, input substitutions, and technological change must be taken into consideration when we assess future effects of environmental management. These economic responses could allow a movement from point "b" to point "c" in figure 1. There is, in fact, evidence that considerable changes in the techniques of production took place as a result of the early clean air legislation. Environmental legislation induced

a spurt of investment in pollution abatement equipment and plant modifications in the early and mid-1970's (table 7). Particularly in the pulp and paper industry, major plant modifications were introduced that led to significantly less polluting production practices. Following these modifications, pollution abatement capital costs fell dramatically. These same adaptations and technological advancements will probably continue to be important considerations in determining the location and shape of industries' marginal abatement cost curves, and the effect of environmental policy on the macroeconomy.

Table 7--Pollution-abatement expenditures as a percentage of total new plant and capital expenditures

Industry	1973	1975	1977	1979	1981	1983
				Percent		
Mineral processing	14.7	14.2	12.1	10.0	17.5	6.3
Chemicals	10.1	10.7	11.2	6.3	6.0	4.7
Pulp and paper	15.6	16.0	10.6	8.2	7.4	6.3
All manufacturing	4.5	8.7	6.4	5.0	4.2	3.7

Source: *Survey of Current Business* (Feb. 1986) "Plant and Equipment Expenditures by Business for Pollution Abatement," 66(2): 39-45.

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Chapter 6

The Conflict Between Trade Policy and Environmental Policy in Agriculture

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Robert Saint-Louis**
Guy Debailleul**

Introduction

The agricultural sector is increasingly regarded as one of the most visible contributors to nonpoint source pollution. Concerns about environmental degradation have contributed to a growing consensus that environmental pollution caused by agriculture must be monitored and controlled. Environmental policies affect trade flows, and trade policy will likely affect the environment. This explains the recent interest in the "greening" of agricultural trade (Anderson and Blackhurst, 1992).

Although agricultural policy in a few affluent countries has responded to environmental concerns, most countries have failed to integrate agricultural and environmental policy. This predicament may partially be explained by conflicting policy goals. For example, achieving self-sufficiency through increased domestic production, independent of associated environmental damage, may be a preeminent policy goal for many developing countries. A country exporting an agricultural product may, similarly, hesitate to impose production or input use restrictions because such moves can erode its competitive position in export markets.

This chapter analyzes some consequences of agricultural trade policy when agricultural production or "bad" input use adversely affects the

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environment. A negative externality may occur in either the domestic production sector or in the foreign production sector. Policies seeking to promote exports or to restrict imports can have deleterious environmental effects if they stimulate production of damage-causing outputs or use of damage-causing inputs. This situation generates a conflict between trade and environmental policy goals in agriculture.

Input- and Output-Related Externalities in Agriculture

The hypothesis that agricultural production practices cause environmental damage is well documented (National Research Council, 1989; CAEFMS, 1990). For trade policy analysis, a distinction between output-related and input-related externalities is important (Bhagwati and Srinivasan, 1983). Environmental damage caused by input use implies an input-related externality. In a parallel fashion, when environmental damage depends on output, but cannot be traced to use of a specific input, it is an output-related externality.

From an economic standpoint, a negative production externality, be it output- or input-related, drives a wedge between private and social costs. For an input-related externality, this divergence results in overutilization of the polluting input. An output-related externality similarly causes overproduction.

Examples of input-related externalities in agriculture are abundant. Rachel Carson's early work, *Silent Spring* (1962), drew attention to damage caused by pesticide use. Since that time, this literature has grown exponentially, fueled mainly by a realization that the pesticide pollution problem is even greater than previously believed. Pesticides and fertilizers also contaminate surface and ground water sources (Canter, 1986; Nielsen and Lee, 1987).

Livestock production is an example of an output-related externality in agriculture. Production of livestock wastes causes eutrophication of water sources, fish kills, nitrate contamination of soil and ground water, and breeding of insect pests. Because externality can be reduced by regulating livestock production, it is an output-related externality.

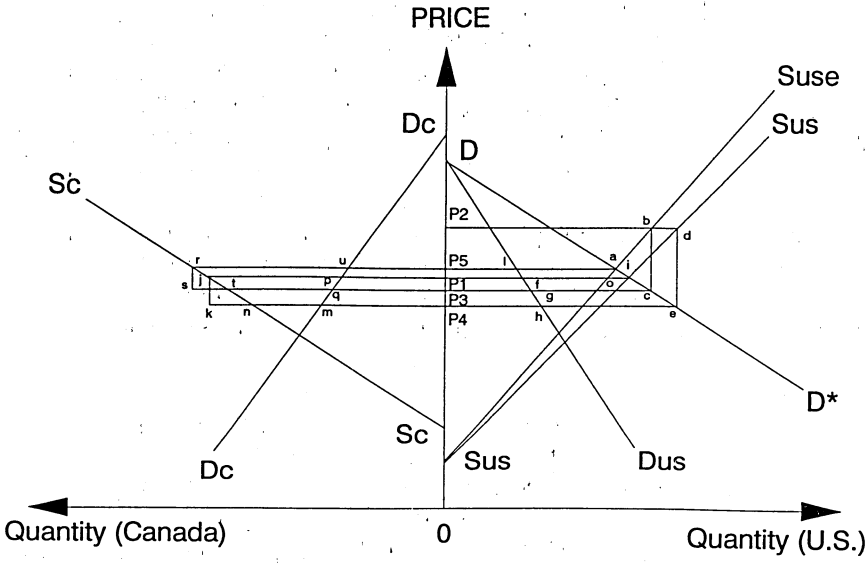
The broader consequences of production externalities in an open economy were recently analyzed (Kurtilla, 1991; Markusen and

Schweinberger, 1990). The model considered below uses a partial equilibrium framework to illustrate potential conflicts between the goals of trade and environmental policy in agriculture. First, the environmental cost of an unlimited production subsidy is evaluated. This case was previously adopted by other researchers (USDA, 1986; Schmitz and others, 1988).

The Environmental Cost of a U.S. Deficiency Payments Program

Consider a large country (say, the United States), and a price-taking competitor (say, Canada). In figure 1, DDus is the domestic U.S. demand curve and DD* is the total demand curve, including domestic demand. SusSus and SusSuse are respectively the private and social marginal cost curves. The vertical distance between these curves measures the environmental cost for that production unit. Similarly, DcDc is the domestic demand curve in Canada; ScSc and ScSce are the Canadian private and social marginal cost curves.

Figure 1 - Deficiency payments and trade: large country case.



When social costs are ignored, world price is P1. Suppose that a deficiency payments program is introduced by setting the target price P2 above the world price. This program causes a net loss of fhedi comprised of a deadweight loss edi and a net transfer to importers equal to region fhei. The latter arises because the program depresses world prices from P1 to P4 allowing importers to purchase greater quantities at lower prices. In addition, an environmental loss is generated in the United States due to increased production.

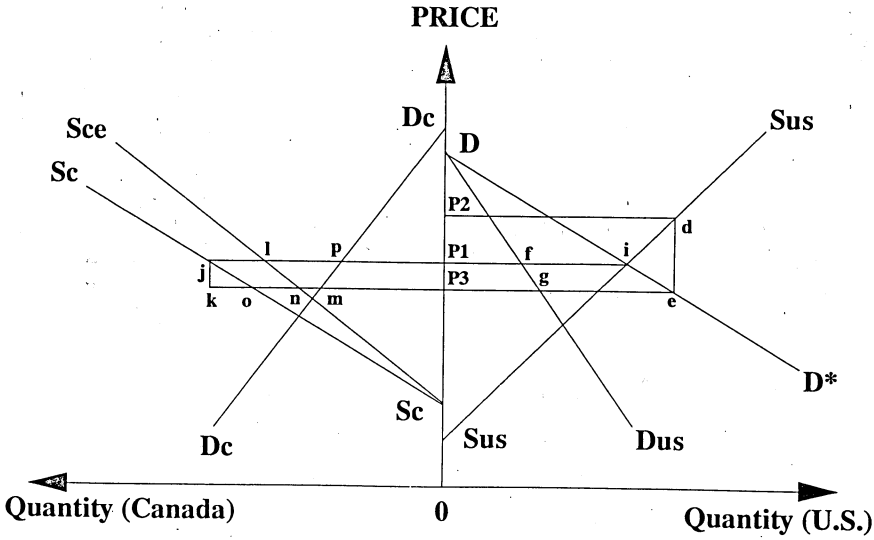
For the competing exporter (Canada), this program increases consumers' surplus by pmP4P1 and reduces producers' surplus by jnP4P1. If Canada chooses to support producer income by introducing a deficiency payments program, the deadweight loss of such a program will be jkn. Suppose that the United States uses SusSuse to determine prices instead of pricing with the marginal private cost curve. In this case, the net loss in the United States due to a deficiency payments program is lgcba. Both the deadweight loss (acb) and the net transfer to importers (lgca) are smaller. Canadian exports are reduced from ru to tp and the deadweight loss due to a Canadian deficiency payments program is rst.

This analysis suggests that, when private and social costs diverge in the U.S. production sector, there is an additional environmental cost of a deficiency payments program. Now suppose that the environmental externality is in the production sector of the competing exporter (fig. 2).

As before, the target price is P2 so that the effective government subsidy is P2P3 per unit. U.S. exports increase from if to eg, domestic production rises from iP1 to dP2, and domestic consumption increases from fP1 to gP3. The net loss in the United States includes two components, fgei which is the transfer to foreign consumers in the form of a price reduction, and eid which is the deadweight loss.

The U.S. subsidy displaces the Canadian domestic demand curve from Dcpj to Dcmk. The price reduction causes a loss to producers (joP3P1) and a gain to consumers (pmP3P1) in Canada. The net loss is jpmo when social costs are excluded from consideration. A U.S. deficiency payments program, by reducing Canadian production from jP1 to oP3, reduces the net environmental loss by depressing Canadian production. If Canada compensates farmers and restores price P1 with a Canadian deficiency payments program, then the net loss will also include an environmental

Figure 2 - Deficiency payments and trade: small country case.



cost component. Even when the deadweight loss component is small due to inelastic Canadian supply response (Schmitz and others, 1988), a Canadian deficiency payments program will have an environmental cost.

These analyses, together, suggest that an unlimited U.S. production subsidy has an additional environmental cost when the externality occurs in the U.S. production sector. This subsidy reduces the environmental cost of a price-taking competing exporter when the production sector of the competing exporter has the externality.

The Environmental Cost of an Import Restriction

The previous analysis assumed that the large price-setting exporter set world price while the competing exporter was a price-taker. Within this framework, any policy reducing world price (such as an unlimited production subsidy) benefits an importing country when negative externalities are present in its production sector. Such a policy reduces production in the importing country. The graphical analysis of a price-taking importer qualitatively mimics the case of a price-taking competing exporter and, for this reason, is not repeated here.

Instead, consider an importer possessing sufficient market power to set world price. An importer may use this power to restrict trade to protect the domestic agricultural sector or to generate tariff revenues. In figure 3, a large importer imposes a tariff. This policy may improve the importer's welfare when the additional tariff revenue exceeds the deadweight loss due to this tariff. There is much literature on circumstances under which an importing country can benefit from a tariff (for example, Brander and Spencer, 1981).

DD is the excess demand curve for imports, and EE is the excess supply curve for exports when exporting countries ignore social costs. Price is set at P1 where import demand is equated with export supply. Since the

Figure 3 - Tariffs and trade with exporter externalitites

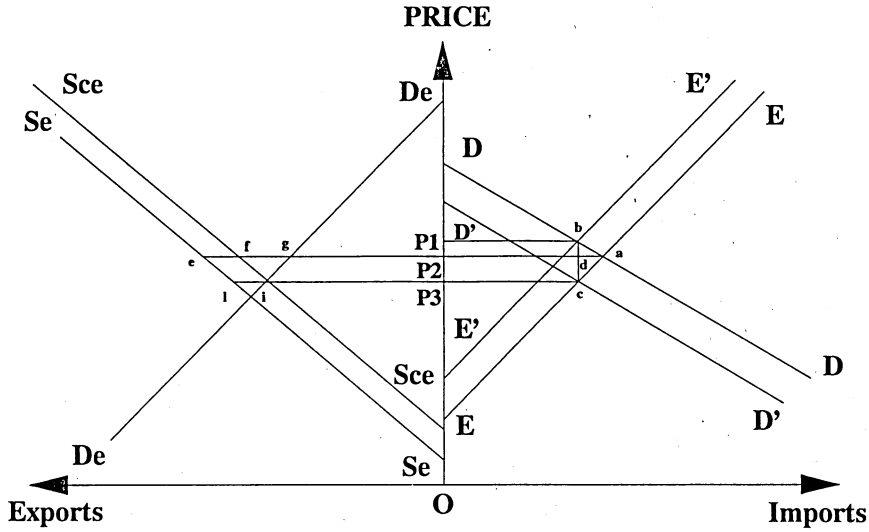
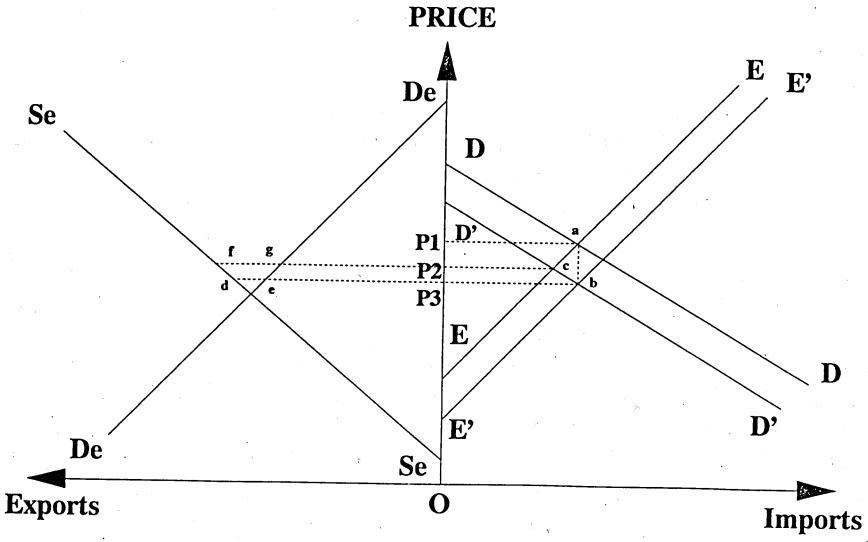


Figure 4 - Subsidies and trade with importer externalitites



exporter's social costs exceed private costs, the true export supply curve is EE'. If exporting countries offered EE', the price would have been P2, and bP2 would have been imported instead of aP1.

Now suppose that the importer imposes a tariff equal to bc for each unit imported. This tariff restricts imports to bP2 and restores the exporting country to the solution that would obtain if the correct export supply curve were used. Both countries could benefit from this tariff. The importing country benefits from the tariff because the additional tariff revenue, cdP1P3, exceeds the deadweight loss, bda. The exporting country suffers a loss of producers' surplus equal to elP3P1 and a gain in consumers surplus' of giP3P1. The net loss efli may be less than the ensuing reduction in environmental damage. In the absence of the

externality, an exporting nation will lose when the importer imposes a tariff. Both domestic and foreign nations can gain from a tariff in the presence of externalities.

For the case of an externality in the importing country, this analysis can be modified (fig. 4). D'D' is the original import demand curve, and DD is the import demand curve when social costs are taken into account. Excluding social costs shifts the import demand curve downward. Including domestic social costs causes imports to rise from cP2 to aP1 and world price increases from P2 to P1.

Suppose that the importer ignores social costs but gives a per unit subsidy equal to ab. The effective domestic price is P3 although the world price is now P1. This consumption subsidy corrects the phenomenon of underimportation. A second distortion, again, corrects the first distortion. The problem of importing too little cannot be corrected by an export subsidy because a price-taking exporter cannot influence world price. For a price-taking exporter with domestic demand curve DeDe and domestic supply curve SeSe, this consumption subsidy stimulates exports from an initial value of ed to fg.

Conclusions and Policy Implications

The previous analysis suggests several conclusions. First, a negative externality in the exporting country causes excessive exports. Second, an externality in the importing country causes too little to be imported. The appropriate policy response here is a substitution of domestic production with imports. Third, import restriction policies will take a nation further from the social optimum, when social costs exceed private costs in the importing country. Finally, export promotion policies will hurt an exporting country, when social costs exceed private costs in the exporting country.

Agricultural policy seeking to increase export market share, by encouraging domestic production, also imposes an environmental cost. Import restricting policies similarly stimulate production in the importing country and thereby induce an environmental cost. This situation poses a conflict as policymakers balance the dual goals of maintaining farm income and reducing environmental degradation.

The appropriate policy response also depends on the type of externality (Bhagwati, 1971; Bhagwati and Srinivasan, 1983). When a negative production externality is input-related, as with pesticides and fertilizers, then a revenue neutral factor tax subsidy is the first-best policy. This policy corrects a distortion at the source. For an output-related externality, a revenue-neutral production tax subsidy is the first-best policy. Since neither policy raises new revenues, no further distortions follow from these taxes.

When a first-best policy instrument is unavailable, trade taxes or subsidies can ameliorate the environmental problem. However, these policies are less efficient than policies correcting a distortion at the source, unless the externality is trade-related. Furthermore, use of trade taxes may be infeasible in some cases. For example, the U.S. constitution forbids using an export tax.

A demand expansion program pursued by a large exporter may reduce environmental degradation for competing exporters and importers. A tariff imposed by a large importer can also benefit other importers and exporters when a negative production externality is present in their agricultural sectors. These conclusions suggest that further analysis of how trade policies affect the environment and how environmental taxes or subsidies affect trade is a fruitful area for agricultural trade research.

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Chapter 7

Of Models And Measures

Some Thoughts on the Use and Abuse of Policy Indicators

Tim Josling*

Introduction

There has been an unusual surge in the use of policy indicators in recent years. Much of this has come from the inclusion of domestic policies in trade negotiations, both at the bilateral (U.S.-Canada) level and at the multilateral (GATT) level. Negotiating and codifying particular quantitative aspects of national policy is often convenient. But the demand is also evident for ways to capture the essence of national policies for purposes of evaluation and analysis even where no negotiations are involved. The growth of multicountry models has led to the need for variables that capture the essence of a national policy without the unnecessary detail. I want to take this opportunity to explore these two different uses of policy indicators and try to indicate what characteristics make such indicators useful. I shall conclude that we may need to rethink the way in which we calculate such policy indicators. At present, we are in danger of confusing ourselves as a profession and not helping those who seek our advice.

What Makes a Good Policy Indicator?

One can define a policy indicator as a number which can be used to convey information about the level, impact, or effectiveness of a policy

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instrument or set of instruments. A large number of possible indicators illuminate some aspect of policy and the choice among such indicators should depend upon the use to which it is to be put. As economists, we have developed and quantified a number of these measures. Sometimes we use these as inputs into our own analyses of markets; they become the policy variables in our models. On other occasions, policy administrators, the media, and industry groups look to us for quantitative indicators that sum up the level, impact, or effectiveness of policies. The issue is whether we are meeting that twin demand.

To be useful to an administrator or trade negotiator, a policy measure should have certain features. It should be comparable over time, across commodities, across policies, and across countries; easily understood and interpreted; noncontroversial; easily measured and replicable; and reasonably accurate. A measure that does not allow comparisons gives little information for the policymaker, even if it is simple to understand, noncontroversial, and easy to calculate. A good, comparable measure which is easily understood can probably withstand a little controversy. The ease of measurement is perhaps of less direct interest to the policy administrator, though replicability might be an issue in international discussions.

To be desirable for use in economic analysis, the criteria for an indicator are almost entirely reversed. Ease of measurement (and finding a convenient source for the data) is the most crucial aspect, followed by its professional respectability and lack of controversy. Ease of understanding (by noneconomists) is of little moment, and comparability will not usually be an issue for use in a specific model.

How well do our indicators meet this dual task of monitoring policy and representing it in economic models? My answer would be "not too well." We tend to separate model building and scenario construction on the one hand from policy monitoring and indicator calculation on the other. As a result, our indicators are based on inadequate empirical foundations and our models use simplistic policy inputs. This generalization is not, however, inevitable. Measures can be both input into and output from models. Models and measures should be working together to add to our understanding of policy. We can improve our contribution to policymakers by rethinking the way we make use of both models and measures in the process of policy monitoring and advice.

Types of Indicators Available

To make this argument more concrete, let us look at a few of the policy indicators in use in both economic modeling and policy description. Perhaps the most widely used is the nominal rate of protection, which is usually defined as the domestic price relative to an appropriate international price. This definition seems to fit the main requirement for an indicator of the level of a policy in a trade model in that it can be used in place of a tariff. It is both replicable and respectable and relatively easy to calculate. Although on the surface easy to understand, it does suffer from problems of interpretation in situations of world price instability. Moreover, any measure which uses world prices suffers from low credibility outside an academic environment. The nominal rate of protection (NRP) fares badly on the criteria of comparability; only in a world of tariffs and producer subsidies does the NRP have much informational content as a comparative indicator of policy levels or impacts.

As a reaction to this, policymakers have resorted to using simpler measures such as budget outlays as indicators of the extent of policies. Comparability is, at least superficially, rather good, as is comprehension. The economist might argue that a dollar spent on different programs can have very different effects, but in a zero-sum budget situation, program costs may indeed be the key policy variable. Economists have tended to react differently to the inadequacy of relative price measures, trying to make them more informative. The concept of value-added (effective) protection was devised to get around some of these problems and has had a good run in the trade literature, but as a policy indicator for administrators and the media, it has been a flop.

A more elaborate set of economic indicators has found favor in the development literature, based on the analysis of social profitability. Best known among these measures is the domestic resource cost (DRC), which indicates the social opportunity cost of resources used per unit of social value added. The DRC acts as an indicator of comparative advantage (low numbers indicating less cost incurred to add the same value to traded inputs) and as a proxy for social profits (the difference between social value added and social resource cost). Its value as a policy indicator has been extensively explored by Monke and Pearson (1989), in what they style as a policy analysis matrix (PAM). The contribution of different types of policies (output, input, and factor market) to correcting

divergences between private and social costs is clearly identified in the PAM. Any measure which involves calculation of social costs is bound to be both controversial and empirically challenging. But the reward is an indicator that attempts to capture the most fundamental aspects of policy, their cost to society.

Economists working on developed country agriculture have taken a different tack. Perhaps because of the greater availability of data and econometric estimates at the market level, the emphasis has been on the analysis of costs and benefits using Marshallian partial-equilibrium measures. This approach has led to such policy indicators as the economic cost of transfer to farmers, the ratio of the producer surplus gain to the net economic cost.[1] More recently, with the interest in international ramifications of farm policies, a new set of indicators has been added. These indicators measure the international externality of farm programs such as the effect on the income of one country's farmers of support to those of another country.[2] Heavily model-based, these indicators are not easily replicable and may be somewhat controversial. They do, however, have that element of communicability that is essential to a good policy measure.

Yet another set of measures has emerged, largely as a result of work done by OECD and USDA's Economic Research Service. Their estimates have been regularly updated since 1987 (OECD, 1987, and USDA/ERS, 1987). The general set of measures are proxy indicators that translate various policies into an "equivalent" level of another policy. The tariff equivalent is the most venerable of these and has obvious value in trade matters. The producer subsidy equivalent (PSE) together with its kin, the consumer subsidy equivalent (CSE), have been widely used in recent years as policy indicators in the agricultural area.

Equivalent-type measures rely for their usefulness on the comparability and comprehension of the instrument chosen as the proxy. A PSE turns everything into producer subsidies on the assumption that such subsidies both have an intuitive meaning and are comparable across countries, commodities, policies, and time. Because of their nature as proxy measures, these policy indicators do not in themselves either require or generate information on what would happen in the absence of the policy

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[1] For an early example, see Josling (1969). For more rigorous treatment, see Gardner (1983).

[2] A powerful use of such measures is found in Roningen and Dixit (1989).

under scrutiny. Thus, they are different in kind from most of the other measures mentioned above. The NRP requires an estimate as to what prices would be like without protection; the ERP does the same for value-added. The DRC and net social profit calculations also imply knowledge of the conditions in a situation without the policy. This knowledge is necessary to be convincing as a measure of the contribution of that policy to social profit. Recasting a mix of policies as a subsidy equivalent makes no claim about what would happen in the absence of such subsidies.[3] The calculation is correct or incorrect depending upon whether a subsidy would truly have the same effect, not whether the no-policy scenario is correctly specified.

The Debate on the Use of Subsidy Equivalents

The recent interest in subsidy-equivalent measures has stimulated a small literature on the desirability of the use of PSE-type indicators in policy descriptions and in trade negotiations. The general conclusion of this debate seems to be that as quantitative indicators of policy levels (that is, how high protection is in various countries and over time), the information imparted by the PSE has been useful. At the least, it has cured the impression that each country's agricultural price is either so complex or so different that it cannot be compared with those of others. Indeed, policy comparisons may be too easy now; the very real quantitative difference among policy instruments may not show up in the quantitative proxy, however technically correct that proxy is.

Economists, however, have been quick to point out that PSE's do not capture the net transfer to producers as a result of policy.[4] A subsidy payment includes the amounts transferred to input suppliers, rental payments, and transfers to foreign consumers through terms of trade changes. A relatively small part might stay with the farm family. As indicated above, the PSE does not try to indicate the impact of policies on net income; it merely compares them with a subsidy. If a subsidy overstates the transfer, so will the subsidy-equivalent. If a tariff overstates

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[3] That is not to say that implicit with/without policy comparisons are not useful in calculating the PSE. To add up all the effects of various instruments, calculating the effect of each (relative to its absence) and adding them up is useful. But, the definition of a PSE is not based on knowledge about the no-policy situation.

[4] This point has recently been forcibly made de Gorter and Harvey (1990).

the net benefits from import protection (as it will), then a tariff-equivalent will do likewise. This constraint clearly limits the direct use of PSE's in the welfare analysis of farm policies.

The use of quantitative indicators for international negotiations has also been subject to scrutiny. The criticism, for the most part legitimate, has focused on two aspects of the PSE. The first is the implied link between income effects and output effects. All support policies generate somewhat different types of income flows; some might depend on input use, some on resource retirement, and others may be tied directly to output. Any measure that ignores these differences would misrepresent the output impact of policy. In Hertel's phrase, "the mix matters" (Hertel, 1987). The second aspect has been the implied link between output and trade effects. Policies can have different trade effects and yet similar output effects. The neglect of consumption effects is a common problem in trade policy. Why else would one encourage tariffs but discourage domestic subsidies? An uncritical use of PSE's as indicators of trade impacts would be open to this criticism.

The reaction to this debate of those of us who welcomed the increased quantification of policies and the opportunity to negotiate down the level of support in industrial-country agriculture was ambivalent. On the one hand, the weaknesses of using a simple policy measure to capture trade effects were apparent. On the other hand, the prospect of countries actually discussing quantitative reductions in all price support programs rather than haggling over the symptoms on an ad hoc basis was appealing. Criticism of the details of the measure could risk losing both baby and bathwater. Modifying the measure itself to improve its fit is better, keeping its clear advantages as an indicator of support cuts.[5]

This approach of modifying the measure on a seemingly ad hoc basis was clearly disturbing to the case for using the indicator in trade talks. Without a well-defined method, countries could play games with the calculations. And yet the definition of the method turned into a mininegotiation. Special interests began to take sides on the issue of the producer subsidy equivalent, aggregate measure of support, subsidy measure unit, and trade distorting equivalent (PSE/AMS/SMU/TDE), depending upon whether its use would help or hurt their cause. As the United States backed away from its use, the EC began to embrace it, or

[5] This view is taken in Tangermann and others (1987).

was the causality reversed? Doubts on the way in which the PSE had been calculated in the U.S.-Canada free trade agreement also added to the confusion.[6] Whether the PSE has added much to the arsenal (as opposed to the lexicon) of trade negotiations as we thought 3 years ago is unclear.

A New Approach to Policy Indicators

What are the lessons for our professional work and in particular for our work on policy indicators? I believe there has been widespread confusion over the meaning and interpretation of policy indicators such as the PSE which have made our work less useful to outsiders. I want to suggest a new approach which could help clarify some of the confusion still clouding the area. The approach starts with the notion of fixing the definition of a measure rather than its composition. This idea should appeal to us as economists. The consumer defines the product and its characteristics; the producer tries to meet those needs at a reasonable cost. The market signals the success of the venture. In this case, there are two "consumers," the policymaker and the modeler. Both should define the product, rather than the process by which it is created. How to create the product is the business of the profession.

Compare this with the present situation. Policy measures are defined by the formulae or techniques embodied in their generation. Both nominal and effective rates of protection are calculated from a formula. There are manuals that guide people down the path of social profitability analysis and partial equilibrium welfare calculations.[7] Such manuals are premised on the assumption that there is a "correct" way to calculate policy measures. This assumption clearly has benefits; assessing different protection estimates is easier if one knows that the same formulae have been employed. But the cost is that the interpretation is left to the decisionmaker. The chorus of cautionary statements that emerged from the profession when it became clear that the PSE might be used in trade negotiations is evidence of our legitimate concern. The problem was not with the PSE per se; other measures would have raised the same problems. The concern was that the measure might be misinterpreted. Fixed-definition measures would not prevent professional controversy, but

[6] This controversy triggered a GAO (1991) report.
[7] A recent and excellent example is Tsakok (1990).

they would channel it into discussions as to how best to calculate the indicator, leaving the interpretation of the indicator reasonably transparent.

To illustrate this proposition, consider a PSE as a "generic" measure of the following type:

PSE_{gen} = the subsidy which is equivalent to a set of policies.

As such, this definition is not workable for an empirical measure; instead, it defines a class of such measures. The three underscored parts of the statement have each to be further defined. The subsidy can be per unit, lump-sum, or any other form of readily identifiable transfer that has a specific interpretation. This subsidy can be equivalent in several different dimensions, such as farm income, farm output, asset value, net trade, farm employment, or the income of farmers abroad. The set of policies also can range from a single policy instrument to all government measures, both in agriculture and outside. Thus, many possible specific PSE's can use combinations of these definitions, each with its own correct interpretation.

The notion of a fixed-definition indicator is to prevent any problems of interpretation. Consider a few "fixed-definition" indicators that might be of interest in the context of policy reform:

1 - The budget cost of substituting lump-sum payments which leave the net income of farmers unchanged, following the removal of a policy.

2 - The per unit subsidy which would give the same output as the current policy mix.

3 - The direct producer subsidy which would have the same trade volume effect as the current policy mix.

Indicator (1) above is unequivocal. It is by definition the budget cost of such payments. Indicators (2) and (3) are similarly transparent in interpretation. The uncertainty comes in the calculation, not the interpretation. Estimating the budget cost may indeed be difficult. To do so, one needs a model of farmer behavior more sophisticated than encompassed in a partial equilibrium supply curve. Thus, such a model is needed to understand the effect of policy whether or not an indicator is

calculated. The model becomes more useful to policymakers because it generates the indicator that has been chosen for its relevance. The indicator becomes more useful because its definition is predetermined.

The three fixed-definition indicators listed above can be measured by specific PSE's. One could call them iso-income, iso-output, and iso-trade PSE's, respectively. No one would knowingly ask for an iso-output PSE as an indicator of the compensation required to offset the removal of price supports. No one could argue that the iso-trade PSE did not capture the different trade effects of diverse policy instruments; it does so by definition. The use would determine the measure, which would be custom-built rather than off-the-shelf.

What about the demand for policy indicators as inputs into models? These too can be customized. A trade model will usually require a fairly simple representation of domestic policy instruments. These often take the form of domestic supply and demand response to policy prices. In such cases, a measure such as an iso-output PSE (and the comparable consumer measure) will be appropriate. Transfers not tied to output or to input use would be excluded. By contrast, a world market model with no explicit domestic behavioral functions would require an iso-trade PSE to represent the relationship between world and domestic prices as a proxy for the actual set of trade-distorting policies. The model will operate "as if" the actual policies were included.

Doesn't this need ask a lot of our ability to derive these measures? Yes, but our ability is in any case limited by our understanding of the relationship between policy variables and economic impacts. In effect, we must use this understanding to improve the quality of our policy indicators. At present, models and measures compete for the eye of the policymaker. Models are constructed to answer particular scenario questions or sets of questions. Measures appear to offer a shortcut, a way to get policy answers without the full-blown model. But each measure (NRP, ERP, DRC, PSE, and so forth) contains its own implicit model. An ERP can be calculated only if we make assumptions about what value-added would be without output and input protection. Those assumptions include an informal model linking domestic price to world markets (usually that world market prices will hold in the absence of domestic protection). A PSE contains the result of a considerable amount of informal modeling of the transfers inherent in the various program instruments. My suggestion is to make that modeling apparent. Make the measures more sophisticated and accurate by harnessing the

information included in the models. Instead of competing for the policymakers' attention, the two activities would be complementary.

The implications of this can be seen by referring to the fixed-definition indicators discussed earlier. An iso-income PSE would require a sophisticated model of farm behavior. But such models exist and are used to examine the implications of changes in present program details. Simulating the replacement of some or all of the instruments currently used with a lump-sum payment which keeps net income to the farm family unchanged would seem a straightforward task. The iso-output and iso-trade PSE's are in principle easy to calculate from current models. But as models progress, the measures should keep pace. Models that include economywide feedback effects are refining our knowledge of policy impacts. A computable general equilibrium model would seem invaluable for estimation of a number of policy indicators. Hence, a CGE-based PSE would be a logical extension of recent trends in modeling.

Conclusion

Models and measures should be seen as complementary aspects of economic analysis in support of policy advice. At present the two, as often as not, appear to be competing. Measures are seen as largely descriptive in nature and subject to misinterpretation or misuse. Where the measures require analysis, it is usually of an informal kind, with implicit models rarely specified. These descriptive statistics have found a limited place in modeling but are often considered to be a poor substitute for "policy detail." My suggestion is to think of measures as having specific definitions tied to their use and not their method of calculation. Competition would be among economists trying best to calculate the measure, rather than among marginally different measures, none of which is clearly focused on the problem. Models would be harnessed to provide sophisticated calculations, to supplement the current back-of-the-envelope methods. The measures would in effect be stylized output from the models, which in turn would allow better assessment of model strengths and model differences. Policymakers would be more likely to take seriously the output from a profession where analysts strove to refine and improve the product to meet consumer demand, rather than engage in internecine quibbles about which product the consumer should be offered.

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Chapter 8

Potential Impact on World Agricultural Markets of Policy Reform in Central and Eastern Europe and the Soviet Union

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Introduction

The recent wave of political and economic reform sweeping Central and Eastern Europe (CEE) and the Soviet Union has brought potential for dramatic change in agricultural production and trade in the region. In those countries where economic reform is most advanced, significant adjustments in agricultural supply and demand are already occurring (for example Poland, the former German Democratic Republic, and Hungary). In those countries where economic reform has thus far been limited, pre-existing imbalances in supply and demand are worsening (for example Bulgaria, Romania, and the Soviet Union). The trade regime of the Council of Mutual Economic Assistance (the Soviet Union and its client countries) countries has been dismantled, leaving individual members to find their respective roles defined by domestic and world market conditions rather than by planned fiat.

The agricultural sector's apparent inability to provide food to the population has been a source of embarrassment to these countries' governments in the eyes of both the local populace and the rest of the world. Agriculture's sizable role in the overall economy of the region and the region's important role in world agricultural trade suggest that effective reform would have significant effects on world markets (table 1).

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We use estimates of support to producers and consumers along with some assumptions on reasonable parameter values in a simulation model to analyze the potential effect of reform in the Centrally Planned Economies (CPE's) on these traditional commodities. Assuming that these economies move to market-based economies, we find that the effect of removing the previously existing planned policy environment on world prices and the final net trade position of CEE and the Soviet Union in the shorter term (4 to 5 years) depends critically upon assumptions of the demand response in the Soviet Union.

Sensitivity analysis suggests that if demand increases after reform (assuming it was heavily repressed by planners before reform and remains high after reform), world meat prices would rise and grain prices would decline, while the region would remain a net importer. However, if income declines substantially, as has happened in Poland (and, to a lesser extent, Hungary) in at least the short term, world prices for both meat and grains would fall but the region would return to net export status. Analysis over the longer term suggests that demand assumptions are less critical as world prices for meat rise slightly, grain prices decline moderately, and the region becomes a significant net exporter.

Table 1--Agriculture's role in selected economies

Item	Unit	EC	CEE	Soviet Union	United States
Total area	*Hectares*	225,420	124,597	607,044	431,382
Population	*Million*	325	137	282	246
GDP per capita[1]	*U.S. dollars*	12,510	5,744	4,538	17,500
Agriculture's share of GDP	*Percent*	3.5	18.0	20.0	3.0
Agriculture's share of labor force	*Percent of population*	2.6	13.0	19.0	.8

[1] GNP for Eastern Europe and Soviet Union. All data for 1988, except agriculture's share of labor force and U.S. data which are 1986.

Sources: U.S. Department of Agriculture, Economic Research Service; Central Intelligence Agency; and the International Monetary Fund.

Recent CEE Agriculture Policy and Performance

Much attention has been paid to the shortages of basic food products in many of these countries, and analysis of the causes of these shortages has generally focused on production shortfalls. But, production problems may not be the largest contributor to food shortages. I estimate aggregate measures of support for the East European and Soviet producers and consumers that are indicative of these countries' effective incentive prices relative to those in the rest of the world. My findings suggest that production was not deficient as much as it was a rational response of producers to a relatively unfavorable price and economic policy environment compared with the policy environment in industrial market economies. Furthermore, problems of overstimulation of demand appear to contribute more to food shortages than shortfalls in supply.

The 1980's brought increasing pressure for reforms of the agricultural sectors in Central and Eastern Europe and the Soviet Union. Overall production performance was good by international standards (table 2). But three areas of difficulties overshadowed gross production performance: production costs, food availability, and food quality.

Regional generalizations blur some of the significant distinctions between countries. Because the Soviet Union has the dominant agricultural economy in the region, its policies often overwhelm the policies of the individual or collective East European economies.

Table 2--Yield growth for selected commodities and countries, 1970-80

Country/ region	Total grains	Wheat	Corn	Beef	Pork
		Percent per year			
World	2.12	2.80	1.18	0.81	2.32
CEE/Soviet Union	3.30	3.91	1.68	1.09	3.24
European Community	2.25	2.87	1.98	.74	.99
United States	1.10	.60	1.31	1.73	1.26
Other Western Europe	2.47	3.23	.77	-.46	1.27

Source: Webb and Gudmunds, 1989.

Growth was achieved only by ever larger resource commitments. Gross production growth was good, but net value added was poor (Wong, 1986). Thus, the incremental resource cost necessary to achieve output growth was high. The actual numbers on total factor productivity growth, or for that matter net value added, in agriculture probably exaggerate the sector's poor performance. Resource allocation economywide was poorly conceived and invested by planners and had relatively low productivity. Thus, the farm sector itself is not completely accountable for the poor performance. The industrial sectors also performed poorly, suggesting that the misuse of resources in the agricultural sector did not necessarily involve high domestic opportunity costs.

The 1980's represent an apparent paradox, in terms of food availability. Increasing quantities of traditional, domestically produced agricultural products were made available, but not enough to completely satisfy demand in many (but not all) of the countries. Per capita consumption in the CEE countries and the Soviet Union did not lag far behind the European Community or the United States, especially compared with the differences in per capita income levels (table 3).

Two related problems moved into sharper focus in the 1980's: poor quality food products and very limited choices. The quality issue embraces both the quality of the raw product produced on farm and the quality of the product after processing. The diversity issue includes the limited diversity of domestically produced and processed goods, and the limited diversity of imported products.

In sum, although the CEE countries and the Soviet Union continued to demonstrate relatively successful production growth during the 1980's, this did not translate into successful agricultural sector performance. At least part of the problem, the imbalance of supply and demand for traditional agricultural commodities, was the direct result of producer and consumer price policies combined with restrictive planned economic systems.

My results are based on conservative estimates of the potential positive supply and negative demand effects. I did not examine the effects of possibly overvalued exchange rates. I was not able to examine other factors such as the possible effect of imperfect (monopoly-dominated) markets resulting from reform. Still, on net, I think my results define more of a lower than an upper bound on the changes in agricultural potential for the region.

Table 3--Per capita consumption of agricultural products, 1987/88

Country/region	Milk	Cereals	Vegetables	Fruit	Meat	Income
	Kilograms					*Dollars*
EC	97	111	116	106	106	12,510
CEE	92	174	117	61	102	5,744
Soviet Union	89	166	97	45	86	4,538
United States	131	100	105	128	125	17,500
	Percent of EC					
CEE	94	157	101	57	97	46
Soviet Union	91	150	84	42	81	36
United States	134	90	91	121	118	140

Source: Per capita consumption data calculated from FAO SUA tables. Per capita income, table 1.

Historical Trade Patterns

Before World War II, the region encompassing the CEE's and the Soviet Union was known as the breadbasket of Europe. During 1925-33, the CEE's and the Soviet Union were, on average, net exporters of grains, meat, butter, and cheese (table 4). On the other hand, the West European countries were sizable importers of all these commodities. However, despite their reputation as a "breadbasket," the CEE's and the Soviet Union were hardly in a position to feed all of Europe; only about 20 percent of West European import needs could be met by CEE and Soviet exports.

After World War II, the CEE and Soviet Union lost their status as net agricultural exporters and, in particular, began to import increasing amounts of grain. Although there has not been a reversal of roles between East and West in the last 20 years, there has been a strong tendency towards just that. The European CPE's are now large net importers of grains, though still exporters of meat. The meat exports of the CEE and Soviet Union appear to come at the cost of expensive grain imports. The EC on the other hand was historically a significant net grain and meat importer and now is a net exporter of both.

Table 4--Net export data for selected commodities and regions

Country/region	1925-33[1]	1985-89[2]
	Thousand metric tons	
Grain:		
CEE	3,262	-4,276
Soviet Union	1,935	-32,333
EC	-23,192	19,062
United States	4,514	87,122
Meat:		
EE	43	1,266
Soviet Union	3	-599
EC	-1,696	767
United States	7	-810
Butter:		
EE	8	47
Soviet Union	28	-300
EC	-128	283
United States	-.2	48
Cheese:		
EE	6	56
Soviet Union	.3	-9
EC	-60	244
United States	33	-104

[1] Excludes live animal trade and poultry from meat statistics.
[2] Excludes live animal trade and mutton and lamb from meat statistics.
Sources: Data for 1925-1933, International Institute of Agriculture, 1934. Data for 1985-89, USDA-ERS.

The Effect of CPE Policies on Agricultural Supply and Demand

Agricultural performance in the countries with industrial market economies, the CEE, and the Soviet Union have obviously taken divergent paths since World War II. At the root of these divergent paths is the interaction of the price (and, in the CEE and the Soviet Union, income) policies pursued and the economic systems chosen in each region. The recent reform movements in the planned economies suggest a need to conduct basic supply and demand analysis.

Estimates of the CPE's effective price of policies in terms of relative incentives to produce and consume have been attempted (Webb and others, 1990; Cook and others, 1991; and Cochrane, 1990). As policy

reform is undertaken, knowing the nature and extent of the distortions underlying the planned economy would be useful, so that reform efforts can be focused productively on those areas deemed most damaging.

East and West Europe: Similar Goals, Different Outcomes

Agricultural policies in East and West Europe (in general, we will focus on the EC when discussing Western Europe) since World War II have worked towards roughly similar stated goals--increased "food security" or agricultural self-sufficiency. Despite the similar goals, however, the two regions have used dramatically different economic systems to try and reach these goals. The EC, using market capitalism, has successfully transformed itself from a major net importer of meat and grains to a major net exporter. The countries under central planning lost their prewar status as net exporters of both meat and grains, becoming significant net importers of grains and apparently maintaining meat exports only through grain and oilseed imports (mainly though not solely due to the Soviet Union's import positions).

My discussion on price policy and systemic interaction will focus on the fundamental supply and demand conditions underlying each region; however, only the European CPE's will be discussed in detail because these countries operated under economic systems that are less familiar to the reader and much less transparent than the EC's. Knowledge of the underlying supply and demand conditions existing under central planning in the CEE and the Soviet Union proves useful in analyzing the effect of region's recent reform efforts. In a later section, I briefly describe the EC's underlying market conditions in the same framework to highlight the basic differences between regions.

Agricultural Price Policies in Centrally Planned Economies

European CPE price policy apparently provided heavy incentives to consume and relatively minor, perhaps negative, incentives to produce (depending on whether one chooses an official or shadow exchange rate in the estimation of support; see note to table 5).[1] West European policy provided heavy incentives to produce, and negative incentives to consume. Table 5 provides summary PSE's and CSE's for EC and provides European CPE's.[2] These support estimates capture only

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[1] My discussion focuses on basic agricultural commodities such as grains and meats. Fruits and vegetables, which in a general sense operated in a less planned environment than grains and meats, are not included.

[2] See Cook and others (1991) and Cochrane (1990) for more detailed discussions of PSE/CSE estimates in the European CPE's. See USDA (1987) and OECD (1988) for a more general discussion of PSE's and CSE's.

financial support provided by government policies in 1986.[3] Despite both regions' claims of self-sufficiency as a policy goal only, EC support estimates work together in this direction (with the East European countries of Yugoslavia, Czechoslovakia, and Hungary apparent exceptions to this general statement).

Producer price policies in the CEE countries and the Soviet Union included very complicated producer price schemes that often varied the price producers received from one region, or even farm, to the next. Producer prices generally changed infrequently. Producer price changes were usually unrelated to existing supply and demand conditions. Still, changes in producer prices were most often designed to carry some incentive effect. The term "some" is used because European CPE farmers faced many nonmarket constraints and nonprofit maximizing elements in their objective functions that probably blunted price incentive effects. Producer price policy was also affected by prices for inputs and services, neither of which were market determined. Many farm inputs are of industrial origin, and industrial prices were "revised" frequently for what were often imaginary quality improvements or increased production costs. Industrial input prices generally increased more often than did agricultural output prices. Thus, CEE and Soviet farmers were often caught in a classic scissors crisis, a change in the domestic terms of trade in favor of industrial goods. This input price policy and the monopoly position of input providers resulted in low quality, high priced inputs (although these prices were often "subsidized" to be below the inputs' production costs) which farms had no real choice in the selection or disposal of. Input quality was often so poor that farmers could actually only use, for example, one out of three units delivered (despite paying for all three), and would use the remaining two units for parts. If the problem was as widescale as anecdotal evidence suggests, then the effective price per utilized input was greater than the reported price per unit. However, because of data limitations, measuring this effect is difficult.

In terms of consumer price policy, prices were set at low levels and held constant over many years. Retail price changes were rare, especially in the Soviet Union. A general CEE objective was to provide cheap food to consumers as one of the benefits of socialism. Food prices in state retail networks were unaffected by changes in supply and demand conditions, nor by changes in the availability and prices of other, nonfood goods.

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[3] Adjustments will be made to these "financial" support estimates below. These adjustments are attempts to capture some of the more obvious "nonfinancial" distortions generated by the planned environment.

Table 5--PSE and CSE estimates for selected countries for 1986

Commodity	United States	EC	Soviet Union[1]	Poland[1]	Yugo-slavia[1]	Hungary[1]	Czech-oslovakia[1]
			Percent				
PSE's:							
Beef	12	36	32	24	58	56	58
Pork	8	27	20	17	20	1	-12
Poultry	14	34	46	24	49	-24	-[2]
Milk	62	65	1	-44	45	-30	-43
Wheat	61	58	-31	52	38	-49	-151
Corn	48	62	56	14	20	23	40
Soybeans	12	44	15	--	47	--	--
Cotton	--	--	23	--	--	--	--
Sugar	73	46	55	23	53	-13	46
Overall[2]	36	48	26	15	34	-9	8
CSE's:							
Beef	-1	-12	82	0	1	58	14
Pork	--	-8	21	9	-64	12	38
Poultry	-3	-17	-28	29	--	25	1
Milk	-30	-26	-29	181	-44	84	119
Butter	-40	-44	58	--	--	20	-38
Wheat	-10	-49	66	-14	-33	29	79
Corn	--	-52	-13	--	28	--	--
Soybeans	--	--	110	--	--	--	--
Cotton	--	--	24	--	--	--	--
Sugar	-52	-59	-38	-4	-67	--	--
Overall[2]	34	-11	-19	50	-44	-25	-65

--=No estimate presented.

[1] For the Soviet Union, Poland, Yugoslavia, Hungary, and Czechoslovakia, adjusted exchange rates were used in support estimates. The official exchange rate was likely substantially overvalued; thus PSE's calculated using the official exchange rate are overstated and CSE's understated. The author used the following adjusted exchange rates in the calculations (numbers in parenthesis are the official rates), Soviet Union 1.91 (0.61). Poland 223.19 (175.29), Yugoslavia 504.70 (379.22), Hungary 61.01 (45.83), Czechoslovakia 19.97 (15.00). For a description of the exchange rate adjustment methodology, contact the author.

[2] Covers all commodities for which support was estimated, not just those reported in this table.

Source: For Soviet Union, Liefert and others (1992); for United states, Webb and others (1990); for Poland, Yugoslavia, Hungary, and Czechoslovakia, author's calculations based on information provided by Nancy Cochrane and Mark Lundell, Econ. Res. Serv., USDA.

The complete insulation of food prices from market pressures made them little more than accounting prices, and they played practically no allocative role. Rapid income growth (far exceeding labor productivity

growth) combined with limited diversity of substitutable goods put increasing pressures on available supplies whether the harvest was good or not.

Because retail prices were set by planners and food prices in general were insulated from market pressures, very little incentive existed for increased product processing or development. Low, fixed prices translated into basic, noninnovative products of poor quality. Little emphasis was placed on convenience or service; thus, to some extent, the low consumer prices existing in CEE countries and the Soviet Union reflect the lack of value added from these attributes.

Supply and Demand Curves Under Central Planning

The supply curves faced by producers under central planning probably differ from those in a market economy in two general ways. First, supply curves under central planning are probably less elastic than they would be in a market environment. Producers under central planning are less responsive to changes in prices. Second, supply curves under central planning are probably located to the left of supply curves that would exist in a market economy. This leftward location of the curves reflects the various institutional rigidities that raise per unit costs or lower productivity or both.[4]

Thus, a prereform planned economy's supply curve at time t might be depicted as Sp in figure 1, and a market economy supply curve under similar conditions might be denoted as Sm. Demand curves under the planned system were also relatively unresponsive to small price changes (again steep) and lay further to the right than those that would have existed under market conditions. Planners restricted the availability and diversity of many consumer goods, especially, but not exclusively nonessential goods. Prices on basic consumer items such as food, medical, and housing services were set very low and kept stable for many years. Retail prices on basic commodities were actually revised far less often than producer prices. Thus, consumer demand curves under central planning were probably steep because of very limited substitution

[4] For a more detailed discussion of these issues, see Koopman (1991). The role of inputs in determining the underlying cost structure of farming appears strongly in favor of higher costs for any given level of production than would have existed in a market environment. From a productivity standpoint and per unit input cost, agricultural supply curves for CEE countries and the Soviet Union likely lie to the left of where they would in a market environment.

possibilities, and shifted out rapidly from a high income elasticity as consumer income growth had to be concentrated on relatively few, low-priced commodities (or alternatively, savings). We depict a consumer demand curve under these conditions at time t as Dp in figure 2. Dm represents a market economy demand curve.

Figure 1. Pre Reform CPE Supply Curve.

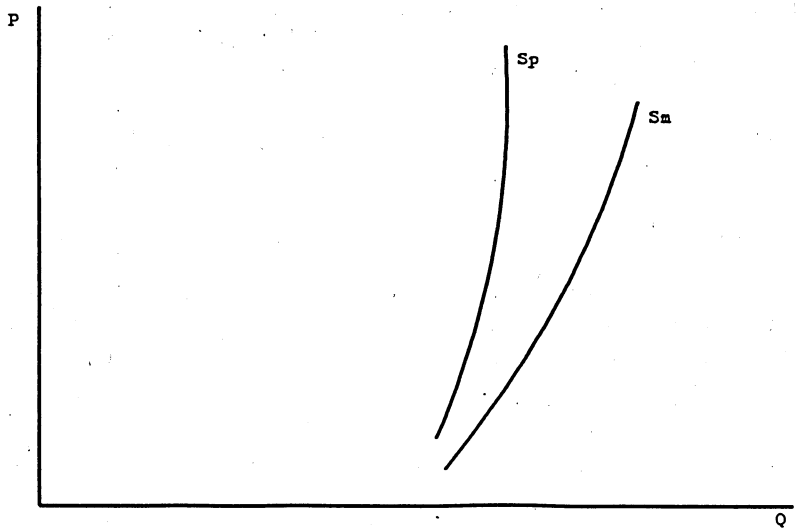
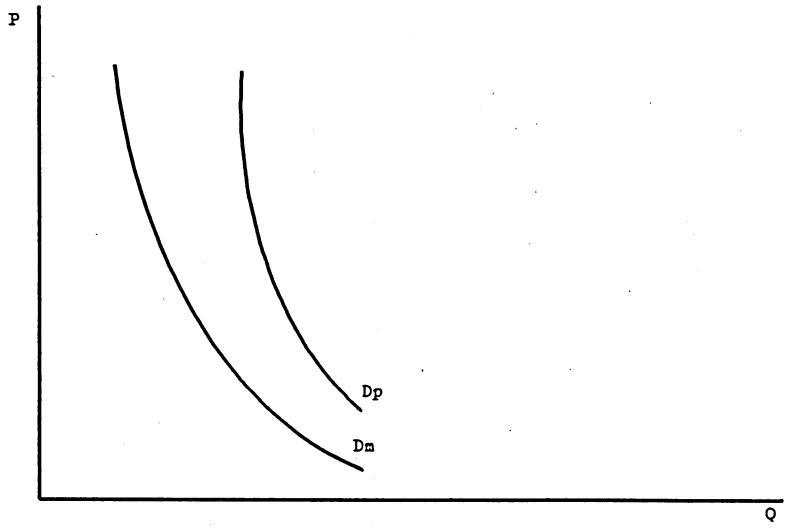


Figure 2. Pre Reform CPE Supply Curve.

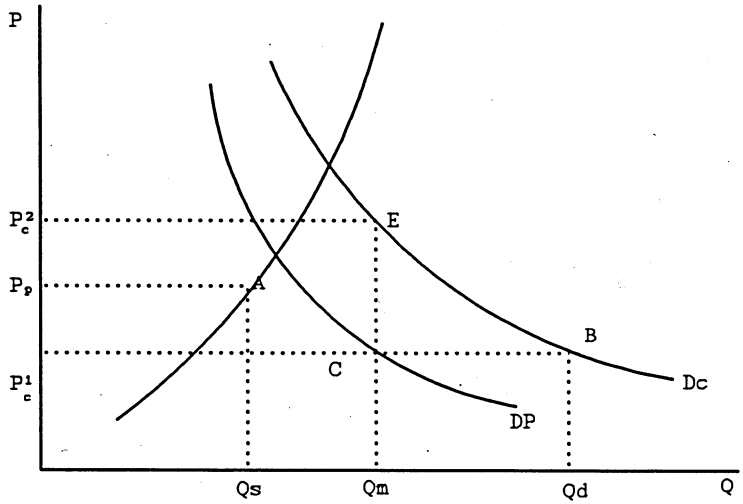


Equilibrium under central planning seems almost a contradiction in terms. But from a planner's perspective, and in terms of economic relations with the rest of the world, CPE's can be thought to be in an equilibrium in the following sense: Planners distribute production plans to producers, who, given their systemic constraints and price Pp, produce at Qs in figure 3. Consumers face price Pc and demand Qd, which would require imports equal to Qd-Qs to equilibrate domestic consumer demand with total supply. But planners only import Qm while maintaining consumer price Pc. Hence, consumer demand remains unsatisfied by Qd-Qm, but planners are "satisfied." Because CPE's generally have closed borders, the unsatisfied demand of consumers Qd-Qm remains internalized. In an external sense then, the CPE depicted in figure 3 is in a planner's equilibrium at prices Pp, Pc, and imports of Qm-Qs.

A Contrast of Systems

As we observed in table 5, the European CPE countries tend to provide greater financial support to consumption than production, offsetting the effectiveness of producer support in bringing about self-sufficiency.

Figure 3. Market Disequilibrium in a Pre Reform ECPE.



Furthermore, the level of financial support to producers is probably offset to some extent, if not more than completely, by the input price policies favoring industry and the planned system's role in holding back input productivity growth. That CEE supply curves are probably inelastic means that any "financial" incentive (or disincentive) to produce is relatively less effective at stimulating (reducing) output. Although a similar argument can be made about the lack of a stimulative effect of consumer support on demand, income growth has been very rapid (as opposed to productivity growth), shifting the underlying consumer demand curve out over time.

The EC provides an interesting contrast to the European CPE policy environment. In the EC, systemic distortions are minor, as the location of agricultural supply and demand are determined by the interaction of numerous market forces. Supply shifts over time may be affected by high support prices bringing high profits which are reinvested in new, more efficient, technology. Both supply and demand curves are relatively price responsive, reflecting numerous substitution possibilities available to producers and consumers.

EC supply curves are thought to be relatively elastic (at least compared with CPE's); thus $1 worth of support in the EC should stimulate more output than $1 worth in the CEE. Furthermore, effective EC producer support levels are higher than in the CEE. The EC's underlying supply curves are effectively market determined, and productivity growth has been rapid. Thus, the combined price policy and systemic arrangement suggests that EC policies are more effective at stimulating output than those in a European CPE.

On the demand side, the EC has relatively high negative support to consumers, which diminishes consumption. Furthermore, EC demand curves are relatively elastic, given the abundance of consumer goods. Thus, the diminishing effect of negative support can be paralleled, though in the opposite direction, with the above argument on the effect of $1 support in the EC versus $1 support in the CEE. Income growth in the EC, for the most part, has been driven by productivity growth, at least relative to the CEE. EC price policy and systemic advantages are clear. High prices in a setting of relatively elastic demand reduce quantity demanded. High income growth shifts out demand, but because income growth is mainly generated by productivity growth, supply (of some goods anyway) is simultaneously shifting outward.

In sum, we see that combined pattern of financial or "price" support to producers and consumers and the underlying supply and demand structure of the two regions have resulted in dramatically different economic

conditions at the beginning of the 1990's. The EC has a combination of price support and underlying supply and demand curves that work strongly in favor of self-sufficiency. CEE countries have a combination of price support and underlying supply and demand curves that complicate their becoming self-sufficient.

The peculiarities of a planned economic system suggest that direct comparisons of aggregate measures of support, such as PSE's and CSE's, for planned economies and industrial market economies could result in misleading conclusions regarding the effective levels of support that CEE and Soviet farmers received relative to those in the West. Much of the financial support received by CEE farmers merely offset other financial factors and systemic distortions that raised production costs. Most industrial market economy support is not required to offset domestic nonmarket distortions and, thus, has a more direct incentive effect.

Pure financial support estimates do not capture the nonfinancial, market-distorting effects of central planning. One would need to adjust PSE's and CSE's for these system distortions to provide better indicators of the net incentive effects of CEE policies for use in international comparisons with market economies.[5]

The Potential Effect of CEE and Soviet Reforms on World Markets

To examine the effect of market-style reform on the CEE countries and the Soviet Union, I use a synthetic simulation model of the world's agricultural economy. Because this model has been discussed in detail elsewhere, I will provide just a brief description here.[6] The model consists of 36 countries/regions, with up to 22 commodities per country. The model is a static, partial equilibrium, net trade model consisting of constant elasticity supply and demand curves for each commodity/country. Economic theory is used to specify cross-price relationships, joint-product specifications, and the relationships in the feed-livestock sector. The base year is 1986.

For reform in the CEE, I assume that supply and demand elasticities move from relatively inelastic planning elasticities to relatively elastic

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[5] Koopman (1991) attempts to correct for these distortions for Soviet PSE and CSE estimates resulting in a decrease in the total Soviet PSE from 26 to 12 percent. The Soviet CSE fell from 34 to 28 percent. Despite the adjustments, support for Soviet consumers remained more heavily subsidized than for producers, and this imbalance in support works against the long-stated, perhaps irrational, goal of self-sufficiency.

[6] For detailed discussions of the CEE models, see Koopman and others (1989), Liefert and others (1992), and Cochrane (1990). For details on the modeling framework in general, see Roningen (1986).

market elasticities. Supply curves are shifted to account for the expected productivity gains. Demand curves are positioned to reflect consumers' demand versus planner's. PSE's and CSE's are used to capture government policy price wedges. The reform scenario effectively rebuilds previously planned economies into what we hope are reasonable approximations of market economies. Government price wedges are removed and curves shifted to approximate the effects of reforms moving from a subsidized planned economy to an unsubsidized market economy. The model's solution horizon is about 5 years. Thus, all things being equal, the model will predict the outcome expected after 5 years of adjustment to reform, but with no supply or demand growth trends. Some alternative scenarios highlight the importance of certain assumptions on the results. Among the alternative scenarios is a longer term scenario that incorporates conservative supply and demand growth trends over a 14-year period (assuming reform began in 1986 and projecting to the year 2000.)

The first scenario incorporates the supply and demand adjustments discussed above. Supply curves are shifted outward reflecting expected productivity gains at the same time their slopes are adjusted to reflect greater price responsiveness. Demand curves for the Soviet Union are shifted out to reflect excess demand while demand curves for all countries are made more elastic.

Removal of government financial support to producers and consumers is approximated by removal of PSE's and CSE's from initial producer and consumer prices.

Under the first scenario, the model predicts that world prices in general would fall nearly 3 percent, meat prices rise by slightly more than 2 percent, and grain prices fall over 7 percent (fig. 4). These price movements follow the changing CEE trade patterns resulting from reform. CEE grain imports decline from 31.5 million metric tons to 8.5 million metric tons, a decline of 73 percent, and the Soviet Union imports less grain than Eastern Europe (table 6). The region becomes a net meat importer, with Eastern Europe exporting 2.2 million metric tons but the Soviet Union importing 3.7 million metric tons.

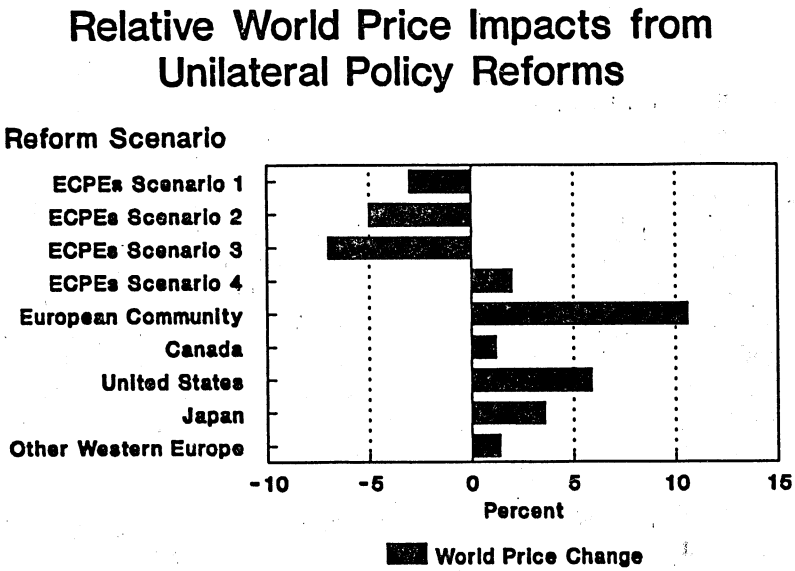
In the CEE, production of most commodities declines (despite the productivity gains), while consumption of meats increases and grains decreases. In total, the contribution of agricultural production to gross domestic product (GDP) after reform falls 37 percent compared with prereform levels (table 7). This estimate overstates the decline because prereform production is valued at the artificially high producer prices. When prereform agricultural GDP is valued using trade prices (reflecting

world opportunity costs), the agricultural GDP decline from reform is only 14 percent.

Under this first reform scenario, the net import position of these economies increases by $7.0 billion (table 7). Eastern Europe improves its net exports from $1.0 to nearly $3.5 billion, but the Soviet Union increases imports from $6.4 to $10.5 billion.

In this first scenario, CEE agricultural GDP declines while net imports rise, suggesting that the CEE countries rely more on world markets for food products than before reform. The regional aggregation, however, hides the fact that the East European countries increase export earnings despite lower levels of production. The Soviet Union on the other hand decreases production but relies on world markets for additional imports to offset the production decline. The role of the excess demand shifts proves to be crucial to this outcome. Will consumer demand for food products increase in a postreform, freemarket Soviet economy compared with the prereform artificially priced planned economy?

Figure 4.



Source: CPE\ERS\USDA and Roningen and Dixit

Table 6--Net trade quantity results for selected commodities under alternative scenarios

Item	Initial	Scenario 1	Scenario 2	Scenario 3	Scenario 4
			Metric tons		
Meat:					
Soviet Union	-796	-3,702	-1,258	-741	-1,950
CEE	1,207	2,342	2,371	2,532	3,533
Total	411	-1,360	1,113	1,791	1,583
Grain:					
Soviet Union	-27,900	-2,266	-2,670	-4,345	16,367
CEE	-3,630	-6,215	-6,257	-260	-870
Total	-31,530	-8,481	-6,927	-4,605	15,497
Butter:					
Soviet Union	-178	0	-15	46	178
CEE	34	92	82	117	37
Total	-144	92	67	163	215
Cheese:					
Soviet Union	-11	0	269	310	307
CEE	56	29	26	61	43
Total	45	29	295	371	350
Sugar:					
Soviet Union	-4,855	-10,333	-8,499	-8,110	-8,293
CEE	373	-259	-434	-193	193
Total	-5,028	-10,592	-8,933	-8,303	-8,046

Source: Economic Research Service, U.S. Department Agriculture and author's calculations.

To highlight the importance of the excess demand shifts used in the first scenario, I ran an alternative scenario without the excess demand shifts (tables 6 and 7). The main differences are most visible in the effect on world meat prices and the value of CEE net trade. In this second scenario, world prices decline by nearly twice the amount of the first scenario, mainly because meat prices decline rather than rise. This outcome highlights the importance of the underlying Soviet demand for meat. If planners have significantly suppressed real meat demand in the Soviet Union, then a postreform Soviet Union would provide significant

Table 7--Estimated agricultural gross domestic product and net trade under alternative scenarios

Item	Initial	Scenario 1	Scenario 2	Scenario 3	Scenario 4
		Million dollars			
GDP:					
Soviet Union	95,799	81,341	76,123	99,663	91,954
CEE	64,843	57,358	53,865	72,812	82,549
Total	160,642	138,699	129,988	172,475	174,503
Net trade:					
Soviet Union	-6,375	-10,520	-3,939	2,914	5,318
CEE	1,071	3,479	2,790	4,691	6,197
Total	-5,304	-7,041	-1,149	7,605	11,515
		Percent			
Net exports/GDP	-3	-5	-1	4	7

Source: Author's calculation.

impetus to world meat prices. But if the long Soviet queues for meat reflect more a concentration of macroeconomic imbalances that will dissipate upon reform, then world meat prices will fall.

Overall in scenario 2, the CEE net import bill drops 84 percent, to $1.2 billion compared with our baseline scenario result of $7.0 billion. This scenario also highlights the importance of the potential trading relationship between Eastern Europe and the Soviet Union. Soviet import expenditures drop over $6 billion, and East European exports decline $0.7 billion as a result. (I did not model bilateral relationships in the model; therefore, the effect on Eastern Europe could be even larger if such a relationship was specified.)

In a third scenario, I examined the possible effect of a substantial income decline in the region. Recent reports from Poland (and to a lesser extent Hungary) indicate a substantial decline in per capita income and per capita disappearance of most foodstuffs because of reforms. Although the decline in per capita income may be a statistical exaggeration, the decline in per capita disappearance is probably more accurately measured. This decline in disappearance probably also includes a sizable decline in per capita human consumption. While much of the decline in consumption reflects higher food prices, there also appears to be a substantial income

effect despite the potential statistical exaggeration.[7] Real income declines can probably be expected in all the CEE countries (reforming or not), and in this section we test the sensitivity of our model results to a 20-percent decline in real income.[8]

The results suggest that a 20-percent decline in income (and no excess demand shifts) would bring about even lower world prices than scenario 2 and a positive net trade balance for the region. Meat and grain prices plummet, resulting in a world price drop of over 7 percent. The Soviet Union remains a net importer, but has cut its import bill in half compared with prereform purchases (tables 6 and 7). Eastern Europe's net exports increase to $4.7 billion. To the extent that an income decline is greater, or income elasticities are higher, these effects could understate the positive effect of reform on food import expenditures.

In the fourth and final scenario, I examined the effect of sustained improvement in productivity growth (though conservative estimates) and income growth in addition to the one time shocks examined in the baseline scenario. The scenario accounts for growth in other countries' supply and demand (but no changes in their policies), again using an equilibrium price determined by world markets. Assumptions of sustainable productivity and income growth are somewhat beneficial to world prices and very beneficial to the CEE region's net trade balance (fig. 1 and tables 6 and 7). World prices would increase 2 percent, based mainly on a slight rise in meat and oilseed product prices. World grain prices fall, but by much less than their fall in the other three scenarios. Both Eastern Europe and the Soviet Union are predicted to be net exporters, despite the assumption of initial excess demand, moderate productivity improvements, and sustained income growth. Net exports are estimated at nearly $12 billion 14 years after reform, or 7 percent of agricultural GDP. This potential outcome suggests that if market style reform is successful, both the Soviet Union and Eastern Europe could return to their prewar status of net agricultural exporters.

How do the world price changes generated by the CEE reform scenarios compare with price changes generated by industrial market economy liberalization scenarios? Figure 4 shows the expected world price changes generated in unilateral policy liberalizations for the EC, Canada, United States, Japan, and other Western Europe as reported in Roningen and Dixit (1986) compared with the reform scenarios for CEE reported above.

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[7] That the CSE's discussed earlier are understated may also be due to an overvalued exchange rate.

[8] The average income elasticity in our model for the CEE countries and the U.S.S.R. is 30 percent. A 20-percent income shock would thus translate into a 6-percent demand shift.

While most CEE scenarios result in lower world prices, the scenarios for countries with industrial market economies result in higher world prices. In terms of size of effect on world markets, CEE reform tends to have bigger effects than either Canadian or other Western European liberalization. CEE reform effects on world markets generally lie somewhere between either Japan or U.S. liberalization.

Conclusions

The real incentive prices at work in the CPE's have probably worked against the stated goal of self-sufficiency. Market-style reform in the region may not necessarily result in a larger agricultural sector (at least for the commodities examined in this chapter) for the region. Eastern Europe appears to be able to increase net agricultural exports under relatively conservative reform conditions. The Soviet Union may increase net agricultural imports if there is a release of pent-up demand. If, however, the pent-up demand is offset by income declines or greater consumer price increases than assumed here, then Soviet imports will substantially decline. Over a longer period, the effect of effective market-style reform brings even the Soviet Union to a net export position.

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Chapter 9

Are There Lessons from the Polish Agricultural Reform that Are Applicable to the Soviet Union?

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Introduction

Although there are considerable differences between Poland and the Soviet Union[1], the similarities of the policy decisions faced by each make the Polish experience applicable to the Soviet Union. This chapter focuses on the role of agriculture in the transition, and the problems faced by the sector in the reform process. The effect of the stabilization program on agriculture in Poland was expected to be positive as real exchange rate devaluation and liberalized prices were anticipated to boost incentives to the sector. However, uncertainty and the oligopsony structure of agriculture stymied the expected beneficial effects. Nevertheless, the Polish experience still points to recommending full-scale liberalization in the Soviet Union along with a strict macrostabilization program. Under such a reform, privatization of agro-industry and land must come soon after the initiation of macrostabilization and price liberalization.

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[1] The world is changing at such a rapid pace that it is hard to know what to call any country. Between writting and publishing this article, the Soviet Union has become the Former Soviet Union. The issues and problems discussed are still very real today if somewhat more complex because of the breakup into separate republics.

Eastern Europe and the Soviet Union have begun an economic reform without precedent. From centrally controlled economies of varying degrees, these countries are embarking on the greatest economic and political transition of modern times. Economists and policymakers have few lessons or guidelines to assist these nations in making the transition. Experience and theory have been focused more on the end points, how planned versus market economies function, than on the actual transition from one to the other. Complicating the understanding of the transition is the heterogeneity of countries embarking on the reforms and the different starting points, from rigidly controlled economies such as in the Soviet Union to more mixed economies such as in Hungary. Lessons--even when tentative and frail--from the early stages of reforms must be gathered and offered to other countries to help guide their transitions.

In this chapter, I will describe the early stages of the transition in Poland, emphasizing the agricultural sector and using these experiences to draw some lessons for a similar but much later transition beginning in the Soviet Union. In some ways, this comparison may be strange because Poland and the Soviet Union have many dissimilarities. But, as I will attempt to demonstrate, the parallels are also remarkable.

The most evident difference between the countries are in their size and political makeup. Although, estimates in international currencies for the Soviet Union and Poland are only approximate, the gross national product (GNP) of the Soviet Union is about $500 billion and that of Poland is roughly $70 billion, according to the International Monetary Fund. Population sizes are about in the same proportion as GNP, 290 million in the Soviet Union and about 40 million in Poland. Thus, per capita incomes are roughly equal. The Soviet Union has been dominated by Communist rule for about 70 years with the population having few contacts with the West. Although in Poland communism was imposed by the outside for about 40 years, the Polish people had more access to the West. Furthermore, the Soviet Union is more diverse politically, consisting of 15 dispersed Republics with many ethnic groups. In contrast, Poland is more unified politically and has only minor pockets of ethnic populations.

The agricultural sectors in both countries are also different. In the Soviet Union, agriculture contributes about 25 percent of GDP, using about 20 percent of the workforce. In Poland, agriculture is much smaller, contributing only 12 percent of GDP but with about 25 percent of the

workforce living on farms although many are only part-time farmers. The structure of production is also different, with about 97 percent of the producing area in state or collective farms in the Soviet Union and only about 20-25 percent in Poland. Furthermore, the private landholdings in the Soviet Union are tiny, only about a half a hectare, while in Poland land is held in small to medium-size holdings averaging 6-7 hectares.

There are also institutional differences between Soviet and Polish agriculture. Although both governments had state orders for supplying planned agricultural output from state farms, the Polish authorities relied more on price as an inducement for production because of the larger private farm sector. Poland also had a long tradition of cooperatives handling marketing and some processing although this tended to be dominated by the nomenclature. In the Soviet Union, the state handled all state orders and procurement with only small quantities entering private channels.

Although there are substantial differences, there are also considerable similarities in the two countries' starting points in the reform process. In the initial stages, both face difficult macroeconomic situations, both have highly distorted relative prices, and both had state-controlled trade and even internal commerce. Furthermore, in both cases, agro-industry and processing are in the hands of the state and, while the state farms in Poland hold a smaller proportion of the total land, both countries must deal with state landownership to get agricultural growth (in Poland, the state farms produce most of the marketable surplus of grains). Also, both countries have difficult housing problems that limit mobility of labor. Finally, any adjustment in either country must deal with the safety net for millions of displaced workers and low or fixed income families.

These similarities in at least the policy decisions that their governments face make the Polish experience at least somewhat applicable to the Soviet conditions. Furthermore, Poland's dramatic stabilization steps and the severe effect on output are often stated as reasons that a similarly striking step would not be possible in the Soviet Union. Yet the international task force of the International Monetary Fund (IMF), International Bank for Reconstruction and Development (IBRD), European Bank for Reconstruction and Development (EBRD), and Organization for Economic Cooperation and Development OECD) essentially recommended rapid and comparable dramatic steps for the Soviet Union but with certain modifications derived at least in part from the lessons of the Polish experience (Konovalov, 1991). How could they recommend similar steps when in some respects the Polish reforms are

considered to have not achieved the results that were first hoped for? In this chapter, I explore why the Polish case does indeed lead to a conclusion that rapid adjustment will also be needed for the Soviet Union. I begin by describing the Polish case, derive some general lessons from it, and then apply them to the Soviet case.

Poland's Macroeconomic Crisis and Stabilization

The government that took power in September 1989 faced an extremely difficult economic situation. Inflation was accelerating at triple-digit rates, fueled in part by a massive budget deficit equal to 8 percent of GDP. External debt amounted to 80 percent of GDP; debt servicing equaled five times export earnings. Growth had stagnated with per capita income now lying below 1978 levels while government expenditures had grown by over 30 percent in real terms in the last decade.

Complicating the macroeconomic situation was the structure of the economy. Over 70 percent of the industrial sector was owned by the state. Exports were canalized by a few large enterprises that had survived on massive export subsidies. But even more critical was the nature of decisionmaking in these firms. In 1981, the Polish parliament gave wide powers to the workers' councils, among them the power to hire and fire management. Management and labor had merged into an explicit collusion, with the government, the nominal owners of capital, having lost control of costs and production yet retaining the ultimate obligation to fund the losses of these enterprises. Because of large subsidies to state enterprises and a substantial fall in revenues, the fiscal deficit reached 29 percent of budget expenditures in the first half of 1989.

The government had then inherited in the fall of 1989 an essentially bankrupt economy, unable to service its debt, a macroeconomic freefall, and a state sector outside of its control. It had few options. Over 40 years of Communist rule had culminated in a rigid economic structure and in macroeconomic ruin.

The new government decided to launch a critical two-pronged attack on the unstable economy. In the first part of this strategy, the government attempted to gain control over the budget and prepare for the next phase by making some institutional and legal changes, mainly introducing

unemployment compensation and bankruptcy procedures. On January 1, 1990, the second phase of the program was launched. The crux of this phase of the government's program was a standard IMF-type stabilization package: fiscal and monetary restraints, a wage freeze, and a massive devaluation followed by a fixed nominal exchange rate to serve as a nominal anchor. The stabilization package was designed to bring down inflation rapidly and to put pressure on inefficient state enterprises. With budgetary constraints in place, the government expected that the market would select inefficient state enterprises for bankruptcy and initiate the rationalization of the state sector. Unemployment was expected to rise, but this could be viewed as a sign of the success of the process; enterprises would be shedding excess labor and improving control over its wage bill. With improvement in efficiency and reduced costs, the cost-push part of inflation would be brought under control. Following macroeconomic stability, the real adjustments in the economy were expected to follow through a gradual process of enterprise restructuring.

Agriculture's role in this stabilization program was envisaged to be threefold. First, it was expected to respond rapidly to the new incentives. Agriculture, largely a private sector, was expected to follow the incentives of higher relative prices and deliver food to urban areas at prices closer to world prices. Although higher food prices would mean falls in real wages, these drops would be moderated by the increased availability of both greater quantities and varieties of food. Furthermore, the hidden costs of food--waiting in long queues--would be eliminated. Second, agriculture was expected to boost exports, easing pressure on the balance of payments. Although export subsidies were eliminated, policymakers expected that about 80 percent of remaining exports would be competitive at world prices. Furthermore, the devaluation of the real exchange rate would compensate for the loss of export subsidies. And finally, agriculture would hold back rural-to-urban migration and perhaps absorb some of the unemployed from the industrial sector. With about 50 percent of the small farm population being part-time farmers employed in local state enterprises, a more prosperous agricultural sector was expected to absorb some of these displaced workers.

The Actual Outcome of the Stabilization

By most macroeconomic indicators, the stabilization program was a great success. Inflation crumbled under the stringent monetary and fiscal restraints from a monthly rate of 79 percent in January, to 24 percent in

February, and to about 5 percent in May. Budgetary controls and increased revenues (from several reforms on enterprise taxation) produced a budgetary surplus, projected to be between 1 and 3 percent of GDP. Monthly interest rates followed the decline in inflation, undershooting inflation in January but becoming real and positive in February by 14-16 percent and falling to 1-4 percent in May. The massive devaluation of January of about 100 percent (compared with the December rate) held, zlotys became readily convertible in Poland, and foreign exchange reserves expanded. Driving the foreign exchange accumulation was a contraction in imports and a rapid expansion of exports (imports fell by 27 percent, and exports expanded by 14.5 percent from convertible currency areas in the first 5 months of 1990).

But, there were also signs of trouble. Real wages fell by 40 percent in the first quarter of 1990. Output declined by 30 percent in the socialized sector (29 percent below its level in May 1989).[2] Food expenditures rose from about 39 percent to 55 percent of total expenditures (compared with the first 4 months of 1989), reflecting the immediate pressure of food price rises on household real income. Unemployment, however, did not increase as expected. By the end of April, unemployment stood at only 2 percent of the labor force. Only a few firms had declared bankruptcy. Nevertheless, real debt increased rapidly by 12 percent in March, 18 percent in April, and 3 percent in May. Also, there were various reports of delayed payments between firms. The restructuring program apparently had not hit the state enterprises; labor was largely being retained, and enterprises were somehow holding on despite the magnitude of the macroeconomic adjustment.

The signs of problems with the macroeconomic program were most evident in the agricultural sector where the greatest successes were hoped to have come. The very strengths of the agricultural sector that were to lead to its success--its largely private nature and its ability to respond quickly to incentives--rapidly mirrored the difficulties facing the macroeconomic adjustment program. Agriculture was unable to achieve stability and a supply response through macroeconomic policies when the real structure of the economy remained distorted and economically concentrated.

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[2] These numbers may overstate the severity of the fall as production in the private sector is not recorded.

The Effect of the Economic Program on Agriculture

Agriculture in Poland is a small sector, contributing only about 12 percent of GDP. Thus, agriculture would seem most likely to be affected by the economic program but would not in turn influence the programs' success. But this expectation is turning out not to be the case. The effect of the economic program is straightforward. With the domestic market consuming about 87 percent of agricultural production, one could expect that the macroeconomic program and the resulting sharp recession to significantly affect the market for farm products and hence the sector's economic well-being. But agriculture also has strong feedbacks to the general economy through employment (28 percent of the workforce) and by affecting the real wage rate (food expenditures range from 35 to over 50 percent of all expenditures depending on income class). Furthermore, about 20 percent of industrial output comes from agro-industries, which in turn depend on domestic agriculture for 90 percent of their raw material. The agricultural sector is, thus, more important to the economy than its economic size would indicate.

When the economic program began, the agricultural sector was highly protected and subsidized. From 1986 to 1989, food subsidies were 3.4 to 4.8 percent of GDP. Although part of this subsidy was nominally for consumption, it was in part brought about by high producer prices. For example, producer prices for wheat during the late 1980's ranged from 10 to over 30 percent above equivalent border prices. For the state sector which produced most of the marketed wheat, the price support was even higher, averaging about 50-60 percent greater than world prices. The producer support was nearly equally generous, from 24 to 50 percent above world prices depending on the year. As with wheat, the support was concentrated in the state sector. This support through output prices was supplemented by input subsidies for fertilizers, pesticides, and animal feed at about 1 percent of GDP. Credit subsidies also were provided to the agricultural sector. Furthermore, export subsidies were given for certain commodities at a rate often half the value of the goods exported.

Aggregating these subsidies for the different crops results in what is referred to as the producer subsidy equivalent (PSE) or the total income supplement offered farmers and the state farm sector. In the state sector for wheat, this PSE constituted nearly 70 percent of the value of the wheat produced; for rye, about 50 to 70 percent; for sugar, about 50 percent; for rapeseed, about 40 to 50 percent; for pork, about 40 percent;

for milk, about 40 to 80 percent.[3] In other words, support for agriculture and processing on a per unit value basis was about at the level of many industrial economies. Agriculture, especially the state sector, was sheltered and heavily subsidized. In 1988, average farmers' income exceeded that of urban workers by 17 percent (compare this figure with Hungary and Yugoslavia where farmers' incomes are below those of urban workers by 4 percent and 20 percent). [4]

The subsidies ended abruptly with the macro-stabilization program and the reduction of state expenditures. Food subsidies fell from about 4 percent of GDP in 1989 to less than a budgeted 0.2 percent for 1990. Agricultural input subsidies declined from 1.3 percent of GDP in 1989 to 0.3 percent in 1990. Furthermore, credit subsidies and export subsidies were nearly eliminated. In less than a year, a once highly supported agricultural sector (with support near Western European standards) had been released to survive in a deeply recessionary economy, still struggling to establish a market economy.[5]

The devalued exchange rate should have partly compensated for this near elimination of direct subsidies. The real exchange rate (the nominal exchange rate corrected for inflation) fell by nearly 50 percent compared with its 1989 level. If this devaluation had been transmitted to farmgate prices, then the net effect would have been a much more neutral adjustment in producer support.

But the price transmission did not occur in part because of deliberate government policies and in part because of economic concentration in agro-industry. With inflation running rampant, the cooperative structure

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[3] Some caution should be exercised in interpreting PSE numbers for Poland as the exchange rate is a confounding factor. However, if estimates of the real exchange rate from the World Bank and IMF are used to correct the PSE numbers, then the level of subsidization actually increases for 1987 and 1988 because these estimates point to an undervalued exchange rate (compared with 1980) for those years. During 1982-85, the exchange rate was overvalued (compared with 1980); subsidies helped to compensate for this overvaluation in those years.

[4] However, in the first quarter of 1990, farmer's income was 86 percent of other workers' income.

[5] This dilemma is most evident in the dairy sector where subsidies reached nearly $1 billion in 1988, fell to $70 million in 1989, and nearly disappeared in 1990. The dairy sector contributes 19 percent of agricultural GDP and provides an important source of cash to over 1 million small farmers.

in disarray (the cooperative unions were dissolved), and a collapse in real producer prices, farmers withheld grains from the market in early and mid-1989 (for the first 9 months of 1989, agricultural supplies to cities were reportedly down by 30 percent). The specter of a food shortage in urban areas created a deep concern to the government. Exports of essential foodstuffs were prohibited and food aid urgently procured. With the blockage of exports, the arrival of food aid, and the sales of farmers to the milling industry increasing (because of the cooling down of inflation and rising interest rates), scarcity quickly turned to abundance. Exacerbating the situation was the decline in domestic food consumption brought about by rising retail food prices and declines in real income. Stocks of grains and milk products accumulated, and farmgate prices plunged. Because of low demand for agricultural inputs, animal feeds and fertilizer sales also sharply declined.

Further aggravating the fall was the behavior of the agro-industry sector. Although the grain industry (the grain monopoly was broken up into 41 separate companies) and the milk industry seem to be quite fragmented and competitive, at the local level they are highly concentrated. Years of accumulated collusive behavior (encouraged by past governments to meet the objectives of a state coordinated sector) continued after prices were liberalized and most subsidies removed. The breakup of national monopolies created local monopolies, and a system of cost-plus pricing continued. Instead of lowering prices to encourage sales, agro-industry restricted throughput, raised selling prices, and forced back on producers (through lower purchase prices) most of the industry's higher per unit operating costs. Wheat prices fell to 60 percent of the border price, oilseeds to 80 percent, pork to 70 percent of its export price, and cattle for slaughter to 59 percent of its f.o.b. export price. The ratio of flour to wheat prices rose from about 3 to 1 on January 1, 1990, to 6 to 1 by the end of June 1990. Heavy government support to agriculture had turned to indirect taxation through export controls, food aid, and oligopsony behavior.

The government, recognizing the rapidly deepening farm crisis, released the ban on most agricultural exports except grains, where it remained bound by its food aid agreements to prevent reexport. For butter given as food aid, the government canceled its request seeking the substitution of feed corn. But the crisis was now deeply imbedded in the sector. Meanwhile, the flush season for milk began, and the grain harvest began to loom on the late summer and fall horizon. High nominal and real interest rates made stockholding extremely expensive, adding to the indebtness of agro-industry. Dairy cooperatives, the potato industry, feed

mills, sugar processors, and part of the horticultural industry were particularly hard hit. Farmers and some state farms, fleeing high interest rates and debt, quickly sold off durable goods and farm implements. Most dairy farmers received only extremely low and delayed (sometimes for months) payments for their milk. Agriculture, the only largely private sector in Poland, had been brought to its knees. But to rescue agriculture through subsidies meant the opening of the floodgate of subsidies elsewhere in the economy as the austerity program began to take hold in other state sectors. In a collective consciousness, state managers seemed to be contemplating the day of restitution of their state enterprises by the government. Macroeconomic stability was being threatened by the problems of a relatively minor sector (in terms of GDP), agriculture.

The Structural Roots of the Polish Farm Crisis

In the 1980's, the government's vision of agriculture was based on income parity and self-sufficiency. Farmers should receive prices that guarantee an income commensurate with urban wages. Furthermore, imports and exports should be restricted so that Poland would become food self-sufficient. This policy produced a highly distorted sector that was unable to follow its natural economic progression; that is, one that would produce a diminishing share of GDP with a lower portion of the workforce (agricultural employment remains extraordinarily high at about 25 percent of the labor force for an agricultural sector producing only about 12 percent of GDP). Furthermore, these subsidies preserved a sector where many of the private farms were of uneconomic size.

Almost at the onset of the reform process, the agricultural sector faced a new reality, of market forces and world prices. The sector was impeded in adjusting to this new reality by the size of private farms and by the physical conditions of its production: land of only moderate fertility and a short growing season. Two other major impediments also hindered adjustment of the agricultural sector: the state sector and its control of food processing and inputs and the formidable external barriers facing its agricultural trade.

The State-Controlled Agro-Industries as Barriers to Growth

In Poland, as in most countries, the efficiency and productivity of agro-industry is as critical to agricultural performance as good farm technology and management. In Poland, an estimated 75 percent of food is processed, and almost all agricultural inputs come from domestic industry. Between these "upstream" and "downstream" industries lies agriculture. Its farmers depend on the efficient and competitive operation of food processing and distribution for their share of wholesale food prices. Farmers also require high-quality, low-cost inputs such as seeds, fertilizer, and other chemicals from their input suppliers. Without the efficient operations of these industrial sectors, agriculture is helpless and, investments in improving farm productivity are nearly useless.[6]

Agro-industry in Poland is grossly inefficient and generally unresponsive to market forces. In terms of factor productivity growth, food processing ranked second to last in a sample of 17 industrial groups, with a decline in annual growth of 5.1 percent in productivity from 1978 to 1982. With the overall resurgence in output growth between 1982 and 1985, food industry productivity growth became positive at 1.2 percent but still ranked second to last in growth. In terms of international comparisons of competitiveness (as measured through domestic resource coefficients (DRC's), the food industry displayed the least international competitiveness of all of Poland's industries (table 1). In fact, the DRC measure for food processing was negative, indicating that the value of inputs exceeded the value of output when measured in world prices.[7] Furthermore, many processing plants were generally 15 years behind in technology.

This lack of efficiency shows up in other measures. In a 1988 sample of 500 of the largest State-owned industrial enterprises, about 10 percent lost money in the absence of subsidies and taxes. Of this 10 percent, about 90 percent were in the food processing industry. Of other industries with losses, about 70 percent supplied agricultural inputs, animal feeds, and fertilizer. While part of the losses is attributable to

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[6] The reverse is also true: agro-industry depends on the efficiency of agriculture. This fact also has broader economywide implications because the food industry share of all industrial output is about 20 percent, of convertible exports 13 percent, and of employment roughly 10 percent.

[7] There was considerable variability of results with the dairy and meat industry being the least competitive and soft drinks and milling products being more competitive.

Table 1--Domestic resource coefficients (DRC's) and value added, Poland, 1986

Industry	Value added, domestic	Value added, world prices	Shortrun DRC's	Longrun DRC's
			Coefficients	
Metallurgical	15,411	5,785	1.15	4.00
Electro-engineering	89,208	70,802	.55	1.32
Chemical	23,581	18,786	.41	1.25
Mineral	8,981	9,177	.49	1.05
Wood and paper	9,226	8,399	.54	1.04
Light	40,601	30,373	.61	.01
Food	6,048	-3,803	-1.47	-3.40
Total	193,226	139,518	.62	1.45

Source: Konovalov (1989).

price controls, a major contributor must also be assigned to the agro-industries' inefficiencies and antiquated technologies.

Beginning in August 1989, the government began to liberalize prices with the objective of allowing the market to determine which firms are efficient and which are not. The drive for efficiency through price liberalization confronted another barrier, the oligopoly structure of agro-industry.

Agro-industry is highly concentrated, both on an aggregate level and on a regional level. For example, in a 1987 sample, two firms had 47 percent of the market in food concentrates, 41 percent in oils and fats, 51 percent in potato products, 30 percent in vegetable and fruit products, and 30 percent in sugar products (table 2). In other industries, such as dairying, milling, and meat processing, the two-firm concentration ratios were lower (in the range 2 to 20 percent of the market), but these low percentages concealed the regional oligopsony nature of the firms. With transport difficult to obtain and costs high, single buyers dominated many regional markets. Also, there is considerable possibility of collusive

Table 2--Economic concentration of state-owned firms, 1987

Industry	Share controlled by-- One firm	Two firms	Four firms
		Percent	
Outputs:			
Food concentrates	31	47	n.a.
Oils and fats	28	41	66
Potato products	27	n.a.	n.a.
Fruit and vegetable products	23	31	40
Flour milling products and pasta	9	14	24
Eggs and poultry	8	15	28
Milk and milk products	2	n.a.	n.a.
Sugar and sugar products	19	30	51
Inputs:			
Tractors	90	96	n.a.
Fertilizer	22	43	73
Farm machinery	15	23	35
Animal feed	14	26	51

Source: Rocznik Statystyczny Przemyslu, 1988.
n.a. = Not applicable.

behavior among these state enterprises. One of the legacies of central planning is that many enterprise directors and managers are accustomed to formal and informal economic coordination.

Despite a dramatic fall in throughput and increasing indebtness of enterprises, few agro-industrial enterprises have gone bankrupt and few have significantly reduced their labor force. With workers' councils having the right to select and fire managers and the state still the nominal owner and thus, eventually, obligated to bail out failing enterprises, no manager has the incentive to reduce his or her labor force or close the enterprise. In many ways, price liberalization has contributed to the worst case scenario: inefficient, oligopoly, and oligopsony enterprises pricing largely as they wish to compensate for lower output and not reducing costs. The agricultural sector cannot be healthy while it is hostage to such an uncompetitive and inefficient agro-industry.

Lessons from the Polish Experience for the Soviet Union

Several lessons are applicable to the Soviet Union, especially if consideration is given to the similarity of the macroeconomic conditions of the Soviet Union in 1990 and with those in Poland in 1989 and the beginning of 1990. In the winter of 1990, Soviet policymakers faced a similar situation as the authorities in Poland found themselves in the fall of 1989. Growth for nearly a decade had been slow or nonexistent. The macroeconomy had deteriorated, with the fiscal deficit growing from about 2 percent of GDP in 1986 to about 8 percent. Furthermore, tremendous inflationary pressures existed. Broad monetary expansion had been at a rate of nearly 15 percent from 1986 while prices had barely increased. With commodities scarce and prices fixed, this monetary expansion put pressure on the supply system for major cities. Unsatisfied demand resulted in accumulation of rubles to possibly 50 percent of GDP. This monetary overhang and the increasing budget deficit carried with it the prospects of hyperinflation. A worsening trade deficit and a growing external debt complicated the decisions that Soviet policymakers were facing. Postponement of dealing with this situation was only worsening the economy.

The lesson from the Polish experience in dealing with macroeconomic crisis is that hyperinflation under such circumstances when coupled with highly distorted relative prices will be inevitable and even desirable. In turning from a controlled economy to a market economy, relative prices must adjust on some items by more than 1,000 percent (some by 10,000 percent). Because a downward movement in relative prices and nominal wages is nearly impossible both politically and economically given the accumulated inflationary pressures, large movements in absolute and relative prices are inevitable. These movements will be dramatic but ultimately controllable as they are largely step adjustments. The trick is matching monetary and fiscal policies to the necessary price adjustment. If monetary policy is too tight, then the fall in output and rise in real interest rates will be severe, as in the case of Poland. But if fiscal policy is lax, the initial price adjustment will feed upon itself and the overshoot will be large. If the stabilization comes while prices are rigidly controlled, the accumulated inflationary pressure and the need for a relative price adjustment will still exist, waiting the final decontrol and with it the strong probably of failure of the stabilization program.

In a manner similar to the Polish authorities' pre-August 1989 action to liberalize most food prices, the Soviet's are considering whether to administratively raise prices or to liberalize them under their stabilization program. The Soviet authorities fear both the inflation and the political reaction to an uncontrolled adjustment in prices. Poland, before its liberalization of food prices, tried to administratively adjust prices upward. But with inflationary pressures already strong, this action proved to be only a temporary step while keeping the government at the political center for pressures to reverse price changes. Full-scale liberalization, both economically and politically, was inevitable.

In the Soviet Union, full-scale liberalization will also be inevitable, primarily because it will be the only way to dissipate the inflationary pressures from the monetary overhang and to get relative prices somewhat in line. The key in the Soviet case will to ensure that the budget deficit is simultaneously eliminated while monetary policy is even somewhat accommodating to the price adjustment.

Another lesson from the Polish experience is that price liberalization will not induce an agricultural supply response in itself either in the very short term or the longer term without other steps. The short-term supply response will not be forthcoming because of the uncertainty created by hyperinflation. Farmers and state farms would rather keep real assets than money (especially if it is not convertible to hard currency) in such an inflationary environment. Until the inflation subsides or is stabilized even at relatively high rates, the supply of even existing stocks will not be forthcoming. Thus, policymakers find themselves in the worst of all worlds: higher food prices without supplies to the stores. Polish authorities turned to food aid that eventually proved excessive and contributed to the collapse in farmgate prices. The key lesson is that supplies must be made available, and these need to be either stocked from domestic sources or imported. Once the back of inflation is broken and supplies do come forward, then any excess supplies must be reexported or held in storage. Food aid agreements must allow for reexport.

The longer term supply response will also not be forthcoming if the monopoly structure of agro-industry is not dismantled or deregulated. Only one solution ultimately remains: massive privatization backed with import competition. As was the case of agriculture in Poland, if subsidies to the sector are also eliminated with the liberalization, the sector will face higher input prices and an oligopsony structure on its output. These prices increase on the inputs, and the lower output prices caused by lack

of competition and elimination of subsidies will crush the sector. Reentry of the government and resubsidization will be inevitable. In the case of Poland, intervention was inevitable; the key was to design the intervention in a way that was least obtrusive and least costly.

For political sustainability, a safety net is also desirable and perhaps necessary. Poland had not much of a compensation package in place when it began the reform program. Unemployment, however, did not emerge as quickly as expected because of the ability of enterprises to avoid the budget constraints, at least in the short run. Furthermore, many Poles held cash reserves in hard currency which they could use to buffer the initial price hit on food. But, a safety net will eventually be needed as unemployment and real wage cuts become sustained. The safety net should ideally be in place before the program begins, but some slack time is built in through the lethargy of state enterprises in ridding themselves of workers and through various means of avoiding nominal wage restraints.

Finally, the state farms must be dealt with upfront but in as least disruptive a manner as possible. In the case of Poland, the government decided to avoid the issue of dismantling state farms for as long as possible. The government had no way to deal with the excess of farmworkers, especially considering that housing was not available in cities. Furthermore, the government feared that production would be disrupted and the marketed surplus would disappear. But, we know that public farming does not work. State farms must be dealt with in a manner that does not permit the excessive fragmentation of landholding. The task force on the Soviet Union made some specific recommendations that are equally applicable to Poland. The Polish authorities will need to deal with the state farm issue soon or the failure to do so could be added to the lessons from the Polish experience. The government should ideally privatize state farms in conjunction with a privatizing of industry.

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Chapter 10

Common Agricultural Policy Rebalancing

The Basis For Possible Agreement

James Gleckler*
Luther Tweeten**

Introduction

The European Community (EC) is the world leader in oilseed consumption. The 1962 Dillon Round of GATT provides foreign oilseeds free access to Community consumers at world prices. Oilseeds as a feed component became very important as the Community livestock sector expanded. High support prices for livestock products and grain have shifted demand toward oilseeds and shifted domestic production away from oilseeds. These distortions are of primary concern to European Community policymakers who want to "rebalance" market protection and support away from grains and toward oilseeds. The rebalancing issue is central to the negotiations on agricultural support reduction in the GATT. If there is a rebalancing formula to which the United States might agree, it would have to leave U.S. producers no worse off. We

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used a world trade simulation model to estimate the welfare effects of several rebalancing schemes. Results show that rebalancing with European price supports reduced 20-25 percent leave U.S. producers no worse off in the short term.

The 1962 Dillon Round Concession committing the EC to duty-free bindings (no restrictions) on oilseed imports was given by the EC in exchange for allowing trade barriers in the newly formed Common Agricultural Policy (CAP) to protect high domestic price supports on grains from foreign imports. CAP border measures isolated the high supports from world markets.

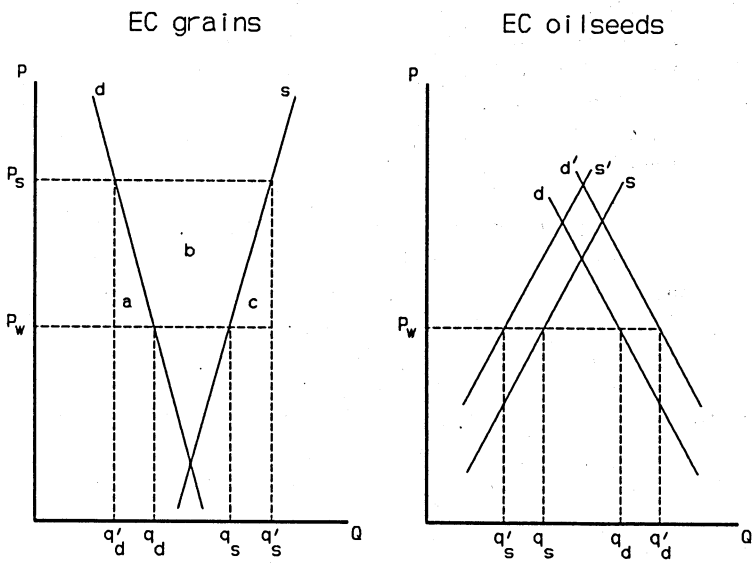
The EC was a net importer of major farm commodities in 1962. Grain exporting countries did not foresee that the high grain price supports and increased productivity would eventually give the EC a major grain surplus which would, in the absence of production controls, receive massive export subsidies. Duty-free access of oilseeds and corn-gluten feeds reduced opportunities to feed excess EC grains to livestock. With the chance in the 1990's to renegotiate the Dillon Round, the EC would probably not agree to exclude oilseeds from its CAP nor would the United States agree to no limits on export subsidies to dispose of EC grain surpluses.

Rapid expansion of the EC livestock sector has made oilseed components of feeds very important. The EC is the world leader in oilseed consumption and oilseed imports. The Community would like to extract the internal farm income and price stability benefits of variable levies and reduce internal competition from cheap protein feeds in this huge market, but has been unsuccessful thus far.

Farm income benefits, stability, and levy receipts are not the only reasons for desiring change. The left panel in figure 1 illustrates the high supports and isolation achieved by EC border measures in most commodities, including grains. High domestic market price support (P_s) in excess of world market price P_w has decreased consumption (q_d to q_d') and increased production (q_s to q_s'). EC agricultural officials perceive that extensive market support in grains and other crops has caused inconsistent distortions in the grain sector and in the unprotected oilseed sector. Increased production in grains has shifted production away from substitutes such as oilseeds, reducing supply s to s´ (right panel of figure 1). High prices for grain components of feed mixes have also shifted demand toward nongrain ingredients such as oilseeds, raising oilseed

Figure 1

Oilseed distortions from EC market price support to grains



demand d to d′. These distortions have increased oilseed imports from q_d-q_s to q'_d-q'_s. High levels of livestock production support have increased demand for both grains and oilseeds.

In addition, export subsidies on grains, area a+b+c in the left panel, have become very demanding on the CAP budget. Prohibition of oilseed import restrictions precludes tariff receipts to help balance the CAP budget.

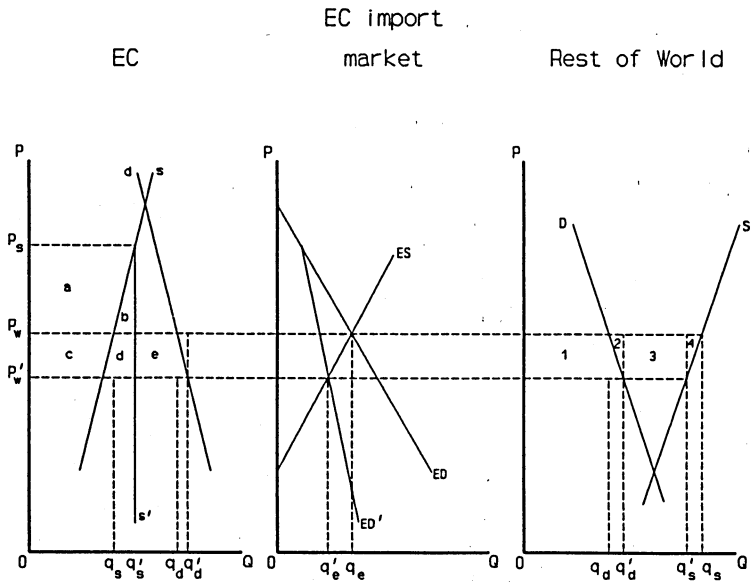
The European Community would like to retain grain support and export subsidy opportunities while pulling oilseeds inside the CAP barriers, but other countries in the GATT have rejected this option. The EC solution has been an oilseed import substitution policy in the form of a processor subsidy which allowed a premium to be passed on to Community producers. This premium was expanded many times in the 1980's and resulted in a doubling of oilseed production in the Community between 1982 and 1987 (Gleckler and Tweeten, 1990a).

Common Agricultural Policy Rebalancing:
The Basis for Possible Agreement

The producer subsidy is illustrated in figure 2. The EC subsidized price P_s in the left panel shifted the domestic supply from s to ss′. EC demand shifted from ED to ED′ in the center panel and world price fell from P_w to P_w' which hurts producers in the rest of the world, such as U.S. farmers (loss area 1+2+3+4, right panel). EC oilseed consumers, still able to purchase at the world price P_w', benefited by area c+d+e and producers by area a compared with a free market equilibrium at P_w. European taxpayers must spend area a+b+c+d to support the policy. Instead of generating levies like other EC imports, the oilseed policy further strains the CAP budget. Even with this producer subsidy, the distortions from not having oilseeds inside CAP barriers are not fully removed. Feed processors purchasing oilseeds at world prices (P_w) continue to find them a bargain compared with highly protected grains.

Figure 2

EC oilseed producer subsidy



In December 1987, the American Soybean Association (ASA) filed a section 301 unfair trade petition against the European Community. The petition alleged that the EC oilseed subsidy constituted a thinly disguised import barrier. The GATT Dispute Settlement Panel ruled in December 1989 that the European oilseed subsidies violate GATT trading rules and discriminate against oilseed imports. In view of this most recent development, the producer subsidy must be eliminated unless multilateral negotiations approve the subsidy as part of a broader agreement that could reduce EC grain export subsidies.

EC policymakers describe a move toward equal levels of market support across all related commodities as "rebalancing." Community leaders would prefer to rebalance oilseeds at high levels without disturbing grain and livestock supports. Such a plan is unlikely given the opposition of exporters including the United States. In recent meetings of the Uruguay Round of GATT, EC negotiators have been pressing a rebalancing proposal which would bring oilseeds behind CAP barriers while concurrently lowering all commodity supports a uniform amount. If export subsidies were cut sufficiently, EC rebalancing might be acceptable to the United States and other exporters.

In the context of negotiations, an acceptable solution might be one in which U.S. producers are at least no worse off after rebalancing. At issue is whether such a rebalancing solution exists. Given present oilseed subsidies, that rebalancing at reduced support levels would probably not leave EC producers indifferent without direct income compensation.

Conceptual Framework

Conceptual models in figures 3 and 4 depict the effects of incorporating oilseeds in the CAP system of variable levies and of lowering market supports for grains. In figure 3, the processor subsidy (assumed to be passed to producers at price P_s) is replaced by uniform market protection for grains and oilseeds. The EC domestic support price P_s, assumed to be at the same level as the former domestic processing subsidy, determines both consumption and production. Demand shifts from free market curve d to dd′, and imports fall from q_d-q_s to q_d'-q_s. Reduced imports lower world price to P_w'. European producers are not affected but consumers lose area a+b+c+d. The position of European taxpayers changes from

Figure 3

EC change from oilseed producer support to full market protection

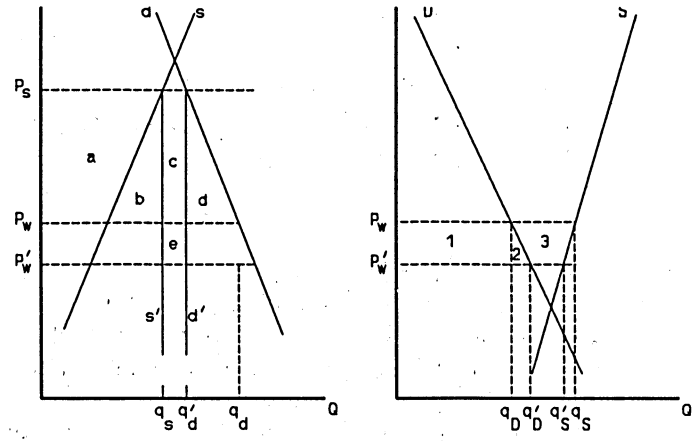
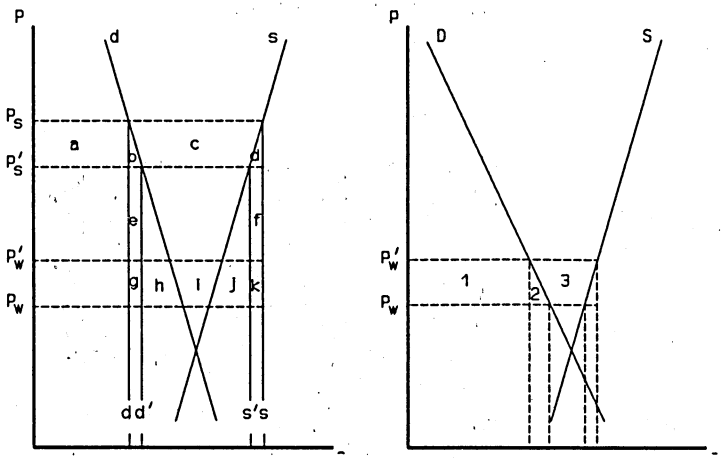


Figure 4

Effects of EC grain export subsidy reduction



paying the area a+b to collecting levies c+e. The lower world price benefits U.S. oilseed consumers by area 1+2, but producers lose area 1+2+3 in the right panel.

Figure 4 depicts a lower level of intervention in the EC grain market. The CAP support price is lowered from P_s to P_s'. European consumers benefit by area a+b while producers are worse off by area a+b+c. Taxpayers benefit by area b+c+d+e+f+g+h+i+ j+k. The increased receipts evident in figure 3 and the savings in export restitution from figure 4 potentially could enable the EC to directly compensate producer losses with a decoupled payment without further budget expenditures. World grain price rises from P_w with the current policy to P_w' from lower EC grain exports in figure 4 benefiting U.S. producers by area 1+2+3. U.S. consumers are worse off by area 1+2.

The conceptual framework does not reveal whether the reduced level of EC oilseed imports and grain exports will balance losses to U.S. oilseed producers (fig. 3) with gains to U.S. grain producers (fig. 4). The simplified partial equilibrium conceptual model does not account for individual country impacts or interactions among commodities. These are best analyzed with a mathematical international trade model. Impacts of rebalancing are quantified for the EC and the United States in the next section.

Empirical Analysis

We estimated the effects of including oilseeds in a rebalanced CAP using a seven-region world trade model incorporating the assumptions of neoclassical trade theory (see Roningen, 1986; Sullivan and others, 1989; and Gleckler and Tweeten, 1990b for descriptions of the model). Data for 1989 were used to initialize the model. Results reflect changes from 1989 conditions and are in 1989 prices. The behavioral coefficients apply to an intermediate-run period of 4 to 5 years, other things equal. The model simultaneously estimates changes in markets for nine commodities: beef, pork, poultry meat, wheat, corn, other coarse grains, oilseeds (principally soybeans, rapeseed, and sunflower seed), oilmeal, and sugar. Substitutability and complementarily among commodities are accounted

for in behavioral equations. Acceptable solutions in the context of negotiations focus on net change in U.S. producer welfare.

EC rebalancing was represented in the empirical analysis as a uniform percentage reduction in price support of grain, oilseeds, and livestock products with oilseed and oilmeal markets fully incorporated inside CAP barriers. Actual supported prices in 1989 ranged from 115 percent to 166 percent of the world market price (table 1).

The oilseed processor subsidies are assumed to be terminated, bringing producer and consumer prices to the same level realized by producers in 1989 with the processor subsidy. With both the variable levy oilseed revenue and termination of processor taxes adding to government revenue, the CAP fund is much enhanced. The percentage reductions in table 2 and subsequent tables are reductions of consumer and producer prices from levels realized by producers in 1989.

Price support reductions of 0 percent (where oilseed markets were brought inside the barriers without any reduction) to 30 percent were simulated with the model. The 0-percent simulation estimates a possible outcome if the GATT negotiations break down completely. The 15-percent simulation resembles the EC proposals to the GATT in 1990 for

Table 1--1989 actual EC price support as a percentage of world market price

Commodity	Relationship of world market price
	Percent
Beef	115
Pork	120
Poultry meat	138
Wheat	144
Corn	166
Coarse grains	128
Oilseeds	147
Weighted average	140

Source: Unpublished data from U.S. Department of Agriculture.

Table 2--Producer surplus change at different levels of EC rebalancing

Uniform reduction of price support for meat, grains, and oilseeds	Producer surplus change for all commodities		
	United States	EC	Rest of world
Percent	*Million dollars*		
0	-948	751	-2,539
15	-308	-2,003	-175
20	-84	-2,910	651
25	142	-3,796	1,446
30	368	-4,675	2,281

reducing support. The 30-percent reduction simulates the Hellstrom proposal presented at Brussels in December before negotiations were called off.

As estimates of the producer surplus change in table 2 indicate, U.S. producers are hurt substantially by incorporating oilseeds into the CAP without accompanying reductions in support. However, as European support is reduced between 20 and 25 percent, U.S. producers become indifferent overall to the changes. In other words, the simulations indicate that some EC rebalancing scheme might be acceptable to the United States. The redistribution of benefits among producers would influence their receptivity to such a scheme. EC producers benefit from the simple inclusion of oilseed markets inside the CAP (0-percent reduction). But, as overall import barriers are reduced, EC producers incur substantial losses. The pattern of gains to commodity producers outside the United States and the EC parallel those of U.S. producers over the range of EC support reductions.

Tables 3 through 7 detail the welfare changes from various levels of EC rebalancing. Table 3 (0-percent reduction) indicates that EC livestock producers are hurt by higher prices for the oilseed component of feed mixes. Oilseed and oilmeal consumers lose because they must buy at the

Table 3--Welfare effect of EC rebalancing with 0-percent reduction in uniform support

Item	Producers	Consumers	Taxpayers	Welfare
		Million dollars		
European Community:				
Beef	-170	0	38	0
Pork	-266	0	145	0
Poultry meat	-138	0	80	0
Wheat	0	0	-19	0
Corn	0	0	-10	0
Coarse grains	0	0	-12	0
Oilseeds	0	-3,036	3,097	0
Oilmeal	1,325	-3,140	932	0
Sugar	0	0	0	0
Total	751	-6,176	4,249	-1,176
United States:				
Beef	81	4	0	0
Pork	121	-30	0	0
Poultry meat	77	7	0	0
Wheat	-9	6	0	0
Corn	15	28	0	0
Coarse grains	-3	10	0	0
Oilseeds	-648	465	0	0
Oilmeal	-586	617	0	0
Sugar	4	1	0	0
Total	-948	1,108	0	160

high support price. Instead of spending for oilseed producer support, the CAP budget collects a levy on oilseed and oilmeal imports. U.S. livestock producers are slightly better off because of reduced EC exports, but decreased European consumption and imports hurt U.S. oilseed producers.

Table 5 reports effects of a 20-percent rebalanced reduction in EC support, the scheme which most nearly produces overall U.S. producer indifference to rebalancing. The redistribution in benefits to U.S.

producers is evident in this table as livestock and grain farmers gain substantially from reduced EC supports while U.S. oilseed and oilmeal producers are hurt.

The redistribution of benefits may not be as serious as these estimates indicate because of the nature of oilseed production in the United States. U.S. oilseeds are often grown by the same operations that produce

Table 4--Welfare effects of EC rebalancing with 15-percent reduction in uniform support

Item	Producers	Consumers	Taxpayers	Welfare
		Million dollars		
European Community:				
Beef	-519	423	63	0
Pork	-845	741	297	0
Poultry meat	-448	36	186	0
Wheat	-754	653	195	0
Corn	-246	299	67	0
Coarse grains	-176	244	-14	0
Oilseeds	-147	-2,618	2,884	0
Oilmeal	1,125	-2,703	829	0
Sugar	7	0	0	0
Total	-2,003	-2,599	4,502	-100
United States:				
Beef	130	-67	0	0
Pork	255	-192	0	0
Poultry meat	218	-140	0	0
Wheat	44	-18	0	0
Corn	133	-69	0	0
Coarse grains	5	1	0	0
Oilseeds	-568	403	0	0
Oilmeal	-527	551	0	0
Sugar	2	1	0	0
Total	-308	470	0	162

Table 5--Welfare impacts of EC rebalancing with 20-percent reduction in uniform support

Item	Producers	Consumers	Taxpayers	Welfare
		Million dollars		
European Community:				
Beef	-629	558	70	0
Pork	-1,041	993	339	0
Poultry meat	-551	484	215	0
Wheat	-1,031	891	280	0
Corn	-334	408	98	0
Coarse grains	-194	292	-16	0
Oilseeds	-199	-2,469	2,809	0
Oilmeal	1,059	-2,555	784	0
Sugar	10	0	0	0
Total	-2,910	-1,398	4,579	271
United States:				
Beef	144	-91	0	0
Pork	303	-250	0	0
Poultry meat	266	-190	0	0
Wheat	66	-28	0	0
Corn	176	-105	0	0
Coarse grains	4	0	0	0
Oilseeds	-539	383	0	0
Oilmeal	-507	529	0	0
Sugar	1	2	0	0
Total	-84	250	0	160

livestock and grain. The losers from including oilseeds in the CAP are the main beneficiaries of European price support reduction in grains and other commodities.

Nearly all categories of EC producers are hurt by rebalancing with the 20-percent or greater reduction in support. The net welfare (deadweight) gains and cash-flow generated by reduced export oilseed processing subsidies would enable direct compensation of producer losses with considerable savings left over. The budget savings of $4,579 million shown in table 5 represent almost 20 percent of the 1989 CAP budget.

Table 6--Welfare impacts of EC rebalancing with 25-percent reduction in uniform support

Item	Producers	Consumers	Taxpayers	Welfare
		Million dollars		
European Community:				
Beef	-746	701	77	0
Pork	-1,223	1,247	373	0
Poultry meat	-651	607	239	0
Wheat	-1,222	1,070	329	0
Corn	-432	516	123	0
Coarse grains	-274	387	-19	0
Oilseeds	-254	-2,320	2,733	0
Oilmeal	994	-2,406	745	0
Sugar	12	0	0	0
Total	-3,796	-198	4,600	606
United States:				
Beef	162	-115	0	0
Pork	350	-307	0	0
Poultry meat	315	-241	0	0
Wheat	78	-35	0	0
Corn	223	-142	0	0
Coarse grains	9	-5	0	0
Oilseeds	-510	359	0	0
Oilmeal	-486	508	0	0
Sugar	1	2	0	0
Total	142	24	0	166

Other rebalancing and support reduction levels (tables 4, 6, and 7) indicate similar EC effects and U.S. producer welfare redistributions. In every case, CAP budget savings are more than enough to compensate EC producers for income loss. Deadweight welfare benefits from rebalancing increase in the EC and United States as EC supports are reduced.

Table 7--Welfare impacts of EC rebalancing with 30-percent reduction in uniform support

Item	Producers	Consumers	Taxpayers	Welfare
		Million dollars		
European Community:				
Beef	-857	836	84	0
Pork	-1,413	1,489	402	0
Poultry meat	-752	730	448	0
Wheat	-1,497	1,310	416	0
Corn	-510	625	162	0
Coarse grains	292	434	-26	0
Oilseeds	-295	-2,190	2,661	0
Oilmeal	926	-2,257	706	0
Sugar	15	0	0	0
Total	-4,675	977	4,853	1,155
United States:				
Beef	178	-139	0	0
Pork	396	-362	0	0
Poultry meat	366	-292	0	0
Wheat	101	-45	0	0
Corn	267	-178	0	0
Coarse grains	8	-5	0	0
Oilseeds	-484	339	0	0
Oilmeal	-464	482	0	0
Sugar	0	2	0	0
Total	368	-198	0	170

Conclusion

Our estimations indicate that some level of European rebalancing leaves the overall economic welfare of U.S. producers unchanged. The reduction in CAP supports necessary to bring about the net U.S. producer indifference is between 20 and 25 percent. At that level of reduction, as apparent in deadweight gains, producers in the rest of the world experience net benefits as do U.S. consumers and the total economy.

The redistribution of benefits from U.S. oilseed growers to U.S. livestock and grain producers may be even less of a problem than the model estimates indicate. Much of the redistribution occurs within farming operations producing grains and livestock as well as soybeans.

The 20- to 25-percent range falls within levels of support reduction discussed in the final days of the December 1990 GATT negotiations in Brussels. The feasibility of these rebalancing schemes does not consider the long-term consequences to the United States and other agricultural exporters of having oilseeds permanently behind CAP barriers. However, with rebalancing and a 20-percent reduction in market support, the European Community's CAP budget benefits by $4,579 million. This figure is enough to directly compensate the $2,910 million loss to EC producers and still have substantial budget savings. If the EC decides to rebalance without a significant reduction in support for other commodities (0-percent reduction), U.S. oilseed producers ~~were shown to~~ sustain substantial losses.

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Chapter 11

The Governance of Agricultural Trade

Perspectives from the 1940's

David W. Skully*

In many quarters the point was made that once you get started on a thing of this sort there is no end to it.

Henry A. Wallace on the Agricultural Adjustment Act of 1933 (1934a)

Introduction

Opportunities to rewrite the rules of the game of international relations are rare. They occur most often in the wake of a decisive war, because the victor can dictate or negotiate with maximum leverage the terms of the peace. The process of rewriting and enforcing the rules of play is analyzed by scholars of international relations in terms of regimes and hegemons. Crudely summarized, regimes are the rules of the game and the hegemon is the leading power, generally the creator of the existing rules and the prime mover in their enforcement. In this framework, the history of international relations can be viewed as the succession of hegemons and the regimes they create and attempt to maintain (Gilpin, 1981 and 1987).

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Kindleberger (1973) analyzed the Great Depression of the 1930's as the partial result of a lack of a clear hegemon in the interwar period. Great Britain was no longer capable of enforcing the existing rules of international economic and political relations, and the United States, while capable of taking the mantle of hegemony from Britain, refused and pursued an isolationist policy. World War II resolved the hegemons problem. The United States ascended to hegemony during the war and, in spite of the protests of domestic isolationists, assumed an internationalist stance in most areas of international relations.

The passing of hegemony from Britain to the United States was remarkably cooperative. Anglo-American negotiations on the structure of the postwar order began as early as 1940, and by 1943 one can easily distinguish the embryonic forms of what would become the International Monetary Fund [IMF], the World Bank, and the still-born International Trade Organization [ITO].

The United States as the new hegemon had the potential to initiate a new order, and it realized this potential in many areas. This chapter considers the failure of the United States to establish or negotiate rules of the game for the conduct of agricultural trade in the immediate postwar period. My argument is that U.S. international agricultural economic policy became thoroughly nationalistic in the 1930's. To be precise, agricultural nationalism began on May 12, 1933, with the passage of the Agricultural Adjustment Act of 1933.

The rents generated by the agricultural programs of the New Deal (and later World War II) created a constituency which proved too powerful to challenge in the postwar period. By the late 1930's, almost all analysts of agricultural policy took domestic programs as a given, nonnegotiable fixture of the economic landscape.

This self-imposed constraint was written into the earliest proposals for the postwar economic order in the form of exceptions and waivers for agricultural commodities. Then as now, the proposals weakened the United States' credibility in its commitment to freer trade. The failure to bind agriculture to a new commercial order in the late 1940's left the United States holding an umbrella over the activities of agricultural nationalists in other nations. Indeed, the U.S. failure to promote international rules allowed its domestic agricultural policy to unilaterally disrupt international markets, and these insouciant actions induced defensive nationalist policies abroad. From this perspective, Americans

should accept the agricultural programs of the European Community and Japan as the sincerest form of flattery.

The New Deal and Agricultural Nationalism

> *[T]he isolationist and restrictionist aspects of foreign economic policy since 1934 have been directly related to agricultural programs. In practically every instance the need for the interference with trade has grown out of the particular needs of a specific agricultural program.*
>
> D. Gale Johnson (1950)

The year 1933 marks a watershed in U.S. domestic economic policy and in U.S. commercial policy. In domestic economic affairs, the Roosevelt administration broke with 150 years of relatively laissez faire domestic policy and attempted to inaugurate a corporatist or state-managed economy. In contrast, Roosevelt's appointment of freetrader Cordell Hull as Secretary of State was an attempt to break with 150 years of protectionism and isolationism in commercial policy. These two decisions, initiated in Roosevelt's first 100 days, set in motion two opposing forces which have collided ever since.

The Agricultural Adjustment Act (AAA) and the National Industrial Recovery Act (NIRA) were radical innovations. They granted the Federal Government considerable discretion to intervene in domestic markets. Industrialists strongly resisted the NIRA. In contrast, most of agriculture welcomed the AAA. In 1935, the Supreme Court found both laws unconstitutional. NIRA faded away, never to be resurrected, but the AAA was quickly repackaged through the joint efforts of agricultural interests and USDA and passed by Congress. The AAA of 1933 gave USDA several instruments with which to raise farm prices and incomes. The ability of Secretary of Agriculture Henry A. Wallace and others at USDA to adapt their policy instrument choices to meet shifting political pressures ensured the survival of Government control of agriculture.

The AAA represented partial fulfillment of the demand by many agricultural groups in the 1920's for some form of two-price policy. Two-price policies were ultimately linked to the U.S. tariff schedule. U.S. tariffs were raised sharply following World War I in the Fordney-

McCumber Tariff Act of 1922 and raised even higher in the Smoot-Hawley tariff of 1930. In reaction to higher industrial prices and falling prices on world markets, farmers began to demand a "fair price" for their products. These prices were identified with parity, usually defined as the terms of trade which were obtained between farm products and industrial products in the early 1910's.[1] Agricultural interests might have been placated with tariffs on farm products which would have resulted in parity with industrial products. However, the United States was a net exporter of most of the agricultural products it produced, rending the tariff an ineffective policy instrument. The demand then was for a policy which would make "the tariff effective for agriculture." Agricultural producers also felt that agricultural markets were more volatile than markets for manufactures, so there was a further demand for insulation from the international market and the external policy and price shocks it transmitted to the domestic market.[2]

The nascent two-price policy of the AAA of 1933 embodied an inherent problem; if prices were "stabilized" above the market-clearing level, surplus stocks would result. How to avoid or dispose of surpluses, given domestic prices, was the key policy issue. There were several options open: destruction of surpluses, production controls, domestic dumping, and foreign dumping. Wallace refused to consider dumping surplus commodities on foreign markets. He realized that exporting the negative external effects of domestic price support policies would merely induce retaliation and make things even worse.[3] Three policy instruments for adjustment remained: surplus destruction, domestic dumping, and production controls. All three were tried. Surplus destruction and plow-ups did not play well against the backdrop of breadlines and fell out of use after the first year. Domestic dumping through targeted assistance programs such as the cotton mattress program and food stamps emerged later in the 1930's. The key policy was production restriction. Under the domestic allotment plan, as it was then called, farmers were paid not to

[1] Tariffs were unusually low following the Underwood-Simmons Act of 1913, further biasing the "normalcy" of the Golden Age, 1910-14.

[2] This issue is addressed in the next section.

[3] Wallace's position that surplus disposal on the international market is inherently self-destructive has been recently "rediscovered" by economists; see Bulow, Geanakoplos, and Klemperer (1985) and Brander and Krugman (1983).

produce crops, reducing surpluses, increasing farm prices and, with the payment increasing, farm incomes.[4]

In a 1934 pamphlet, *America Must Choose,* and its hard-bound sequel, *New Frontiers,* Wallace presented his case for international cooperation over nationalism.[5] In particular, he stressed the financial risk of a policy of commercial nationalism. Because U.S. agriculture relied on exports, for there to be a recovery in agriculture there would have to be a recovery in the foreign effective demand for U.S. farm products. Wallace argued that the United States, as the world's leading creditor nation, must increase commercial imports from its trading partners, and that this could best be accomplished by reducing tariffs under the Reciprocal Trade Agreements Act. Without increased dollar revenues, foreign markets would not be able to service their dollar-denominated debts, nor would they be able to pay a fair price for U.S. farm products. In Wallace's view, the Smoot-Hawley tariff and the trade retaliation it generated shifted the burden of adjustment to agriculture and necessitated the acreage limitations of the AAA. The more America turned nationalistic, he argued, the greater the adjustment on agriculture. Wallace estimated that at least 50 million acres of cropland might have to be retired under nationalism (Wallace, 1934a). Lower tariffs would allow more agricultural production and would result in a more equitable distribution of adjustment.

Wallace had little doubt about the overall comparative advantage of American agriculture and felt that it had little to fear and much to gain from bilateral tariff reductions. The bulk of the adjustment to a more liberal trade regime would be borne by industrial cartels. The longer the burden of adjustment was placed on agriculture, the deeper the contraction of domestic demand for urban products, and the downward economic spiral could easily spill over to military conflict.

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[4] Payments were financed from taxes on processors. This scheme was what the supreme Court found unconstitutional in 1935. Since 1936, payments have been made from general revenue. This approach has helped diffuse the cost of agricultural programs and the political opposition they might provoke if financed more directly.

[5] Wallace's article in *Foreign Affairs* (1934a) and his "Secretary's Report to the President" in the *1934 Yearbook of Agriculture*, cover most of the points made in *America Must Choose* and are easier to find. Alonzo Taylor, then director of Stanford's Food Research Institute, critically analyzes Wallace's 1934 writings in *The New Deal and Foreign Trade* (1935). Taylor especially notes Wallace's neglect of monetary issues.

Wallace's aversion to export dumping stems from his longer run view of international economic relations. However, Wallace faced opposition from shorter run nationalists in USDA. George Peek was Wallace's administrator of AAA programs. Peek, the leading proponent of the two-price idea of agricultural policy in the 1920's and a former farm implements manufacturer, was vehemently opposed to production restrictions. Farmers should be given a fair price, produce all they can (buying implements all the while), and what could not be consumed at home should be dumped abroad. Peek's views and actions were to conflict directly with those of Wallace and Hull.

Hull's appointment as Secretary of State had an immediate effect on the conduct of U.S. commercial policy. Roosevelt and Hull had to contend with the repercussions of the exceptionally protectionist Smoot-Hawley tariff of 1930. Most U.S. trading partners retaliated with tariffs designed to discriminate against U.S. products, especially agricultural commodities, and many quantitative restrictions were tightened, especially the system of British Imperial Preferences (Jones, 1934). Trade imbalances resulted in many bilateral "balanced trade" agreements between trading partners. The United States was then the leading creditor nation and therefore faced severe discrimination under balanced trade policies.

The new administration's first opportunity to stem the spiral of protectionism and bilateralism was the 1933 World Monetary and Economic Conference held in London by the League of Nations. The U.S. position at the conference regarding trade is easily summarized: economic nationalism is self-defeating. To rise above the noncooperative solution, some international code of conduct and means of negotiation is required. Toward this end, Hull advocated three principles: (1) abolish or relax all quantitative restrictions, (2) reduce tariffs, and (3) promote nondiscrimination either through most favored nation clauses or via multilateral rather than bilateral trade negotiations. However, the United States delegation to the London Conference was instructed to demand an exemption from any concessions which might undermine the programs

and activities of the AAA.[6] Roosevelt signed the AAA into law on May 12, 1933, and the London conference began June 12, 1933. That is, 1 month elapsed between the time the AAA initiated nationalistic agricultural controls and the time that U.S. trade negotiators attempted to pry open the door to liberal world trade while simultaneously holding it shut to any concessions on agricultural trade.

The London Conference ended in failure. The inability of the major powers to resolve currency issues or chronic imbalances dominated any discussion of commercial disputes. The London Conference is important because the planning of the postwar economic order was, in large part, a reaction to its failure to resolve these three problems. The proposed postwar solutions were three institutions: a Clearing Union, which would emerge as the IMF; an economic adjustment facility, the World Bank; and a commercial regulatory facility, the International Trade Organization.

Lacking any multilateral framework for trade negotiations, Roosevelt and Hull spurred congressional passage of the Trade Agreements Act of 1934 which provided the legislative basis for all subsequent trade policy. The Trade Act gave the President the power to negotiate reciprocal trade agreements. The means of negotiation was bilateral, but Hull attempted to employ most favored nation clauses to make bilateral deals as multilateral as possible.

Peek and Wallace collided in October 1933 after Peek cut a deal to subsidize the sale of Pacific white wheat to China. Peek and Wallace clashed over a number of issues and, in December 1933, Roosevelt asked for Peek's resignation. In compensation, Roosevelt named Peek as a Special Trade Advisor. This move put Peek into direct conflict with

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[6] Kindleberger (1973) and Peek (1936) portray Hull as tariff-obsessed. Hull (1948) portrays himself in a better light. He rightly viewed the NRA and the AAA as severe impediments to international commercial agreements, and that the administrators of such policies "believed in cutting the United States off from the rest of the economic world which they regarded as of little importance. They wanted to concentrate on lifting prices and restoring business in this country by purely domestic measures. As prices rose, they felt the need for import embargoes and higher tariffs to keep out imports from abroad which would interfere with the increasing price scale." Also see Kindleberger (1973) on the motivation for the U.S. agricultural waiver.

Hull.[7] In 1934, Peek attempted to buy German trade concessions by offering surplus cotton stocks at a fraction of cost. Hull objected to such an obvious departure from the principles of nondiscrimination.[8] Roosevelt sided with Hull, and Peek ultimately resigned.[9]

Peek may have lost the battle over cotton subsidies, but he won the war for making the dumping of surplus commodities on foreign markets a mainstay of U.S. agricultural policy. Dumping, or any form of price discrimination, creates the potential for arbitrage; a nation could purchase subsidized U.S. exports and reexport them to the United States for the higher domestic price. Arbitrage would simultaneously undermine domestic prices and give the arbitrageur a unit profit equal to the price gap. In August 1935, the 1933 AAA was amended to permit and finance dumping. Section 32 set aside 30 percent of customs revenues for the Secretary of Agriculture to use to subsidize agricultural exports.[10] To prevent arbitrage and secure the insulation of domestic agriculture from competitive forces, section 22 allowed the executive to impose import quotas to prevent imports from "rending ineffective or materially interfering with" domestic programs. The 1933 Act had metamorphosed

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[7] Hull (1948) notes, "The greatest threat to the trade agreements came not from foreign countries, not from the Republicans, not from certain manufacturers or growers, but from within the Roosevelt Administration itself, in the person of George N. Peek. In March 1934, the President had named him Foreign Trade Advisor. If Mr. Roosevelt had hit me between the eyes with a sledge hammer he could not have stunned me more than by the appointment."

[8] According to Hull (1948), "One basis of our trade agreements policy--equality of commercial treatment and opposition to the numerous sorts of discrimination and preference--would have been openly violated by the Peek barter proposals. Our program undertook in a broad way to provide export facilities for the more burdensome surpluses such as cotton, tobacco, lard, wheat, and automobiles, by reducing discriminations and preferences abroad and creating equality in trade treatment."

[9] Peek's book *Why Quit Our Own?* (1936) is a tirade against reciprocal trade agreements and production restrictions. In the chapter "The Sell Out," he gives his view of reciprocal trade agreements:

> Secretaries Hull and Wallace got out their school books, gathered around them a group that owned the same school books, and started to play a game that was in their books instead of the game that was in progress. Secretary Hull could not recognize that the elaborate system of exchange controls, quota systems, restrictions and regulations on trade which had sprung up throughout the world were not panic expedients but were reasoned attempts to preserve monetary systems and domestic economies.

[10] The value of 30 percent was employed because 30 percent of the U.S. population was considered to be involved in the agricultural sector in 1935. Section 32 is still in effect at the 30-percent level, although the agricultural portion of the population today is only 2 percent.

into a two-price policy; moreover, domestic agricultural programs had gained legal priority over trade negotiations. Of the broad powers granted by the AAA, the nationalist policy instruments came to dominate internationalist instruments. After 1935,

> [t]hose in the government concerned with commercial policy could do little or nothing to influence the future course of farm programs, which were of key importance to the New Deal. Legislative policies established by Sections 22 and 32 were regarded as untouchable. Accordingly, the trade-agreements program was made to conform (Leddy, 1963).

All agreements subsequently negotiated under the authority of the Trade Agreements Act contained a clause exempting quantitative restrictions linked to agricultural programs.

The Wallace and Hull alliance was only with respect to George Peek, as Wallace, unlike Hull, did not trust the free operation of market forces. In 1939, Wallace, over Hull's protests, successfully defended the use of section 32 to subsidize cotton exports. Even for Wallace, there were times when the political costs of holding surplus stocks outweighed the costs violating internationalist principles.

Agricultural Internationalism: The Ever-Normal Granary

Henry A. Wallace was a third-generation Iowa farm journalist and was well aware of the farmer's complaint of price volatility.[11] Wallace's solution was to help stabilize commodity markets through the establishment of an ever-normal granary. Wallace traced this solution to the Bible and the writings of Confucius.[12] To Wallace, the Commodity Credit Corporation was an obvious instrument for financing and managing a domestic buffer stock. But a domestic buffer stock would not solve the problem of international price volatility; in fact, it would exacerbate it. An international buffer stock was needed.

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[11] This is an understatement of the Wallaces; see Lord (1972) and Rosenof (1967).

[12] In essence, it is a buffer stock scheme. See Newbery and Stiglitz (1981) and Choi and Johnson (1991).

John Maynard Keynes was among the economists who considered the problems of commodity price volatility in the 1930's. He argued that primary products were different from industrial products. Their relatively price-inelastic demand and supply schedules were vulnerable to stochastic production and cyclical income shocks and resulted in price series of high amplitude. He concluded that primary producers had a legitimate complaint about excess price volatility and felt that some form of international buffer stock was required to moderate price fluctuations. Unless excess price volatility could be damped, producers were too prone to lobby for the kinds of nationalistic agricultural policies which only exacerbate the problem by shifting domestic volatility to the international market. Keynes was rather critical of the existing International Wheat Agreement, as he felt it discriminated against nonsignatory nations.[13] For commodity agreements to work without massive stock accumulation, Keynes advocated bringing long-term supply and demand into line by eliminating high-cost producers in an orderly manner with due notice.[14]

Keynes' published work on commodity problems starts with a 1938 paper presented at the Royal Economic Society meetings and published in the *Economic Journal.* August 30, 1938, Keynes sent a copy of the paper to Wallace. In the cover letter, Keynes wishes Wallace good luck with Canadian bilateral trade negotiations, and concludes with the following statement:

> I am a convinced advocate of the general principles underlying your policy of a concerted government policy to average fluctuations by an assisted scheme of storage (Keynes, 1980).

During 1940 and 1941, Keynes was involved with drafting proposals for an International Clearing Union and in Anglo-American negotiations over lend-lease. During a visit to Washington in May 1941, Keynes met with Dean Acheson and Leo Pasvolsky, among others at the State Department. At that meeting, Keynes expressed his support for some form of an ever-normal granary. According to Keynes' editor, Moggridge:

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[13] Moreover, Argentina and the United States defected from the agreement shortly after it was signed in 1933.

[14] The idea of international buffer stock schemes was not popular with the British Ministry of Agriculture, which claimed that all other Ministries of Agriculture desired planned output (a euphemism for organized restriction), quotas, and fixed prices. In light of this predictably nationalistic complaint, Harrod (1951) quotes Keynes in a meeting with the Ministry as remarking "All Departments of Agriculture are rackets."

> Mr. Keynes was aware that a project of this kind was highly ambitious, but he felt that it was one which would appeal to the Vice-President [Henry Wallace] and he considered that the fact that it was difficult and even grandiose should not exclude it from the long-range planning involved in dealing with the surplus problem.
>
> The reaction of Mr. Acheson to this was interested, but cautious. He gave the impression of not having thought along those lines before, and indeed at the end of the meeting he said that he felt his mind was much clearer now for giving thought to the problem as a whole. . . .
>
> Mr. Pasvolsky was obviously interested and attracted from the outset. He was particularly concerned with the reverse adjustments which would be necessary after the war in cutting down productive capacity which had been called into existence by the war but which would not be needed during the peace. He was also clearly taken with the idea of linking the problem of surplus accumulation with that of postwar distribution (Keynes, 1980).

Keynes and Acheson maintained an active correspondence on the issue of international commodity agreements. Keynes also drafted several briefs on the International Wheat Agreement and was involved in international cotton negotiations. In 1942, Keynes shifted from specific commodity issues to the more "grandiose" issue of how to design an institution to manage an international multicommodity "ever-normal granary." These efforts were contributions to the U.K. Treasury's position papers in the Anglo-American negotiations over the institutional framework of the postwar order. The earliest extant draft of his paper, "The International Control of Raw Materials" was dated April 1942 (republished in Keynes, 1974 and 1980). Both this draft and the draft of May 1942, contain the heading: "The internationalization of Vice-President Wallace's ever-normal granary" (Keynes, 1980):

> The essence of the plan should be that prices are subject to gradual changes but are fixed within a reasonable range over short periods; those producers who find the ruling price attractive being allowed a gradual expansion at the expense of those who find it unattractive.

Buffer stocks would effect price stabilization; however, in cases of more extreme imbalance, output regulation would be required.[15] Such a policy would:

> amount to an internationalization of the ever-normal granary' proposals of Vice-President Wallace, which seem to go to the root of the matter and are likely to promote the *general* interest more completely than can be claimed for any projects which are primarily directed to restriction (Keynes, 1980, emphasis in the original).

As Anglo-American talks progressed, Keynes' commodity control institution was linked to the Clearing Union for financing. As the Clearing Union emerged as the IMF, the commodity control facility was dropped. At Bretton Woods, May 1944, a resolution was adopted to devise means to "bring about the orderly marketing of staple commodities at prices fair to the producer and consumer alike."[16]

Towards a Postwar Order

War mobilization, not the New Deal, ended the depression in the United States. The crisis in agriculture shifted from one of surpluses and excess capacity to one of shortages and supply constraints. Although the war sharply raised crop prices and farm incomes, farmers feared that the end of war-induced scarcities and the revival of production in competing countries would result in an agricultural depression as devastating as the one following World War I.[17] Farmers were hesitant to risk expanding production to meet the demands of the war economy if a postwar bust were likely to follow. To assuage their concerns, legislation in 1941 and 1942 extended parity-based price supports to a wide range of commodities (among them turkeys, sweet potatoes, tung nuts, and hemp), exempted them from war-time price controls (to 110 percent of parity), and guaranteed price supports for 2 years following the official end of hostilities. The 2-year guarantee, however, did not remove the threat of a

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[15] The idea that there is a corridor within which classical assumptions hold and beyond which quantity adjustments are required is a motif that pervades Keynes' work, see Leijonhufvud's (1981) essay, "Effective Demand Failures."

[16] Bretton Woods Conference, Vol. I, pp. 937-42, cited in Brown (1950).

[17] The 1920-22 agricultural depression stimulated the political demand for McNary-Haugen-type legislation and the formation of the farm bloc in Congress.

postwar bust; it merely delayed it. Two issues consequently dominated postwar policy discussion, in order of priority: how to return domestic policy to a peace time basis, and then, how to devise rules for international commodity trade.

1945 was a banner year for proposals for a postwar agricultural and trade order. In January 1945, W.H. Jasspon donated $12,500 to the American Farm Economic Association [AFEA] to fund a contest. Entrants were requested to write a paper: "A Price Policy for Agriculture, Consistent with Economic Progress, that Will Promote Adequate and More Stable Income from Farming." There were 317 entries. Awards were presented in September 1945, and the 18 winning papers were published in the November 1945 issue of the *Journal of Farm Economics*. First, second, and third prizes were awarded, respectively, to William H. Nicholls, then of the University of Chicago; D. Gale Johnson, also of the University of Chicago; and Frederick V. Waugh, of USDA's Bureau of Agricultural Economics. Fifteen honorable mention awards were also granted.

AFEA President L.J. Norton, in his introduction to the November 1945 issue, summarizes the policy suggestions of the papers:

> The papers logically fall into two groups, those written by farmers and other laymen; those written by professional economists. Among the former there was a strong accent in favor of fixed prices, in many cases related to "cost of production." No definite plans were proposed for accomplishing this. The desire of many farmers for fixed prices may be considered as a wish for security against the effects of fluctuating prices and depression accompanied by severe price declines.
>
> The professional group of papers included a wide variety of proposals. In general the present parity formula was considered to be outmoded and the entire concept of parity was held to be unworkable by a number. . . . Very little emphasis was placed on production controls.
>
> Among the prize-winning papers there was a strong accent on the desirability of general measures that would maintain a vigorous and prosperous general economy, greater freedom in prices of individual commodities than

> is possible under existing price support legislation, some type of "forward pricing" in order to guide production, and government supplementary payments to maintain total returns from individual products or total overall farm income.
>
> The general trend of thought was toward freer markets accompanied by measures to support some minimum level of farm income.

There is little discussion of international trade in the winning papers. To claim that this absence is evidence of an isolationist or insular view of agriculture given the topic of the contest, its page constraints, and the impending end to wartime supports would be unfair. Waugh is one of the few to explicitly discuss the international market:

> *A foreign trade program.* A revival of foreign trade will be essential. The best possible domestic nutrition program will not provide adequate outlets for wheat, cotton, tobacco, and other export crops. The United States should use its influence to bring about a general, world-wide relaxation of international trade barriers. But we should recognize that progress along these lines may be slow and difficult. Therefore, we should also proceed immediately to work out international commodity agreements aimed at an orderly distribution of world surpluses of the primary export commodities. These agreements should provide a "buffer stocks" program to even out fluctuations in supplies. They should also include measures to make surpluses available to undernourished populations in areas of chronic need.

Waugh's comments reflect an emerging view in the *Journal of Farm Economics* during the early and mid-1940's that international commodity agreements might provide a second-best solution to the volatility of international agricultural markets. But what transpired during the negotiations of the ITO and the GATT (1945-50) ultimately had little to do with internationalist views of Keynes, Wallace, or the professional economists writing in the *Journal of Farm Economics.* Rather, it was L.J. Norton's "farmers and other laymen"--the George Peeks of the world--and

their demand for fixed prices related to the cost of production who gained control of the postwar agenda for agriculture.[18]

1945 was also a good year for official proposals for the postwar order. Four merit our attention. In its report on policies for economic stability in the postwar world, the League of Nations strongly advocated international agreements among governments. The greatest risk of a return to the economic nationalism policies of the depression would be during the "transition period," those few years during which economies would attempt to shift from wartime to peacetime.

> It seems inevitable that the ad hoc uncoordinated decisions of individual governments to deal with specific problems confronting them at that time (whether these problems relate to import controls, surplus stocks of commodities, or exchange control practices) will be of a defensive rather than of an expansive character, and that these defensive policies embarked on in the transition period will set the tone of international economic policy for a long time to come. . . . Short-run considerations of expediency may from time to time appear to indicate a temporizing approach; the immediate difficulties of bold action may make the temporizing approach appear more realistic than a bold and far-sighted view. Realism is, however, not to be confused with myopia (League of Nations, 1945).

The League's prescription for "International Anti-Depression Measures for Raw Material and Food Producing Countries" follows directly from the Keynes-Wallace formula: international buffer stocks with production controls as needed.

> [C]ontrol may prove necessary as a supplement to buffer stocks in order to preserve the existing pattern of production and productive capacity in the world rather by international agreement than by competition among governments in the preservation of redundant capacity. The justification is only valid so long as governments are resolved to prevent the elimination of the unprofitable.

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[18] Peek grasped the realpolitik of international trade policy; see footnote 9 above.

> The creation of a buffer stock scheme would remove an important reason for protectionism, because . . . it would very greatly diminish, if not remove altogether, what has been a real risk in the past, namely, that productive capacity which is again vitally requisite during a boom may be destroyed during a depression (League of Nations, 1945).

Two points are important here. First, because national governments tend to preserve redundant and unprofitable production capacity, an international agreement is required to constrain this behavior. Second, reducing price volatility will moderate both booms and busts. Booms are as much a problem as busts, because owners of marginal land cultivated during a boom demand protection against redundancy when normal conditions return. Protection of redundant capacity initiates a cumulative process resulting in surplus production, protectionist pressures, and an increasing risk of a bust.

The U.S. State Department's proposal was an exemplar of Hullian liberalism, voicing strong support for the ITO. However, there were some glaring exceptions: in particular, sections 22 and 32 were defended, and there was support for international commodity agreements under ITO control (U.S. Department of State (1945), pp. 13-23 in particular). The USDA's program, at least as it pertained to trade issues, championed international agreements. The influence of Keynes, Waugh, and Schultz, among others, is apparent in its emphasis on consumption enhancement and its aversion to production control. International coordination of transfers of surplus stocks to households or nations with an "ineffective demand" for food, but nutritional needs, would, at one stroke, help alleviate supply, demand, and income imbalances. Although the USDA program was internationalist, it left a very limited role for the market in international trade, as a liberal trade order in agriculture would undercut government management of domestic agriculture (U.S. Department of Agriculture, 1945). The consumption enhancement view of international control of agricultural trade is also strongly voiced in the proposal by the Food and Agriculture Organization of the United Nations (FAO) for the establishment of a World Food Board (FAO, 1945). One of the struggles during 1945-46 was over which international organization would have control of international commodity trade. USDA lobbied for FAO control, while State lobbied for ITO management. As Brown (1950) explains, on the issue of commodity agreements, the FAO

> . . .has not, as the drafters of the ITO Charter tended to do, regarded such agreements as necessary exceptions to general rules of commercial policy, to be rather reluctantly accepted and strongly safeguarded against abuse. There has, moreover, been a tendency for governments, even those of importing countries, to send representatives to FAO deliberations who are more deeply imbued with the point of view of producer interests than were the representatives sent to the ITO negotiations by the same governments. It seems probable that if the ITO entered into force this difference in attitude would continue, and that the ITO would tend to emphasize consumer interests, that it would attempt to minimize departure from more liberal trading policies, and that it would treat commodity agreements as essentially short-term devices to meet particular emergencies, rather than as permanent and desirable methods of conducting trade. Such an attitude would be in accordance with the spirit and provisions of the ITO Charter as a whole. The FAO would probably continue to see in commodity agreements an important technical device for the achievement of positive objectives, such as improved nutrition and the sale of "surplus" products to depressed areas at special prices.

The Truman administration witnessed the origin of the cold war. Henry Wallace, Secretary of Commerce until 1946, split with Truman over U.S. relations with the Soviet Union. After a year as editor of *The New Republic,* Wallace reestablished and then headed the ticket of the Progressive Party in the 1948 presidential election. Among other points, Wallace stressed cooperation and trade with the Soviets and strengthening the power of the United Nations. In particular, he advocated U.N. administration of foreign aid. As the political climate polarized, Wallace and advocates of internationalism became increasingly suspect.

The internationalist perspective in commercial policy met a similar end. Internationalists argued for adoption of a code of international rules which would constrain economic nationalism and reduce the risk of depression and military conflict. The United States as the new hegemon faced a decision between binding itself and all others to a system of rules

and reserving for itself complete discretion at the apparently small cost of a marginal loss of legal leverage over other countries. The nationalist view in the United States ultimately prevented the Congress from even voting on the ITO charter, and by default the GATT, which was, and remains, very weak on agriculture, became the code governing international trade.[19]

Despite the demise of the ITO, the prospect of international commodity agreements remained alive and several were signed in the late 1940's. However, the idea of an international buffer stock for the purpose of price stabilization surrendered too much national sovereignty to an international committee for the United States to consider. The buffer stock proposal withered away leaving the shell of an international commodity agreement stripped of its international public good rationale.[20] Arguments for surplus disposal and consumption enhancement also remained, but they were increasingly nationalist in scope. The emergence and ultimate permanence of the "temporary" Food for Peace program (1954) is perhaps the clearest manifestation of agricultural nationalism generating bilateral government-controlled commodity trade. The other export programs of the United States, as well as those of the European Community (EC), are also derivative of the demands of domestic producers for a controlled environment.

Conclusion

The decision not to bind agricultural trade to some form of international governance in the late 1940's still affects the conduct of agricultural trade, its empirical analysis, and prospects for its liberalization.

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[19] Covering the debates over agriculture in the ITO and the origins of the agricultural exceptions of the GATT would require a paper at least double the length of the present text. Readers can turn to two excellent sources: Brown (1950) and Johnson (1950). Both authors served as economic advisors on international trade issues at the State Department under the Truman administration, and both books were published when the ITO was still a live issue and cover many issues not covered in later works. For agriculture under the GATT, Warley's (1990) article picks up the narrative where this chapter concludes.

[20] Poor mechanism design is the weak point of any commodity agreement. The International Wheat Agreement, initiated in 1949, was the only agreement of any importance, and its performance was fairly comical. See Farnsworth (1957).

Conduct and Analysis

The exemption of agriculture from the rules of the game has led to policies of competitive bilateralism which have proved destructive in the 1980's and, unless constrained, are likely to become even more destructive in the 1990's. Bilateralism remains the dominant mode of international agricultural trade. There is much more government control of international trade than our standard assumptions of a law of one price and continuous and twice-differentiable functions would lead us to deduce. Almost all quotas and government export programs are bilateral, and bilateral trade short-circuits the Walrasian auctioneer who implicitly solves the equations of our trade models.[21] One should seriously question the results of analyses which require a suspension of belief in what we know about agricultural trade: the assumptions undergirding one-price, Armington, and net trade models result in elegant but implausible representations of observed conduct.

Stability and Liberalization

In the United States, free trade in agriculture has not been a politically correct position since 1933. This political reality cannot be assumed away. Current proposals for agricultural trade liberalization may be too liberal for national governments to tolerate if liberalization increases the variance of agricultural prices and farm incomes within their borders. What Gale Johnson warned of in 1950 still holds true:

> Regardless of which proposal [for effecting price stabilization] is accepted, this country must stand ready to consider the desires and aspirations of agricultural producers for greater economic stability. If these desires are not taken into account, the possibility of achieving liberal trade throughout the world is sharply reduced.

The possibility is even further reduced today because the United States is no longer the victorious hegemon that it was in 1945. Too little attention has been paid to the issue of price stability, or the political demand for it, in the context of liberalized agricultural trade. The plans for a Commodity Control or World Food Board were certainly idealistic, but

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[21] These issues have been the focus of the author's recent research (Skully, 1990, 1991, 1992).

Keynes and Wallace, although overoptimistic about the capacity of the public sector, were not dueling with phantoms. They recognized and attempted to devise a means to reduce price volatility, which they viewed as the core cause of agricultural nationalism.

Keynes and Wallace identified an international political-market failure and attempted to construct an international public good: an institution that would (1) lessen the demand for nationalistic policies by (a) reducing price volatility and (b) resolving, multilaterally, effective demand failures (food aid); and (2) credibly enforcing rules to constrain the external effects of domestic agricultural policies from spilling over into the international market.

Designing or realizing such an international public good may be impossible, but it seems to embody what many current partial liberalization proposals are groping toward.[22] The current Hobbesian circus of retaliatory bilateralism, with the United States and the EC at center stage, is too self-destructive to be sustainable. The risk is that agricultural retaliation is at least as likely to spread to other areas of commerce and finance as it is to be resolved by a cease-fire and an agreement to play fair in the future; no one has played fair in the past. The proposed alternative of liberalized agriculture trade, as long as the volatility problem persists, is equally unsustainable, not to mention politically unacceptable. The Uruguay Round of the GATT is the first time since the late 1940's that proposals on rules for agricultural trade have been seriously discussed multilaterally. The negotiations on agriculture have limited themselves to evaluating alternative amendments to the rather weak GATT foundations. The GATT, after all, was the default option to the ITO. The agricultural diplomacy of the 1940's, as outlined in this chapter, entertained a much broader portfolio of options than we have permitted ourselves today, although we face essentially the same problems, and some of these options may contain solutions or alternatives to the current stalemate.[23]

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[22] Production entitlement guarantees and trade distortion equivalents address the second goal, but the price volatility problem remains.

[23] A constitutional convention rather than amendment to the existing order may be needed. Jackson (1990) discusses the establishment of a World Trade Organization, and Bhagwati (1991) alludes to constitutional questions in his analysis.

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Chapter 12

Increased Protection in the 1980's

Exchange Rates and Institutions

David A. Stallings*

Introduction

Trade protection is generally acknowledged to have increased in the United States during the 1980's (Rowley and Tollison, 1988). Several explanations of this phenomenon have been made in the literature, with two being pertinent here. First was the appreciation of the dollar between 1980 and 1985 (Haberler, 1988; Corden, 1987; Dornbush, 1988; and McCulloch, 1988). This persistent rise led to an increase in imports of products that compete with those of U.S. domestic firms. The second explanation for the increase in import restrictions lies in the more accessible trade "remedies" available to the protection seeker (Baldwin, 1989). Firms "injured" by imports could, among other things, search for ways to lower costs, accept lower profits for the duration of the appreciation, or appeal for protection. The last was seen by many as the least-cost solution.

The above explanations are not independent. The dollar's 1980-85 appreciation raised the demand for import restrictions. However, the supply of protection "remedies" has also changed. The emphasis is now on regulatory protection, exemplified by antidumping and countervailing

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duty determinations. The move to this type of protection was predicted by Finger, Hall, and Nelson (1982). The trend has been to deemphasize protection achieved through overtly political (legislative) channels. Jones (1986), in the prime example of an industry using available import-restricting institutions, traces the postwar protection accorded the U.S. steel industry, showing how it moved from attempts to impose quotas through Congress in the 1960's, to the use of antidumping and countervailing regulations in the 1970's and 1980's. Eichengreen and van der Ven (1984) point to changes in the Trade Act of 1974, in particular, that encouraged the use of antidumping petitions. Appeals for import restrictions for many products are now directed exclusively into administrative solutions.

A bureaucratic solution is, by definition, one of specific rules in an inflexible order.[1] Thus, a plea for trade protection presented in the proper form to the appropriate agency, and which followed all the rules for stepping through a "perfect" administrative procedure, or algorithm, would always result in some specific import restriction.

An antidumping duty is imposed in cases of price discrimination in which the U.S. customer pays the lower of two prices. A successful petition for protection typically results in a tariff that forces the U.S. consumer to pay the higher price.[2] A duty may also be levied in an antidumping case if the producer charges less than the cost of production. A countervailing duty is designed to offset subsidies paid by the exporting country.

Opposition to potential antidumping and countervailing duties by domestic groups, such as consumers or retailers, is mitigated in three ways. First, and most important, the rules preclude adversarial participation; dissenting domestic concerns are irrelevant to the decision

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[1] The second definition under "bureaucracy" in *Webster's Collegiate Dictionary (Fifth Edition)* states that it is "officialism in government; rigid, formal measures or routine procedure in administration."

[2] The U.S. price is compared with either a price in the exporting country or to a price in a third country. In an antidumping case involving off-road motorcycles from Japan, for example, the duty was based on higher prices on such vehicles in Canada. There were very few sold in Japan; thus, a domestic price in Japan could not be established.

rules.[3] Second, the complexity of the process makes the cost of understanding the issues very high, especially when there is little payoff. Third, there will be little open discussion which could arouse opposition. Newpaper coverage, for example, of antidumping and countervailing cases is often limited to ex post decisions.

The Twin Towers of Bureaucratic Protection

Two U.S. Government agencies are involved in the disposition of antidumping and countervailing cases. The International Trade Commission (ITC) decides, via a quasi-judicial process, whether or not a domestic industry (as represented by those parties submitting a petition in a countervailing or antidumping case) has been materially "injured" by imports.[4] The ITC is an independent agency. The International Trade Administration (ITA), of the Department of Commerce, determines the size of antidumping and countervailing duties. A dichotomy is created where the ITC looks at the domestic picture for an industry while the ITA examines that industry's foreign competitors.

The ITC was established by Congress in the Trade Act of 1974 to supplant the Tariff Commission. There are six commissioners who vote on decisions concerning trade issues. All are appointed by the President, subject to Senate confirmation. No more than three may be from the

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[3] Finger, Hall, and Nelson refer to the "disenfranchising" of the opposition (1982, p. 454). Vermulst (1987, p. 66) notes that the "interested parties" are defined as (1) a foreign manufacturer, exporter, or U.S. importer of the merchandise under investigation (includes trade or business associations), (2) the government of the country of manufacture or export, (3) a manufacturer or wholesaler of the product in the United States; (4) a certified union or group of workers recognized as representative of the U.S. industry, (5) a business or wholesale association, the members of which are composed of (3), or (6) an association, the majority of whose members are composed of (3), (4), and/or (5) with respect to a like product. There are no consumer groups, industries using the products as inputs, or exporters that may challenge the decision. See the *Federal Register* 52, December 27, 1988, p. 52345, for a description of "interested parties" to countervail investigations. The regulation adds, in response to the Omnibus Trade and Competitiveness Act of 1988, a "seller in the United States of the like product produced in the United States" as one potential "interested party." Sellers of imports are still excluded. The definition of an "interested party" for antidumping cases is identical (*Federal Register* 53, March 28, 1989, p. 12771).

[4] The term quasi-judicial was used in the 1985, 1986, 1987, and 1988 *Annual Report* of the United States ITC.

same political party, thus earning the appellation "bipartisan." However, merely because an agent is "bipartisan" does not mean that the wishes of Congress cannot be satisfied. Baldwin (1986, p. 89) points out, for example, that the President has no authority to recommend or change the budget of the ITC. The ITC depends solely upon Congress in receiving and justifying its revenue.

Moore (1989) provides evidence that ITC "bipartisanship" is less than independence. He finds that constituencies of members of the Subcommittee on Trade of the Senate Finance Committee are more likely to get a favorable ruling from the ITC in antidumping cases. However, he was unable to find any pattern of support for constituents of the House Subcommittee on Trade of the Ways and Means Committee.

Moore does not test for a political cycle or use exchange rates to predict the outcome of ITC decisions. He does find, however, that ITC antidumping injury decisions (in the absence of congressional influence) are based on changes in domestic industry performance indicators such as declines in production, profit rates, and industry employment. Declines in these variables are taken as evidence of "material injury."

One key focus in this study is the influence of the exogenous flexible exchange rate on the provision of protection. Because the ITC looks only at the domestic industry, part of our attention shifts to the ITA, the agency that investigates the exporting industry. The ITA establishes the duty to be imposed whenever it finds guilt in antidumping and countervailing cases.

Antidumping and Countervailing Duty Cases, 1980-88

The authority for the investigation and determination of duties in antidumping and countervailing cases was transferred from the Treasury Department to the Commerce Department, effective January 2, 1980, by the Trade Agreements Act of 1979. That act also instituted strict statutory deadlines for the processing of antidumping and countervailing

allegations.[5] The transfer from the Treasury by the 1979 Act also removed the ability of the Secretary of the Treasury to suspend collection of countervailing duties. Senator Daniel Patrick Moynihan, a member of the Senate Finance Committee in 1979, was asked about the relocation of responsibility from Treasury to Commerce:[6]

Mr. Olmer: Senator, was there, in your mind, any linkage between the transfer of responsibility from the Treasury Department to the Commerce Department for administration of the antidumping countervailing duty law in passage of the 1979 Act, in this commitment that you spoke of to future generations?[7]

Senator Moynihan: Yeah, there was. And it does not intend any disparity [sic.] of the Treasury, but rather would more, I would hope, to be thought of as a compliment to the Department of Commerce. There is simply a matter [sic] of what the priorities of a Department [are]. . . . This is the Department of Commerce, if you will find yourself a seal, what do you see on it?

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[5] Vermulst (1987, p. 176, fn. 314) quotes the House Report on the Trade Agreements Act of 1979:

> The [Ways and Means] Committee is very dissatisfied with the past record of the Secretaries of the Treasury in assessing duties on entries subject to a dumping finding. Unless dumping duties are assessed in a timely fashion, the remedial effect of the law is negated. In this regard, the Committee finds the 3 to 3 and one-half year period average delay between entry of merchandise and assessment of duties unacceptable.

[6] From a transcription of the *Conference on Novel Issues*, held in Washington, DC, November 4, 1983. Recorded and transcribed by Free State Reporting, Inc., of Annapolis, MD.

[7] Sen. Moynihan stated that one of the purposes of the GATT *Subsidies Code* which was incorporated in, according to him, the Trade Agreements Act of 1979, was to save "future generations" from the ravages of subsidized competition. According to Sen. Moynihan, the jobs of thousands of future Americans are owed to the foresight of the Senate Finance Committee.

The seal of the Department of Commerce has an eagle sitting atop a shield containing a lighthouse and a ship. Moynihan could well mean that the Department of Commerce, in the person of the ITA, acts as a beacon of vigilance for the proper course of international commerce.

The 1979 Act made a significant institutional change in the mechanism for seeking protection through an antidumping or countervailing petition: transfer of the investigating agency and strict timetables. This chapter considers only those petitions directed to the ITA between January 1, 1980, and December 31, 1988. The Trade Act of 1984, according to Bello and Holmer (1983), made no substantive changes in the antidumping and countervailing duty investigation process. The Omnibus Trade and Competitiveness Act of 1988, however, significantly changed antidumping provisions (Lipsey, 1988).

Table 1 details the course of investigation of antidumping and countervailing duty cases prior to the assignment of any tariffs. The 1980-88 period saw 582 petitions filed. The most, 51, came against Japan. Among other particularly popular country marks: Brazil with 43, 34 for Canada, 34 for Mexico, 32 for South Korea, and 31 for Taiwan.[8] There were 351 antidumping cases. Japan led with 50 cases. Other popular targets for antidumping petitions were Brazil and Canada with 23 each, Taiwan with 25, West Germany with 20, and South Korea with 22. There were 231 countervailing cases during the study period. The most frequent target was Mexico, facing 28 petitions during 1980 through 1988. Other targets include Brazil (20), France (13), Spain (11), Canada (11), and South Korea (10).

The ITA is required to initiate antidumping and countervailing duty cases within 20 working days from the receipt of the petition. The initiation is a certification that the petitioner is an "interested party" and that there are sufficient grounds for investigation. The 582 petitions received during 1980-88 resulted in 570 investigations actually begun between 1980 and 1988; one case was initiated in 1989. Twelve cases, 10 antidumping and 2 countervailing, had petitions either rejected or withdrawn before initiation.

The initiation of the investigation is the formal notification to both the plaintiff and the defendant that further information, mostly from the

[8] Country detail is contained in Stallings (1990) and is available upon request.

Table 1--Summary of antidumping and countervailing activity, petitions filed between 1980 and 1988, through the preliminary ITC "injury" determinations

Item	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	Total
					Number						
Petitions filed with the ITA	24	23	94	69	95	101	100	23	53	0	582
Antidumping	16	12	34	50	51	62	71	15	40	0	351
Countervailing	8	11	60	19	44	39	29	8	13	0	231
Petitions dismissed or canceled	0	1	2	1	0	4	3	1	0	12	0
Cases initialized by the ITA	24	22	91	68	78	115	96	23	52	1	570
Days between petition and initiation	24.6	15.0	24.3	26.4	26.8	26.6	26.8	25.6	26.1	27.0	26.1
ITC preliminary determinations	15	15	69	42	59	92	94	21	45	3	455
Antidumping	12	12	31	39	43	69	67	18	37	3	331
Countervailing	3	3	38	3	16	23	27	3	8	0	124
Total positive	10	11	60	34	51	79	78	20	43	2	388
Antidumping	7	9	27	31	39	61	56	17	35	2	284
Countervailing	3	2	33	3	12	18	22	3	8	0	104
Total negative	5	4	9	8	8	13	16	1	2	1	67
Antidumping	5	3	4	8	4	8	11	1	2	1	47
Countervailing	0	1	5	0	4	5	5	0	0	0	20
Days between petition and ITC preliminary	61.6	60.1	52.5	47.6	50.6	46.0	47.6	46.0	45.9	54.0	49.0

Source: Stalling (1990).

defendant, is to be requested. The defendant's responses are available for review and comment by the petitioner or other "interested parties" during the course of the inquiry.

The next step is a preliminary injury determination by the ITC, required within 45 days of the petition being filed. This determination must be completed for all antidumping cases, but only for those countervailing duty cases that involve signatories to the GATT subsidies code or where the imported good is nondutiable. A negative preliminary injury determination at this point closes the case. The ITC relies solely on the content of the petition, subject to verification. Only 455 of the 570 cases initiated had to have a preliminary decision from the ITC. There were 331 antidumping cases[9] and 124 countervailing cases. Thus, 94 of all antidumping cases, but only 54 percent of countervailing cases went to a preliminary ITC decision.

The ITC made a number of negative determinations, closing 67 cases. The overall success rate is, at this stage, 86.2 percent (503 out of 582 cases), but is different for antidumping than for countervailing duty cases. Only 20 countervailing duty cases are included in the "negative" ITC determination category, compared with 47 antidumping cases. The 16.2-percent failure rate for countervailing duty cases is higher than that for antidumping cases. Countervailing cases may also be affected if the accused country decides to sign the GATT subsidies code. The case is then "reinitialized" by the ITA, and the ITC issues an injury determination.[10]

The positive decision reached by the ITC at this point is the first overt step in imposing costs on a possible defendant. The case then goes back to the ITA for determination of preliminary antidumping margins or subsidy rates. The failure of a company or importer to defend itself in

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[9] Ten antidumping cases were resolved after initiation but prior to the ITC preliminary determination by export restraints, dismissal of the petition, or combining petitions.

[10] Countries which became parties to the Subsidies Code in the midst of investigations include the Philippines, New Zealand, and Mexico. Prior to April 23, 1985, Mexico had not become a party to the GATT Subsidies Code. Therefore, no injury determination was necessary. However, after Mexico became a signatory, any countervailing cases that had not resulted in a preliminary ruling had to be resubmitted with allegations of injury. This action resulted in the petitions in two cases being withdrawn: "Converted Paper Supplies" originally filed on November 16, 1984, petition withdrawn May 17, 1985 (50 *Federal Register* 24012, June 7, 1985), and "Portable Aluminum Ladders and Components" originally filed March 26, 1985, petition withdrawn May 2, 1985 (50 *Federal Register* 21480, May 24, 1985).

accordance with the rules of evidence (as set by the ITA) automatically results in the information in the petition being used to determine the preliminary outcome. The case of "Industrial Belts from South Korea" (C-580-802) is typical, and shows the ramifications of not responding to a request for information. The Hankook Company of South Korea did not cooperate (in the view of the ITA) and was assigned a preliminary 24.52-percent duty. The average preliminary duty for all South Korean companies was only 0.51 percent. The same was true in "Reinforcing Bars and Shapes from Mexico" (C-201-401). Companies that "cooperated" were assigned a preliminary duty of only 1.73 percent. Companies which "unreasonably refused to provide requested information" had products assessed 104.58-percent duties. Thus, once the case proceeds to preliminary ITA determination, the failure to act is costly.

Table 2 covers the 503 antidumping and countervailing cases surviving the ITC preliminary injury determination. Forty-four cases were "resolved" prior to a preliminary ITA determination, with 20 resulting in trade restrictions (all involving steel or steel products). There were 459 total preliminary findings by the ITA, with 402 resulting in duties. Thus, 72.5 percent, or 422 of 582 petitions, achieve either a tariff or other export restraint. The success rate rises sharply once the ITA preliminary determinations are reached, as 87.6 percent of these decisions assigned duties.

The date of the preliminary decision, as published in the *Federal Register*, is the effective date that the duty is imposed. A petitioner might reasonably expect, on average, a 4-month wait for a countervailing duty (123.3 days, from table 2, including nonwork days), but a 6-month wait for an antidumping levy (184.3 days). The relevant economic question is the tradeoff, should one exist, between an antidumping and countervailing duty petition. One may hypothesize that information requirements for countervail petitions should be greater: specific subsidy policies of national governments and their application to individual industries must be gathered and documented. An antidumping petition requires only that a price difference be reported, with prices lower in the United States than somewhere else. Therefore, the statutory requirement that a countervail case take 30 days less, and the actual 60-day difference, may be an

inducement to seek a countervailing duty in addition to one for antidumping.[11]

There is also a "learning" process in countervailing cases which may encourage some free ridership. Once a country, such as Brazil for example, has been found guilty and information on its subsidy practices has been published, subsequent filings by other U.S. industries against their Brazilian cousins become easier. The subsidies found are often very similar (if not identical) to those in prior cases for the same country. This similarity does not generally, however, affect the time required for investigation; the specific type of subsidy must be verified as being used and the amount received by each company must be determined.

The "inducement" to continue to pursue antidumping cases would then trade relative success for the time period difference. The total number of preliminary duties applied in antidumping cases, 248, represents a 91.5-percent success rate (out of the 271 cases). The proportion of positive determinations also seems to have grown over time, with 96.5 percent of preliminary determinations assessing duties between 1986 and 1988, including 51 of 52 cases decided in 1986. The overall success rate for ITA preliminary determinations in countervailing cases is 81.9 percent (154 out of the 188 cases), declining sharply in 1986-88 to 70.6 percent.

The rate of success is only part of the story, however, as the size of the duty is also important. The overall unweighted average preliminary antidumping duty would raise the price of affected imports by 33 percent. Countervailing duties averaged 14.8 percent.

After the ITA Preliminary Decision

Once a preliminary decision has been issued, the parties may respond to the reasons given by the ITA in reaching its determination. The ITA also attempts to gather necessary information that was lacking for the preliminary finding. The result is that the ITA will give a second, and final, determination of antidumping margin or subsidy rate and set the size of the duty. This determination must occur (delays are permitted) within 75 days of the preliminary ruling in both countervail and antidumping cases.

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[11] There are often countervailing petitions filed at the same time as for antidumping, especially for developing countries.

Table 2--Summary of antidumping and countervailing activity, petitions filed between 1980 and 1988, preliminary ITA determinations

Item	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	Total
						Number					
Case completed prior to ITA preliminary	2	1	16	4	7	11	3	0	0	0	44
Export restriction	2	0	8	1	0	9	0	0	0	0	20
Petition withdrawn, dismissed, or combined	0	1	8	3	7	2	3	0	0	0	24
ITA preliminary determinations	6	15	59	48	69	84	79	38	47	14	459
Antidumping	1	10	17	31	34	52	52	28	33	13	271
Countervailing	5	5	42	17	35	32	27	10	14	1	188
No injury determination required	2	3	17	12	24	14	8	3	7	0	90
Injury determination required	3	2	25	5	11	18	19	7	7	1	98
Total positive	6	13	51	42	57	75	69	36	40	13	402
Antidumping	1	8	14	28	29	47	51	27	31	12	248
Countervailing	5	5	37	14	28	28	18	9	9	1	154
No injury determination required	2	3	16	10	19	11	7	3	4	0	75
Injury determination required	3	2	21	4	9	17	11	6	5	1	79
Total negative	0	2	8	6	12	9	10	2	7	1	57
Antidumping	0	2	3	3	5	5	1	1	2	1	23
Countervailing	0	0	5	3	7	4	9	1	5	0	34
No injury determination required	0	0	1	2	5	3	1	0	3	0	15
Injury determination required	0	0	4	1	2	1	8	1	2	0	19

Continued--

Table 2--Summary of antidumping and countervailing activity, petitions filed between 1980 and 1988, preliminary ITA determinations -- Continued

Item	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	Total
						Number					
Days between petition and ITA preliminary	90.0	159.1	162.7	170.9	143.4	160.4	151.0	163.5	171.7	201.5	159.3
Antidumping	113.0	179.7	206.3	194.9	177.4	184.8	167.7	183.9	191.1	204.9	184.3
Countervailing	85.4	118.0	145.0	127.0	110.3	120.6	119.0	106.4	125.8	157.0	123.3
No injury determination required	88.0	92.3	124.9	125.7	119.2	108.4	116.9	92.0	121.4	0	116.9
Injury determination required	83.7	156.6	158.7	130.1	90.9	130.1	119.9	112.6	130.2	157.0	129.2
Average duty	21.5	12.1	13.1	25.5	20.6	25.7	24.1	36.0	36.8	58.2	25.5
Antidumping	50.0	15.7	14.1	35.3	31.2	30.2	27.8	33.7	50.2	54.7	32.9
Countervailing	15.8	4.9	12.8	7.6	10.4	18.4	17.2	42.4	5.2	103.6	14.8
No injury determination required	12.3	5.9	16.4	6.7	11.2	21.6	50.0	114.3	3.9	0	19.3
Injury determination required	18.1	3.4	10.4	9.8	8.7	15.9	3.4	11.6	6.5	103.6	10.7

Source: Stallings (1990).

A final positive antidumping or countervailing duty finding by the ITA sends the case back to the ITC for a final injury determination. This finding is required within 45 days of the final ITA decision. The final picture for an antidumping or countervailing case emerges about a year after the petition has been filed. A negative final decision by the ITC, which states that no "injury" to domestic firms has occurred, removes any duties which have been assessed and leads to a refund of any paid.

Previous work has concentrated on decisionmaking by the ITC (Moore, 1989; Shughart and Tollison, 1985; and Baldwin, 1986). However, as we have seen, the ITC is not involved in all decisions for protection via antidumping or countervailing statutes. The ITA decisions may, of themselves, impose costs on exporters independent of a final duty or injury ruling.

The ITA may impose current and future costs on an exporting firm. A case that goes as far as an ITA preliminary ruling requires the importer, exporting company, or country of origin to mount a defense.[12] Failure to do so is an assumed plea of guilty as charged. Further, a preliminary positive ruling by the ITA requires that a bond be posted. This tariff is, moreover, imposed not only on subsequent imports, but on inventory currently on hand. No statutory trade protection, even in the days of Smoot-Hawley, imposed such a penalty.

Second, a positive preliminary or final ruling by the ITA may act to restrain exports regardless of the ITC final determination. Consider, for argument, cases in which the ITA has ruled that subsidies are being provided or that an antidumping duty is warranted, yet the final injury determination is negative. An increase in imports at any time after the ITC ruling may, in the future, lead to demonstrable injury. Since "unfair" trade practices have already been established, a future petition will be easily prepared. Further, any action that "injures" a U.S. industry will

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[12] A letter from the Charge d'Affaires of the Embassy of Colombia, Fernando Cepeda, to David Binder, Acting Director, Office of Investigation, dated May 17, 1981, regarding "Fresh-cut roses from Colombia" (1981), concerned this issue. Cepeda notes previous antidumping petitions against the Colombia flower industry (in 1979 against roses and in 1977 against all fresh-cut flowers) resulted in no direct relief to U.S. producers. He stated that "they had an adverse impact on the fresh-cut rose trade. The uncertainty which such action created in the market and the financial and administrative burden of their defense acted as a trade barrier . . . the legal costs of the defense can be very burdensome."

lead to a favorable outcome for a subsequent petitioner. Injury may, of course, be defined in a number of ways favorable to a domestic industry; loss of market share being one that is readily identifiable.

Worse, for the exporter, the provision of "critical circumstances" can come into play. "Critical circumstances" occur when the importer "should have known" that imports are at an "unfair" price and that there has been a "surge." A previous positive antidumping or countervailing finding is prima facie evidence that the importer "should have known."[13] Thus, any future duty under these statutes will be applied retroactively by 90 days prior to the preliminary ITA determination and can be selectively applied to individual companies. Appeals must wait for the ITA final ruling. A preliminary and/or final positive duty could reasonably produce a cautious response to any temptation by an exporter to expand sales in the United States.

Why Protection via Regulation?

The increased clamor for protection, especially early in the 1980's, and the means by which these demands were satisfied, served to advertise remedies that could be implemented quickly and provide effective relief. The brief 1980-88 history of countervailing and antidumping petitions provides eight identifiable benefits to those pursuing protection.

First, and most obvious, countervailing and antidumping investigations provide relief very quickly. Duties in countervail cases appear, on average, within 4 months of a petition. Those for antidumping take only 6 months (table 2).

Second, duties are prohibitive, especially when compared with the low level of current U.S. tariffs. Countervailing duties assessed in preliminary

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[13] The antidumping case of "Photo Albums from Korea" (petition filed on January 30, 1985) proves instructive. The South Korean exporters would not (or could not) comply with the requirement that data be submitted in machine readable form. Thus, the Department of Commerce used the information in the petition itself to set the final ad valorem duty (equalling the dumping "margin") of 64.81 percent. According to the petition, apparently deemed by the Department of Commerce more reasonable than the efforts of the Koreans, the U.S. price represented slightly over 35 percent of production costs. Further, the ITA also discovered that Canada had previously found South Korea guilty of the same offense. The result was a finding of "critical circumstances"; the duty was applied retroactively to 90 days prior to the preliminary finding by the ITA (*Federal Register*, July 16, 1985).

ITA determinations between 1980 and 1988 were almost three times the current U.S. average tariff (14.8 versus 5.0 percent). Antidumping duties are six times that average, larger than the largest average tariff on dutiable imports since the United States entered World War II (*Historical Statistics of the United States*, 1975). These duties have increased in magnitude since 1986 (table 2).

Third, the duties are applied immediately to goods already warehoused in the United States by the importer. Before sales can be made out of that inventory, a "bond" must be paid to the Customs Service. Duties can also be applied retroactively, in "critical circumstances," to 90 days prior to the ITA preliminary ruling. This action yields protection within 1 month for countervailing or 3 months in antidumping investigations.

Fourth, the success rate (for the petitioner) is very high. There were 459 cases initialized by the ITA between 1980 and 1988 that received a preliminary determination from the ITC and/or the ITA. Preliminary duties were assigned in 402 instances. Another 21 cases yielded suspension agreements or quotas without a preliminary ruling. The overall success rate for a preliminary (or early) positive duty determination is over 70 percent. This rate rises sharply once frivolous cases are dismissed.

Fifth, even if no duties are applied, there are nontrivial costs associated with defending oneself against the charges. Estimates range from $100,000 to provide the most rudimentary defense (Vermulst, 1987) to $4.0 million (Rugman and Anderson, 1987) for a full defense. The latter example was for a case won by the Canadian softwood lumber industry in 1982. Should the exporter fail to respond to the charges, the information in the petition will be accepted by the ITA, and the duty requested by the petitioner will be granted. Unlike nolo contendere in legal proceedings, there is little scope for plea bargaining.

Sixth, there is no effective domestic opposition.[14] Neither the President, Secretary of Commerce, nor any other non-Divine entity may intervene to change a preliminary or final decision. Consumers, retailers, and

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[14] Destler and Odell (1987) point out several cases in which domestic opposition to specific import restrictions has been helpful in preventing or softening proposed measures of protection.

manufacturers that use imported goods receive no consideration in the determination. They are not permitted to submit evidence to either the ITA or the ITC. The guilty exporter is officially labeled as someone selling a product at "less than fair value" if the charge was antidumping. The pejorative for countervailing is milder, but public notices provide a litany of rhetorically exploitable "unfair" subsidies.

Seventh, the rules of evidence are easy. An antidumping duty is automatic whenever the domestic price in the exporting country (or a third country in the absence of a domestic market) is found to exceed the U.S. price. A case against a Japanese exporter is virtually assured of victory: Japanese distribution systems are heavily protected, prices include premiums for certainty of delivery, and domestic industry cartels effectively segment domestic and export markets.[15] Other things equal, prices on Japanese goods sold in Japan will be higher than those same goods sold in the United States.

Pricing based on current production costs is also increasingly popular in antidumping cases. The petitioner may allege that home sales in Japan, for example, are below the cost of production. The ITA will then request that the company provide all expenditures relevant to the production of the merchandise under investigation. A judgment that goods are sold below the cost of production means that the "fair" price will be "constructed."[16]

"Constructed" prices may require higher costs than are economically justified. The exporting company must spend at least 10 percent of the price of the product on "general expenses," such as marketing, and also earn an 8-percent profit. There can be no "loss-leaders." The conception of marginal cost, especially that which declines over the range of production, is nowhere to be found. Joint costs which may be allocated between products are largely ignored. Thus, high-technology goods make excellent targets of investigation. Companies that economize on "general expenses" or temporarily accept lower profits will be penalized. Phases of the

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[15] See *The Economist* (January 28, 1989), pp. 15 ("Cheaper Shopping in Japan") and 70-1 ("Gingering Japan's Distribution System") for a description of retailing problems.

[16] The procedure is codified in the *Code of Federal Regulations* under title 19, part 353.5, as published in the *Federal Register*, March 28, 1989, p. 12787.

business cycle are immaterial.[17] No comparison with returns of domestic firms in the same industry is permitted. "Constructed value" implies, in some industries, that price is determined by adding together a superset of average (not marginal) input costs, rather than in organized markets of buyers and sellers.

Because of the domestic pricing structure, an assumed joint production of many goods, and the high technology character of many export industries in Japan one should not be surprised, that 40 of the 42 preliminary determinations for antidumping cases involving that country resulted in duties. These duties were an average of 44.2 percent, ad valorem.

The eighth reason that a petitioner would seek an antidumping or countervailing duty is the highly technical nature of antidumping and countervailing cases. Otherwise interested people will probably not be tempted to learn the way in which duties were calculated and imposed. The stultifying language in the *Federal Register* entries reporting ITA and ITC decisions discourages close reading, unless one is a party to the case and/or has a direct interest. There are several terms which may have been designed to evade easy interpretation. For example, "suspension of liquidation" indicates that a tariff has been imposed, and no further sales out of the importer's inventory may be made without paying the penalty. "Posting bonds" is a euphemism for collecting a preliminary or final duty before the final determination. "Constructed value" says that cost is the only relevant determination of price.

A reasonable assumption is that most people, although one would hope not the majority of economists, have little idea of the nature of the decisions made by the ITA. This assumption may also be expressed as

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[17] See Ethier (1982) for a more indepth discussion. Dale (1980, p. 199) notes a U.S. submission to the GATT antidumping code negotiating session in 1966:

> The use of "cost of production" when any comparable sale price can be found is subject to serious objection on both theoretical and practical grounds. Sales at below cost do not necessarily involve price discrimination. For example, domestic as well as export sales at below cost, can be normal business practice at times of business depression.

Even though the United States at one time formally recognized the business cycle causes of dumping, the ITA apparently ignores such in evaluating price complaints. Instead (Vermulst, 198 - p. 709) the ITA uses a "normal industry practice test," which does not recognize pricing policies during recessions.

rational ignorance; there is no reason, at the margin, that the person in the street perceives a net benefit from learning the minutiae of antidumping and countervailing cases.[18] Those antidumping cases based on price discrimination state that U.S. consumers should always pay the highest (most noncompetitive) price, regardless of how that price was obtained. Thus, if Brazil protects itself from imports of brass by imposing a tariff, then U.S. consumers should pay that Brazilian, tariff-ridden price on any imports from Brazil. The end result is the spread of other countries' import protection to the United States.[19]

Rules have shifted to the benefit of the petitioner, and never, since the passage of the 1974 Trade Act, to the benefit of the accused party. Sales at prices that are temporarily below production costs were not considered dumping before 1974, but have become a major way to establish a dumping "margin." The question is whether or not such fluid notions of "fairness," especially when the flow always benefits the domestic industry, imply that these instruments are protection. The answer cannot, objectively, be no. No one knows, with certainty, whether one's pricing behavior will, at some undetermined future point, suddenly switch from being acceptable to unacceptable.

Antidumping and countervailing investigations and subsequent duties advance the cause of protection, while successfully hiding that purpose. Exporters to the United States, particularly Canadians (Lipsey, 1988; Rugman and Anderson, 1987; and Morton, 1989), have continued to complain about the rise in such protection.[20] The dismal forecast implied by our model, below, is that the process will become more lenient to the petitioner in the future, because the petitioner is not the only beneficiary.

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[18] This process of rational ignorance is encouraged by "optimal obfuscation," as described by Magee, Brock, and Young (1989, p. 134): "The principle of optimal obfuscation suggests that a party will shift to more indirect policies for redistributing income so long as the electoral gains in voter obfuscation exceed the electoral cost of receiving fewer resources from the clientele lobby." That is, these protectionist policies must be transparent to those desiring them, but not to those who pay the price (such as consumers and retailers).

[19] Furthermore, exemption from import duties for inputs is countervailable, according to the ITA. Thus, the *ad valorem* duty not imposed by Brazil, for example, is imposed by the United States.

[20] Kelly and others state that complaints concerning U.S. antidumping and countervailing investigations are by no means limited to Canada (1988, p. 10).

Granting Protection

Benefits of administered protection accrue not only to those who demand protection, but also to those who broker import restrictions. Thus, the population at large turns into possibly unwilling (or at least unknowing) suppliers of income transfers to those who have successfully petitioned for relief.

The assumption is that there is a strong principal-agent relationship between the budget authority (the trade subcommittees in the House and the Senate) and the ITA.[21] Legislators earn votes by providing guidance for a constituent service. The ITA gains income by providing that service. There is a close (but not one-to-one) association between changes in the ITA budget for the division responsible for import investigations and the number of antidumping and countervailing cases handled (fig. 1).[22]

The strength of the principal-agent relationship should be most evident in periods when trade protection is especially valuable to the legislator. Voter myopia magnifies the importance of constituent services in election years. Tests should therefore indicate that significantly more cases are begun in election than nonelection years. Further, we would expect negative outcomes (no duties provided) are absolutely (with a statistical certainty of one) more scarce the closer one approaches election day.

Many of the same reasons that petitioners find administered protection desirable also benefit brokers of that protection. High tariffs and rates of success are marks in favor of the ITA and the legislator in whose district or State the beneficiaries reside. The mitigation of opposition provides

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[21] This assumption is based on theories of delegation advanced by Aranson, Gellhorn, and Robinson (1982); McCubbins and Page (1986); and Wolf (1979). They have been supported by the theory of bureaucracy first articulated by Niskanen (1971). The delegation theory is demonstrated in action by Fiorina (1977) and given empirical support by Weingast and Moran (1983).

[22] A similar result could not be obtained for the ITC; antidumping and countervailing investigations are 10.1 percent of its budget (the ITC *Annual Report*, 1988). The chart represents the percentage change in the real budget for the Trade Administration Division, which conducts the investigation of antidumping and countervailing duty petitions. In 1987, the Export Administration Division became separate. Fiscal years 1988-90 include Export and Trade Administration (now Import Administration) together to be compatible with prior years.

no opportunity for embarrassing debate. Rather, the legislator can stand in the forefront of a defense of "fairness." Complaints about the process are buried in references to rules and procedures. Last, fast relief provides a means whereby a legislator can quickly capture the gains afforded by trade protection.

Empirical Results

The assumption is that the 1980-88 period of antidumping and countervailing law was stable. The supply of this mode of protection is observed to be almost perfectly elastic: few petitions were refused. Virtually every opportunity to earn revenue (such as in the form of political capital and future budget appropriations) by the ITA was accepted. The quantity supplied is solely a function of the position of the demand schedule.

The most direct test of increased demand for protection has the number of antidumping and countervailing petitions as the dependent variable. The exchange rate hypothesis may be stated simply that as the dollar rises in value, then more antidumping and countervailing duty petitions will be submitted.

The political payoffs occur as one is closer to an election. More petitions should be filed in an election than a nonelection year. There is no distinction between Presidential and midterm elections. Our model specifies that the relevant actors are members of Congress and people in the supporting bureaus. The President has no authority to change any countervailing or antidumping ruling. Therefore, the question of the Presidential election is moot.

Last, the rate of growth in aggregate real income (gross national product (GNP)) may also affect the incentives to seek trade protection: slower growth in aggregate demand may induce petitioners to seek to restrict imports to maintain their sales in shrinking or stagnant markets. The equation tested is then stated as:

$$\text{ALLCASE} = \text{CONSTANT} + \beta_1\text{TWXALL} + \beta_2\text{GNP} + \beta_3\text{ELECTION} \qquad (1)$$

where:

ALLCASE = The total number of antidumping and countervailing petitions,

TWXALL	=	The real exchange rate index weighted by the total number of cases brought,[23]
GNP	=	Real U.S. GNP, and
ELECTION	=	Dummy variable for an election year, equaling one for all four quarters of an election year, zero for other years.

Quarterly data were used from 1980-88, giving 36 observations. The expected signs on the coefficients for TWXALL and ELECTION should be positive, and on GNP negative. Levels were used for both the exchange rate and GNP. The variety of products involved and the differing speed of import penetration in those markets makes a unique lag specification unlikely.

The ordinary least squares results, with all variables (except ELECTION) in logarithms, are in table 3 for the combined total of antidumping and countervailing petitions filed in each quarter. All coefficients as specified in equation (1) are of the expected sign. The coefficient on the exchange rate index based on all cases, TWXALL, implies that a 1-percent appreciation in the real value of the dollar will lead to a 5.4-percent increase in the total of antidumping and countervailing duty petitions. This exchange rate elasticity is significant at the 1-percent level. The coefficient associated with real GNP is significant at the 10-percent level. A 1-per

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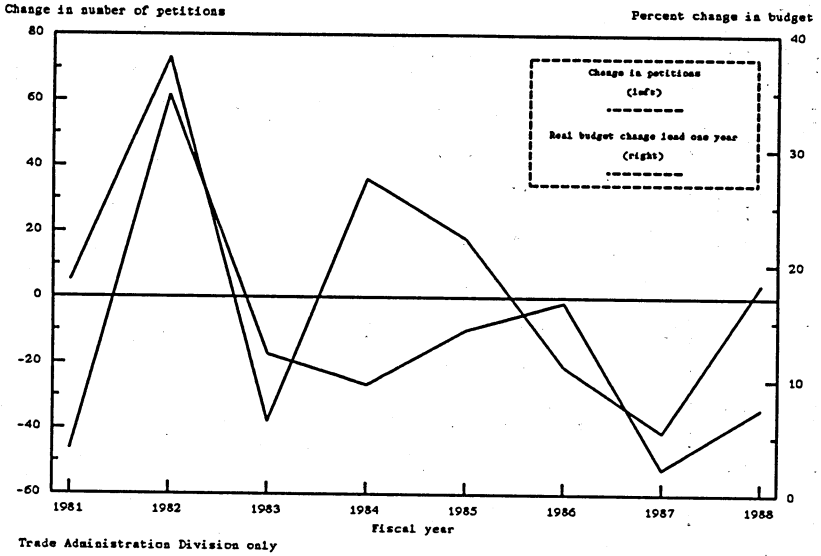
[23] The index was constructed as:

$$Index = 100 \prod_{i=1}^{60} R_{it}^{w_i}$$

where:

w_i	=	weight for country i, held constant through the study period, for the 60 countries against which antidumping or countervail petitions were brought between 1980 and 1988. Weights are shown in appendix table 1.
R_{it}	=	real exchange rate, in units per dollar, for country i in time t divided by the base period rate.

Figure 1
Budget increases and number of antidumping and countervail petitions



Trade Administration Division only
Source: U.S. Office of Management and Budget

conditions to regulatory activity, particularly Takacs (1981) and Shughart and Tollison (1985). Last, an election year will produce an 88-percent rise in the number of cases brought. The election year coefficient is significant at the 1-percent level.
cent increase in real GNP will lower the number of petitions by 1.8 percent. This result confirms earlier studies that relate business cycle

The significance of the election year can be seen most clearly in considering how large a change in the value of the dollar would be required to offset the election year effect. A 16.3-percent depreciation is needed to counter the increased number of cases in an election year.

The regression, as a whole, explains almost 60 percent of the variation in the total number of antidumping and countervailing duty cases. The Durbin-Watson statistic indicates no first-degree autocorrelation. These outcomes can be interpreted as strongly supportive of the two central hypotheses. An exchange rate appreciation leads to an increase in the demand for protection, as represented by the number of antidumping and countervailing petitions. Second, the filing of more petitions in an

election year can be interpreted as a sign of pressure on legislators that may be satisfied by a favorable antidumping or countervailing petition.

Using the exchange rate index for total imports (TWXTR) and the Federal Reserve weighted-average index (TWXFED) is also shown in table 3. The magnitude of the signs of the coefficients of the exchange rate variables and the election year variable were virtually the same, although the exchange rate elasticity decreases when the Federal Reserve index is used. The exchange rate and election year coefficients remain significant at the 1 percent level. The clear difference is the decline in importance of GNP as an explanatory factor (the sign reversal and in its coefficient).

When Are Decisions Made?

The "political cycle" has said, so far, that more petitions for protection occur as elections come near. This "cycle" also has another implication: decisions should also be more favorable as the election is closer. Both the ITC and the ITA could make decisions harmful to protection-seekers. The ITA could decide that no duty should be imposed. The major damage that the ITC can do to an antidumping or countervailing petition is to stop it in its tracks via a preliminary negative injury determination. A decision that no domestic firm is now (or could be) "injured" by imports will close the case, before any decision on the size of a duty can be reached.

The assumption of voter myopia tells us that the chances of a negative determination should fall as an election comes closer. Members of Congress are, by definition, more concerned with favorable outcomes for their citizens (in the form of constituent service and otherwise) as elections draw near. The recognition that one's representative is partially responsible for increases (or decreases) in one's wealth provides an incentive to vote for (or contribute to) the incumbent if he or she has recently "helped" deliver the goods (Kiernan, 1989).

The agency that assists the interested member of Congress has more to lose (the gratitude of a congressional sponsor at budget authorization time) the closer to the election that the agency chooses to issue an unfavorable ruling. The agency can, conversely, minimize negative

Table 3--Basic regression results for all cases, combining antidumping and countervailing

Dependent variable		ALLCASE
Independent variable	Coefficient	T statistic
CONSTANT	-6.7550	-0.7853
TWXALL	5.4071	7.0328
GNP	-1.8151	-1.7052
ELECTION	.6290	3.5796
Durbin-Watson 2.0320	R-squared (corrected) 0.5962	
CONSTANT	-31.9450	-3.1802
TWXTR[1]	6.1186	6.7622
GNP	.8358	.7875
ELECTION	.6346	3.5189
Durbin-Watson 1.9807	R-squared (corrected) .5768	
CONSTANT	-25.4724	-3.1953
TWXFED[2]	13.8297	6.7575
GNP	1.3172	.7698
ELECTION	.6399	3.5179
Durbin-Watson 1.8905	R-squared (corrected) .5571	

[1] TWXTR was constructed in the same way as TWXALL, but with weights determined by imports into the United States from country i (see footnote 23). Weights are shown in appendix table 1.

[2] TWXFED was constructed in the same way as TWXALL, but with weights used in the Federal Reserve weighted-average exchange rate index for country i (see footnote 23). Weights are shown in appendix table 1.

political (and thus budgetary) costs by making adverse decisions outside the view of a nearsighted electorate. One may also avoid congressional harassment and the need for providing time-consuming regular reports.

Some negative decisions may be necessary, moreover, to ensure that positive decisions are more credible. The acceptance of all claims of injury or the belief that all imports are the result of price discrimination cannot be correct. Frivolous petitions are filed, including at least one case where the U.S. price was higher than that overseas.[24] A negative decision enhances the reputation of objectivity (even if it is a rare occurrence), making a positive decision more difficult for "outsiders" to challenge.

Those necessary negatives will, in standard economic theory, be made according to the principle of cost minimization. A rational bureaucrat avoids a negative decision, close to an election, that may produce poor press for an incumbent set of legislators. A potentially costly decision for an incumbent could also be a costly one for the offending agency. Thus, since some outward appearance of objectivity must be preserved, those statements of objectivity in the form of decisions adverse to trade protection will fall further from elections, on average. They then cost the agency less because they cost the principal less.

The results from table 4 indicate that the likelihood of a negative preliminary decision by the ITC is greater if it is reached over 366 days before an election than in the 365 days just before. The likelihood of negative determinations is about 1 in 5 between 365 and 730 days before an election, yet only 1 in 10 if between 1 and 365 days before. The average number of days between a negative ITC preliminary decision and the next election is 407.8 days. The average for a positive decision is only 332.8 days. Negative decisions occur further from elections than positive decisions.[25]

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[24] Gilmore Steel Corporation, for example, filed an antidumping suit against Belgium (September 29, 1983) for hot-rolled carbon steel sheet. The petition was dismissed because Gilmore did not produce the product. Syntex Agribusiness, Inc., filed a petition (November 11, 1983) alleging that a U.K. producer of choline chloride "dumped" their product in the United States. The ITA, in both its preliminary (April 30, 1984) and final (September 18, 1984) decisions, found that prices were actually lower in the United Kingdom.

[25] Similar results (Stallings, 1990) were reached for ITA preliminary duty decisions, but are excluded for brevity.

Table 4--Dispersion of positive and negative International Trade Commission preliminary decisions, by number of days prior to next election

Number of days prior to election	Negatives	Positives	Share of negatives
	------- *Number* -------		*Percent*
More than 640	16	51	23.9
Between 550 and 639	6	43	12.2
Between 460 and 549	6	29	17.1
Between 366 and 459	12	39	23.5
Between 270 and 365	8	34	19.0
Between 180 and 269	5	58	7.9
Between 90 and 179	10	88	10.2
Less than 90	4	46	8.0
More than 365	40	162	19.8
Less than 365	27	226	10.7
Average	407.8	332.8	N.A.
Standard deviation	215.2	222.6	N.A.

N.A.= Not applicable.
Source: Stallings (1990).

The evidence on the timing of ITC decisions is drawn on the population of antidumping and countervailing cases. The statements made concerning averages, percentages, and time are not made with some hypothetical distribution in mind, or using artificially constructed variables (exchange rate indices, real exchange rates, and GNP have some element of subjectivity in construction). Therefore, probability statements are inappropriate for what follows; we know the results with certainty. A negative decision (no protection) is less likely, the closer the next election.

Rent Seeking and Administered Protection

Protection under antidumping and countervailing rules is attractive because it is inexpensive: the rent-seeking costs are low relative to the transfers received. This incomplete rent dissipation can be observed quite easily, and leads to more protection than would otherwise be the case. The following stylized example provides an illustration.

A firm that produces, for example, economics texts, has a falloff in sales. Let us call it, for illustrative purposes, the Smoot Company. Its lead salesman notices economics texts manufactured in Japan in a local bookstore, at a 40-percent lower price than those produced by domestic companies, including Smoot. The board of directors of the Smoot Company (perhaps along with union representatives) contacts a trade lawyer in Washington, perhaps on the advice of their senator or representative. The lawyers tell them they have a good potential case of dumping. Furthermore, the average antidumping duty against Japanese goods will close the price gap at the current level of imports.

The Smoot Company pays the lawyer, who prepares the petition in its name. The petition finds higher prices either in Japan or Canada. Just for good measure, the accusations also allege sales at below the cost of production. The lawyer, noting lots of previous experience in handling Japanese cases, agrees to a $250,000 fee, representing a 1-year profit for a $2.5-million firm earning 10 percent. Thus, a very small company chooses protection if an alternative investment of $250,000 would still leave the Japanese manufacturer with a price advantage.

The rules specify that the Smoot Company must represent the industry, but if no other economics text manufacturer complains, the ITA assumes that this is true. The question of whether or not a petitioner represents an industry came up in the case of "Electrical conductor aluminum redraw rods from Venezuela" (A-307-701). The ITA stated that requiring that Southwire, Inc. (the petitioner) prove its representation would be "onerous."[26] Thus, many other manufacturers must respond to the petition if it is to be voided. This opinion adds costs not only to the importer, but to other industry members who oppose the petition.

Other economics texts manufacturers clearly benefit from duties imposed as a result of Smoot Company's action. Smoot Company therefore does not receive the full value of the transfer resulting from the protection. It does receive enough of a transfer, at the margin, to compensate it for the opportunity cost of the investment in protection.

Full dissipation of rents, economy-wide, will not occur. We therefore have a situation in which a great deal of protection can be produced at a

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[26] See the *Federal Register* of June 30, 1988, p. 24756.

very low price. Raising the price of obtaining that protection or lowering the potential for success would therefore reduce import restrictions. Whether the rise in rent-seeking costs is greater than the gains from less protection is an open question, but one may at least assume that less protection will be sought.

Summary

The problem of increased protection in the United States is not one of a persistent appreciation of the dollar. Increased protection occurred because the tools to restrict imports were available, easy to use, quick to implement, and virtually impossible to fight. Only the winners are permitted to play the game; the rest of us, the losers from protection, are only observers.

The problem of appeals to and the success in achieving antidumping and countervailing protection may seem hopeless barriers to those who favor a liberal world trading system. There is no incentive for the principal or agent to change the process except to improve the probability that protection is granted. Judgments are cloaked in terms of fairness, and criticism necessarily implies that the critic is opposed to fair play.

Solutions to the widespread use of administered protection involve education as to its costs. Further, the way in which decisions are reached must be changed to permit "outside" voices to be heard. Rent-seeking costs must be raised. Otherwise, we will be left with a great deal of protection at very low cost.

U.S. antidumping and countervailing laws may be mimicked in other countries. Vermulst (1989) details unilateral interpretations by the United States, European Community (EC), Australia, and Canada that have increased trade restrictions. As the dollar falls in value, foreign electoral cycles notwithstanding, we may expect our exporters to be penalized by antidumping and countervailing statutes very similar to those used in the United States.

The empirical analysis used has focused on a period in which the institutions of administered protection were stable. Therefore, the amount of protection offered was essentially a passive function of demand. However, those who determine the price at which these instruments of protection are offered are not passive. The supply side of

protection, in the principal-agent model, can be verified with the acceptance of institutional evidence.

Bureaucrats and legislators gain from the promotion of restrictions on "unfair trade." Thus, if exploitable "profits" remain from expanding the scope of administered protection, entrepreneurs in the public sector will find them. Antidumping and countervailing statutes continue to provide more opportunities for protection. The further evolution of antidumping statutes in the Trade Act of 1988 to include "downstream dumping" is an example of legislative attempts to broaden the reach of these laws. Further, the Department of Commerce has proposed antidumping rules at the GATT that could, conceivably, widen the use of such devices.[27] Despite the fact that an exchange rate depreciation may reduce petitions for administered protection, the principals (Congress) and agents (Department of Commerce) can maintain their strength by extending the use of regulatory devices over which they have control. Entrepreneurship remains alive and well outside the private sector.

Antidumping and countervailing statutes allegedly defend U.S. producers from predatory pricing practices of exporters to the United States. The empirical evidence shows an exchange rate and election cycle. The relevant question is one of why foreign goods are "dumped" or "subsidized" more frequently as the dollar appreciates or as members of Congress seek votes (or campaign contributions). The answer is that administered protection, as it has been with protection through history, is a solution partially obtained by the political process.

The concerns expressed herein also apply to other tests of price discrimination, where subjective notions of "fair prices" dominate the debate. When standard business and pricing patterns become "unfair" by definition, the dynamic process of capitalism itself may be threatened.

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[27] Lachica, writing in the *Wall Street Journal* (November 22, 1989, p. A7) states, "The United States recommended that the international trade organization [GATT] amend its 10-year-old dumping code to make it harder for companies to evade antidumping penalties."

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Appendix table 1--Weights used in exchange rate indices

Country	All antidumping and countervailing petitions	U.S. merchandise	Federal Reserve index
		Percent	
Argentina	2.4	0.4	--
Australia	.9	1.0	--
Austria	.7	.2	--
Belgium	1.8	1.0	6.4
Brazil	7.9	1.9	--
Canada	6.3	20.2	9.1
Chile	.6	.3	--
China	--	--	--
Taiwan	5.7	5.1	--
Colombia	1.5	.3	--
Costa Rica	.6	.1	--
Denmark	--	.5	--
Dominican Republic	--	.3	--
Ecuador	.4	.4	--
El Salvador	.4	.1	--
EC	.4	--	--
Finland	.4	.2	--
France	5.2	2.6	13.1
Federal Republic of Germany	4.4	6.1	20.8
Greece	.4	.1	--
Hong Kong	.4	2.7	--
Hungary	.6	.1	--
India	1.5	.7	--
Iran	.7	.3	--
Ireland	.2	.3	--
Israel	1.7	.6	--
Italy	5.0	2.7	--
Japan	9.4	20.1	--

See footnote at end of table.

Continued--

Appendix table 1--Weights used in exchange rate indices -- Continued

Country	All antidumping and countervailing petitions	U.S. merchandise	Federal Reserve index
		Percent	
Republic of Korea	5.9	3.2	--
Luxembourg	.6	--	--
Macao	--	--	--
Malaysia	1.1	.8	--
Mexico	6.3	5.8	--
Netherlands	1.1	1.1	8.3
New Zealand	1.8	.3	--
Norway	.2	.7	--
Pakistan	.2	.1	--
Panama	.2	.1	--
Peru	1.5	.4	--
Poland	--	--	--
Portugal	10.7	.1	--
Romania	--	--	--
Saudi Arabia	.2	2.9	--
Singapore	1.8	1.2	--
South Africa	2.0	.8	--
Spain	3.9	.8	--
Sri Lanka	.2	.1	--
Sweden	1.1	1.1	4.2
Switzerland	.6	1.0	3.6
Thailand	1.7	.5	--
Trinidad and Tobago	.4	.6	--
United Kingdom	2.8	4.9	11.9
Uruguay	.2	.1	--
Venezuela	2.8	2.2	--
Yugoslavia	.9	.2	--
Zimbabwe	.2	--	--

--=Exchange rate not included in the index.

Appendix table 2--Data used in regression analysis

Year	Quarter	Exchange rate based on all antidumping and countervailing case (TWXALL)	Exchange rate based on total merchandises imports (TWXTR)	Federal Reserve index (TWXFED)	Real U.S. GNP, trillion 1985 dollars (GNP)	Number of antidumping and countervailing petitions (ALLCASES)
1980	I	69.3	76.6	63.6	3.2334	6
	II	69.4	76.3	64.3	3.1570	4
	III	67.6	74.3	62.5	3.1591	6
	IV	68.2	74.9	65.6	3.1992	8
1981	I	69.7	76.1	69.7	3.2611	2
	II	73.3	79.2	75.7	3.2502	6
	III	76.6	82.8	81.6	3.2646	5
	IV	75.7	81.0	77.4	3.2190	10
1982	I	78.1	83.2	80.0	3.1704	29
	II	81.0	86.3	82.5	3.1799	24
	III	86.4	90.7	87.0	3.1545	31
	IV	85.8	90.1	87.7	3.1593	10
1983	I	85.2	88.2	84.6	3.1866	17
	II	87.9	90.1	87.0	3.2583	11
	III	90.2	92.2	90.9	3.3064	18
	IV	91.1	92.4	91.6	3.3651	23
1984	I	91.7	92.7	92.5	3.4517	24
	II	92.5	93.8	93.1	3.4980	17
	III	96.6	97.7	99.7	3.5206	28
	IV	99.1	99.3	103.3	3.5352	26

Continued--

Appendix table 2--Data used in regression analysis -- Continued

Year	Quarter	Exchange rate based on all antidumping and countervailing case (TWXALL)	Exchange rate based on total merchandises imports (TWXTR)	Federal Reserve index (TWXFED)	Real U.S. GNP, trillion 1985 dollars (GNP)	Number of antidumping and countervailing petitions (ALLCASES)
1985	I	102.1	102.7	109.1	3.5775	28
	II	101.5	101.4	103.6	3.5992	23
	III	99.7	99.5	97.3	3.6358	33
	IV	96.0	95.7	89.6	3.6624	17
1986	I	91.9	92.5	83.4	3.7211	28
	II	89.6	89.2	79.3	3.7046	30
	III	87.7	87.4	75.7	3.7124	14
	IV	86.9	88.1	74.8	3.7336	28
1987	I	84.4	85.9	70.2	3.7830	4
	II	82.0	83.2	68.4	3.8235	4
	III	82.0	83.6	70.1	3.8728	12
	IV	78.7	80.3	65.8	3.9356	3
1988	I	76.5	77.9	64.3	3.9748	16
	II	75.4	76.7	64.7	4.0107	27
	III	78.5	79.5	70.3	4.0427	6
	IV	77.4	77.4	67.1	4.0694	4

Chapter 13

Endogenizing Government Behavior

Mary A. Marchant* and Alex F. McCalla**

Introduction

The purpose of this study was to endogenize government behavior; that is, to acknowledge the political setting in which agricultural policy is made.[1] We sought to answer the following questions: (1) Why does the U.S. Government choose the policies it does? (2) What factors influence policymakers' decisions--economic, political, domestic, and/or international factors?

We chose the dairy industry for this analysis because it has historically been politically powerful and has had strong domestic and international markets. Dairy is the only commodity with both a price support program and a marketing order program. We focused on policymakers' choice of the price support level for manufactured dairy products (MDP) as our policy variable to endogenize. The price support level is set by the Government and underpins other dairy prices.

Comparison of Models

Economists differ on the approach used to endogenize government behavior. Rausser, Lichtenberg, and Lattimore (1982) identified two types of models: (1) the behavioral model and (2) the criterion function (or policy preference) model. Both models endogenize Government

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[1] More detail of this analysis is provided in Marchant and McCalla (1990).

behavior. Rather than choose between these two approaches, our research developed models using both approaches. In the behavioral model, the policymakers' decisionmaking rule is unknown. In the criterion function model, the policymakers' decisionmaking rule is known and equals the model's objective function, also referred to as the policy preference function. The behavioral model does not contain political weights. Political weights do exist in the criterion function model, and these weights measure the political influence of each special interest group. Both models include a commodity component consisting of supply, demand, stock, and Government cost and revenue equations.

The models differ regarding the process used to obtain the policy equation. In the behavioral model, the policy equation is directly specified and estimated. Inclusion of independent variables is based on both economic and political economic theory. The behavioral model consolidates empirical results of other studies (such as budgetary concerns and policy inertia) as discussed below. The policy equation in the criterion function model is analytically derived (equaling the first order necessary condition) and then estimated. The criterion function model is a constrained optimization problem, where policymakers choose the optimal price support level that maximizes the policy preference function subject to constraints in the commodity component. This model is transformed into an unconstrained optimization problem by substituting equations from the commodity component into the objective function. The first order necessary condition is then obtained by differentiating the unconstrained objective function with respect to the policy variable; such as the price support level for manufactured dairy products (MDP). Next, the price support level is isolated and this policy equation is then estimated.

Presented below are two models of the U.S. dairy industry which attempt to quantitatively test the influence of economic, political, domestic, and international variables on the U.S. support price for manufactured dairy products (butter, cheese, and nonfat dry milk, aggregated on a milk-equivalent basis). Results from both models endogenize Government behavior by identifying variables which potentially influence policymakers' choices. Results of the criterion function model also identify which special interest group--consumers, processors, or taxpayers--most influences policymakers' decisions.

Behavioral Model

The behavioral model consists of two components: (1) a commodity component describing the supply, demand, stocks, and Government revenues and costs associated with the U.S. dairy industry and (2) a policy component describing policymakers' choice of the support price for MDP. A general description of the model follows (where variable definitions are presented in the appendix):

Commodity Component

$$\hat{S} = \hat{\alpha}_0 + \hat{\alpha}_1(P^{Spt}) + \hat{\alpha}_2 P^{Farm} + \hat{\alpha}_3 P^{Inputs} \quad (1)$$

$$P^{Retail} = P^{Spt} + M \quad (2)$$

$$\hat{D} = \hat{\beta}_0 + \hat{\beta}_1(P^{Spt}) + \hat{\beta}_2 Y + \hat{\beta}_3 POP + \hat{\beta}_4 P^{Margarine} \quad (3)$$

$$SR = (Sales) + (Dntns) \quad (4)$$

$$Stocks_t = (Stocks)_{t-1} + (SA)_t - (SR)_t \quad (5)$$

$$GR_t = (Sales)_t(1.1 * P^{Spt})_t \quad (6)$$

$$GC_t = (SA)_t(P^{Spt})_t + (Stocks)_t(SC) + (Dntns)(DC) \quad (7)$$

Policy Component

$$P^{Spt}_t = f\left[P^{Spt}_{t-1};\ (Stocks);\ (GR - GC)^{US};\ Y^{Farm};\ X;\ SIG \right] \quad (8)$$

Processors' supplies of MDP are specified in equation (1). Equation (2) describes the marketing margin between processing and retail prices. Equation (3) specifies derived demand for MDP by U.S. consumers. Stock removals from the Commodity Credit Corporation (CCC) stockpiles equal the sum of sales and donations as identified in equation

(4). Domestic and international outlets are included for both sales and donations. Equation (5) is a market-balancing equation, where current Government stocks equal carryover stocks plus additions to stocks minus stock removals. Government revenues and expenditures on the dairy support program are specified in equations (6) and (7).

Equation (8) describes the policy component in its most general form. A more detailed form is described in equation (A).[2] The support price is a function of six general groups of variables based on economic and political economic theory: (1) **Institutional inertia,** following the hypothesis that once a policy is in place, it does not dramatically change (Allison, (1971); Lavergne, (1983); von Witzke, (1990); and Young, (1987)); thus, we expect a positive relationship between the support price in the current year and the support price in the previous year. (2) **Stocks,** as represented by the following variables: (a) actual carryover stocks from the previous year, (b) actual and (c) forecast additions to stocks, and (d) actual stock levels. We expected stocks to be negatively related to the price support level; that is, as stocks rise, policymakers should lower the guaranteed minimum support price level in an effort to reduce overproduction and the build-up of costly stockpiles of MDP's. (3) **Net Government costs** accounting for budgetary concerns (Infanger, Bailey, and Dyer, (1983); de Gorter, (1983); and von Witzke, (1990)). This variable was represented by the Federal budget deficit, and the cost share for the agricultural sector and the dairy industry. A negative relationship is expected; that is, as the budgetary costs rise, the price support level should fall. (4) **Domestic farm income,** following the hypothesis that one means to achieve the domestic goal of raising farm incomes is to increase the support price (Dixit and Martin, (1986); and Gardner, (1987)). Again, a negative relationship is expected; that is, as farm income level falls, policymakers may attempt to improve farm incomes by raising the price support level. (5) International variables, following the hypothesis that policymakers consider the international market when choosing domestic policy instruments (Lattimore and Schuh, (1979); Sarris and Freebairn, (1983); Paarlberg, (1983); Paarlberg and Abbott, (1986); and von Witzke, (1990)). International variables were represented by the U.S. trade balance and export shares for agricultural exports and MDP exports. (6) **Special interest groups,** following the hypothesis that political influence, as measured by campaign contributions or economic rent can influence policymakers' decisions (Welch, (1974); Caves, (1976); Sarris

[2] Equations (A), (B), and (C) are from Marchant and McCalla (1990). Equation (A) is reproduced in the appendix to the chapter. Equations (B) and (C) follow in the text.

and Freebairn, (1983); and Krueger, (1974)). A positive relationship is expected; that is, the greater the campaign contribution and/or potential for economic rent generated from the proposed policy decision, the greater the influence of special interest groups on policymakers' decisions.

Empirical Estimation of the Behavioral Model

Data was obtained from the U.S. Department of Agriculture, the Bureau of Labor Statistics (BLS), and the Federal Election Commission (FEC). Many different estimations were run, for example, real versus nominal data; using different data sets to represent variables, for example, stocks were represented in three ways--actual additions to stocks, forecast additions to stocks, and actual stock levels. We omitted the lagged dependent variable. In addition to the above regressors, equation (A) was estimated using a time trend variable and a dummy variable for years in which Congress enacted farm legislation. Estimations used ordinary least squares (OLS) on annual time series data for 1951-87, depending on data availability for specific variables. Presented below are examples of the best estimations based on the following overall criteria: correct signs, high coefficient of determination and F-statistic, significant variables, and lack of autocorrelation.

$$\hat{P}_t^{Spt} = \underset{\substack{(0.17)\\ 2.3}}{.391} + \underset{\substack{(0.026)\\ 42.8}}{1.13}\, P_{t-1}^{Spt} - \underset{\substack{(0.008)\\ -5.3}}{0.043}\, Exp\,(Stk_t) - \underset{\substack{(0.009)\\ -2.2}}{0.022}\, Y_{t-1}^{Farm} + \underset{\substack{(0.002)\\ 3.7}}{0.008}\, (GR - GC)_{t-1}^{US} \qquad \text{(B)}$$

$R^2 = 0.9935 \quad F = 1152 \quad h = 0.4547 \quad n = 31$

(C)

$$\hat{P}_t^{Spt} = \underset{\substack{(0.19)\\0.03}}{0.005} + \underset{\substack{(0.04)\\32.6}}{1.31}\, P_{t-1}^{Spt} + \underset{\substack{(0.002)\\2.87}}{0.005}\, (GR - GC)_{t-1}^{US} -$$

$$\underset{\substack{(0.009)\\-6.0}}{0.053} \left[\frac{GC^{MDP}}{GC^{Ag}}\right]_{t-1} - \underset{\substack{(0.11)\\-5.8}}{0.62}\, (P^{Spt} - P^{Wld})$$

$$R^2 = 0.9957 \quad F = 815 \quad h = -0.299 \quad n = 15$$

Equation (B) was estimated at an aggregate level using nominal prices, where (1) expected stocks were measured as actual additions to Government stocks equaling CCC purchases of MDP and (2) farm income was measured as the change in net farm income. The difference between equations (B) and (C) was that equation (C) has fewer observations but includes four more independent variables, of which only two were significant. These four variables with a smaller available data set included (1) the ratio of the Government costs of the dairy program relative to Government costs of total agricultural programs, (2) the ratio of MDP exports relative to total agricultural exports, (3) the difference between the retail price and the world price for MDP, and (4) the difference between the support price and the world price for MDP.

Thus, in equation (B), the variables that significantly affected policymakers' choice of the support price for manufactured dairy products were (1) the support price in the previous year, (2) expected additions to CCC stocks, measured as actual additions to stocks, (3) change in net farm income, and (4) the U.S. Federal budget deficit.

In equation (C), the variables that significantly affected policymakers' choice of the support price for manufactured dairy products were also (1) the support price in the previous year and (2) the U.S. Federal budget deficit. In addition, (3) the cost share spent on the dairy industry and (4) the difference between the support price and the world price, measuring the price distortion, were also significant.

Summary and Interpretation of Empirical Results for the Behavioral Model

Estimations of the policy component in the behavioral model were performed using both nominal and real prices. Empirical results indicated a common set of explanatory variables which appeared to affect policymakers' choice of the support price. Estimations using either nominal or real prices indicated that policymakers appear to be influenced by the following: (1) the support price in the previous year, supporting the hypothesis that institutional inertia is important, (2) the cost share of Government expenditures on the dairy program, as measured by the ratio of Government costs of the dairy program relative to Government costs of agriculture, as a whole sector, where, as the cost share increased in the previous period, the support price fell, and (3) the difference between the support price and the world price, where a positive price distortion resulted in lowering the support price. In addition, in the nominal case, the support price also appeared to be influenced by the following: (4) expected additions to CCC stocks, that is, as stocks increased, the support price fell, (5) change in net farm income (that is, as farm income fell, support prices rose), and (6) U.S. Federal Government deficit (as the deficit increased, the support price fell).

Criterion Function Model

Criterion function models, which analytically derive and then estimate policy instruments, include Rausser and Freebairn (1974), Zusman (1976), Zusman and Amiad (1977), Sarris and Freebairn (1983), Paarlberg (1983), Paarlberg and Abbott (1986), Riethmuller and Roe (1986), and Lopez (1989). Empirical results of the criterion function model identify (1) variables that significantly influence policymakers' decisions of the policy variable and (2) the political power of the special interest groups.

The criterion function model also consists of two components: (1) a policy preference function describing U.S. policymakers' decisionmaking role in choosing the price support level for MDP and (2) a commodity component similar to that used in the behavioral model. A general description of the model follows (where the same variable definitions hold as identified in the behavioral model):

Policy Preference Function

$$\underset{\{P^{Spt}_t\}}{Max}\ PPF = Max\ [\Gamma_1(CS) + \Gamma_2(PS) + (GR - GC)] \tag{9}$$

Commodity Component

$$\hat{S} = \hat{\alpha}_0 + \hat{\alpha}_1(P^{Spt}) \tag{10}$$

$$\hat{D} = \hat{\beta}_0 + \hat{\beta}_1(P^{Spt}) \tag{11}$$

$$SR = (Sales) + (Dntns) \tag{4}$$

$$Stocks_t = (Stocks)_{t-1} + (SA)_t - (SR)_t \tag{5}$$

$$GR_t = (Sales)_t\,(1.1 * P^{Spt})_t \tag{6}$$

$$GC_t = (SA)_t(P^{Spt})_t + (Stocks)_t(SC) + (Dntns)(DC) \tag{7}$$

Equation (9) describes the policymakers' preference function (PPF) which consists of four economic agents, each with its own objective: (1) consumers, who maximize consumers' surplus (CS), (2) processors, who maximize producers' (processors') surplus (PS), (3) taxpayers, who maximize (minimize) net Government revenue, GR-GC, (net Government expenditures, GC-GR) on the dairy support program, and (4) policymakers, who maximize a policy preference function, which is a weighted sum of all other agents' objectives. The weights (Γ_i, i=1,2) measure the political influence of each interest group as perceived by members of Congress, where the political weight associated with taxpayers is set equal to one; that is, the numeraire. This objective function is similar to that used by Paarlberg (1983), Sarris and Freebairn (1983), Rausser and Freebairn (1974), and Zusman and Amiad (1977).

Equations (10), (11), and (4) through (7) compose the commodity component of the criterion function model, similar to those in the behavioral model. The equations describing stock removals (4), stocks

(5), and Government revenues (6) and costs (7) are identical to those in the behavioral model. The difference occurs in the equations describing supply and demand. Now, both the supply equation (10) and the demand equation (11) are solely functions of the support price. The reason behind this stems from the mathematical process (discussed below) used to recover the political weights, (Γ_i, i=1,2) associated with the special interest groups.

The estimated policy equation of the criterion function model was analytically derived. The criterion function model was transformed from a constrained into an unconstrained optimization problem by substituting the commodity component constraints into the objective function. The optimal support price was analytically obtained from the first order necessary condition and equals equation (12). It is the policy equation of the criterion function model, comparable to the policy equation (8) in the behavioral model.

$$\hat{P}^{Sp}_t = \left[\frac{\left[(-\Gamma_1\hat{\beta}_0\hat{\beta}_1) - (\Gamma_2\hat{\alpha}_0\hat{\alpha}_1)\right]}{\left[(\Gamma_1(\hat{\beta}_1)^2 + (\Gamma_2(\hat{\alpha}_1)^2\right]}\right] + \left[\frac{1}{\left[(\Gamma_1(\hat{\beta}_1)^2 + (\Gamma_2(\hat{\alpha}_1)^2\right]}\right]\left[SA - (1.1 * Sales)\right] \tag{12}$$

In the criterion function model, policymakers' choice of the optimal support price for MDP is dependent on (1) estimates of the political weights associated with each economic agent (Γ_i, i=1,2), which are currently unknown, (2) previously estimated parameter estimates from the supply and demand functions (α_j and β_j, j=0,1), and (3) exogenous variables related to the net change in stocks, [SA - (1.1*Sales)], a known variable.

In more general terms, equation (12) can be written as:

$$\hat{P}^{Sp}_t = [\hat{\lambda}_1] + [\hat{\lambda}_2]\left[SA - (1.1 * Sales)\right] \tag{13}$$

$$[\hat{\lambda}_1] = \left[\frac{\left[(-\Gamma_1\hat{\beta}_0\hat{\beta}_1) - (\Gamma_2\hat{\alpha}_0\hat{\alpha}_1)\right]}{\left[(\Gamma_1(\hat{\beta}_1)^2 + (\Gamma_2(\hat{\alpha}_1)^2\right]}\right] \tag{14}$$

$$\left[\hat{\hat{\lambda}}_2\right] = \left[\frac{1}{\left[(\Gamma_1(\hat{\beta}_1)^2 + (\Gamma_2(\hat{\alpha}_1)^2\right]}\right] \tag{15}$$

Note that in the criterion function model, the policy equation is a function of one independent variable, net change in stocks. This equation is estimated to obtain parameter estimates of λ_k, (k=1,2). Results indicate whether the net change in the stocks variable significantly influences policymakers' choice of the optimal price support level. Equations (14) and (15) show the relationship between the estimated coefficients of λ_k, (k=1,2) and the embedded parameters, (Γ_i, i=1,2) and (α_j and β_j, j=0,1). The λ's, the α's, and the β's are known, having all been estimated. The Γ's are unknown. Thus, we must solve equations (14) and (15) for the unknown political weights, Γ's.

The math problem arises in the recovery of the political weights. Note that only two political weights are unknown (Γ_i, i=1,2). To obtain unique solutions from a just-identified system, the supply and demand equations must be functions solely of the intercept and the support price variable. For estimation purposes, these equations were estimated in their expanded form, as specified in the behavioral model (equations (1) and (3)), to obtain unbiased and consistent parameter estimates. Intercept and support price slope parameter estimates were then used in the criterion function model. Restrictions imposed on the number of independent variables in the supply, demand, and policy equations in order to recover the political influence weights, are among the limitations of the criterion function model.

Once all parameters were estimated, (α_j, β_j, λ_k; j=0,1 k=1,2), the political influence weights, (Γ_i, i=1,2), were analytically recovered from equations (14) and (15). This solution, describing the political influence weights for each special interest group in matrix notation, is the following:

$$\begin{bmatrix} \hat{\hat{\Gamma}}_1 \\ \\ \hat{\hat{\Gamma}}_2 \end{bmatrix} = \begin{bmatrix} (\hat{\hat{\lambda}}_1(\hat{\beta}_1)^2 + (\hat{\beta}_0\hat{\beta}_1) & (\hat{\hat{\lambda}}_1(\hat{\alpha}_1)^2 + \hat{\alpha}_0\hat{\alpha}_1) \\ \\ (\hat{\hat{\lambda}}_2(\hat{\beta}_1)^2) & (\hat{\hat{\lambda}}_2(\hat{\alpha}_1)^2) \end{bmatrix}^{-1} \begin{bmatrix} 0 \\ 1 \end{bmatrix} \tag{16}$$

where Γ_1 measures the political influence of consumers and Γ_2 measures the political influence of processors. Now, we will look at estimation results remembering that the criterion function model tells us (1) whether or not the net change in stocks independent variable significantly influences policymakers' choice of the price support level for MDP and (2) which special interest group is most politically powerful.

Criterion Function Model Estimation Results

The general form of the estimated policy equation was:

$$\hat{P}_t^{Spt} = \left[\hat{\lambda}_1\right] + \left[\hat{\lambda}_2\right] \left[SA - (1.1 * Sales)\right] \tag{13}$$

Estimations were performed using (1) both nominal and real prices, (2) a variety of specifications such as first differences, lags, inclusion of a trend variable and a dummy variable for years in which farm acts were passed, and (3) different data sets measuring the net change in stocks (one data set included donations).

One would expect, a priori, that the support price would be negatively related to the variable (SA - 1.1*Sales). That is, if (SA - 1.1*Sales) is positive, whereby additions to Government stocks exceed sales, and stocks are increasing, then one would expect a decrease in the support price level. If (SA - 1.1*Sales) is negative, such that sales exceed additions to stocks, then the stockpile is decreasing and, if the level of stocks is low, one would expect the support price to increase. A sample of results are presented below:

Case One

$$\hat{P}_t^{Spt} = \underset{\substack{(1.1277)\\ -8.4617}}{-9.5420} + \underset{\substack{(0.034101)\\ 2.3042}}{0.078578}\,(SA - 1.1 * Sales) + \underset{\substack{(0.047014)\\ 14.176}}{0.66649}\,Time \tag{21}$$

$R^2 = 0.9653 \quad n = 16 \quad F = 210 \quad D.W. = 1.0557$

Case Two

(22)

$$\Delta \hat{P}_t^{Spt} = 6.4566 - 0.20905\,(SA - 1.1 * Sales)$$
$$\begin{array}{ll} (3.5270) & (0.20912) \\ 1.83067 & -.99968 \end{array}$$

$$R^2 = 0.4136 \qquad F = 12 \qquad \hat{\rho} = 0.65194$$
$$Runs\ Stat. = 0.9869$$

Empirical results were generally disappointing. The net change in stocks variable either had (1) the wrong sign and was significant (*case one*) that is, as stocks increased, the price support level also increased, or (2) had the correct sign but was insignificant (*case two*); that is, as stocks increased, the price support level decreased. Thus, the criterion function model gives ambiguous empirical results in regard to the impact of stocks on policymakers' support price decisions. Using these results, political influence weights were calculated.

Political Weights of the Policy Preference Function

The second empirical result from the criterion function model focused on the political weight of each special interest group. It identified which special interest group is most influential using the above policy parameter estimates. As shown in equation (16), political weights for each special interest group were calculated using the demand, supply, and policy parameter estimates. Results were calculated for the two cases presented above:

Case One

$$\hat{\hat{\Gamma}}_1 = 2.105112 \qquad \hat{\hat{\Gamma}}_2 = 2.110020 \qquad \Gamma_3 = 1.0 \tag{23}$$

$$\begin{array}{lll} \text{Given:} & \hat{\alpha}_0 = 58.132 & \hat{\alpha}_1 = 2.1424 \\ & \hat{\beta}_0 = 55.863 & \hat{\beta}_1 = -1.202 \\ & \hat{\hat{\lambda}}_1 = -9.542 & \hat{\hat{\lambda}}_2 = 0.078578 \end{array}$$

Case Two

$$\hat{\hat{\Gamma}}_1 = -1.510873 \qquad \hat{\hat{\Gamma}}_2 = -0.5666011 \qquad \Gamma_3 = 1.0 \tag{24}$$

$$\begin{array}{lll} \text{Given:} & \hat{\alpha}_0 = 58.132 & \hat{\alpha}_1 = 2.1424 \\ & \hat{\beta}_0 = 55.863 & \hat{\beta}_1 = -1.202 \\ & \hat{\hat{\lambda}}_1 = 6.4566 & \hat{\hat{\lambda}}_2 = -0.20905 \end{array}$$

Political influence weights under *case one* (incorrect sign) indicated that processors were the most influential special interest group and taxpayers were the least influential on policymakers' choice of the support price (Γ_2 exceeded Γ_1 and Γ_3). This result supports Stigler's (1971) theory regarding the dominance of producer (in this case, processor) interest groups. In *case two* (correct sign), taxpayers were the most influential group (Γ_3 exceeded Γ_1 and Γ_2), while both consumers and processors appeared to have a negative influence on policymakers' choices. But, in a relative ranking, the processors' weight, (Γ_2), again exceeded the consumers' weight, (Γ_1), in accordance with Stigler's hypothesis.

Empirical results for *case one* are highly questionable because Government stocks and the support price move together. The bottom line is an empirical model with explosive, unstable results: as stockpiles increase, policymakers exacerbate the problem by increasing the support price which encourages overproduction, generating a larger surplus that is ultimately purchased and stored by the Government.

Empirical results for *case two*, however, indicated that taxpayers have the most influence on policymakers' decisions when stocks and the support price move in opposite directions; that is, as stocks increase, the support price falls. In this case, Government-cost-minimizing taxpayers are politically effective, and profit-maximizing processors are not. As stockpiles increase, policymakers will decrease the support price level, which discourages overproduction and reduces additions to CCC stocks. Thus, Government costs, financed by taxpayers, are reduced, as are processors' profits. The problem with *case two* is that it is based on the statistically insignificant net additions to stocks variable of equation (22), although this variable has the correct sign.

Criterion Function Model Empirical Results Summary

Empirical results of the criterion function model specify (1) the influence of the net change in stock variable on policymakers' choice of the optimal support price and (2) which special interest group had the most political influence. Empirical results were ambiguous. For *case one*, which had the wrong sign but significant results (that is, stocks were positively related to the support price), the processors were the most influential special interest groups. For *case two*, which had the correct sign but

insignificant results (that is, stocks were negatively related to the support price level), taxpayers were the most politically influential.

Perhaps these results do make sense. In *case one*, as the change in stockpiles increase with an increase in the support price level, that processors were the most influential special interest group makes sense. The policy may seem irrational, but it definitely benefits processors. In *case two*, as the change in stockpiles increase with a fall in the price support level, that taxpayers were the most influential special interest group makes sense. This policy is more rational and definitely benefits taxpayers.

What Have We Learned?

What conclusions can be drawn from the empirical results of the criterion function and behavioral models? Empirical results for the behavioral model were good in terms of statistical significance and properties and reinforced other empirical results. Significant explanatory variables which appeared to influence policymakers' choice of the support price level for MDP can be categorized into the following general groups: (1) political variables, including (a) inertia, as measured by the lagged support price (Lavergne, (1983); Allison, (1971); von Witzke, (1990); and Young, (1987)) and (b) the change in net farm income, as a proxy variable representing the domestic goal of increasing farm income (Gardner, (1987)) and Dixit and Martin, (1986)) and (2) budgetary concerns as measured by (a) the Federal budget deficit, (Infanger, Bailey, and Dyer, (1983); von Witzke, (1990)) and de Gorter, (1983); (b) the share of Government expenditures on the dairy program, (von Witzke, (1990)) (c) the difference between the support price and the world price, (Sarris and Freebairn, (1983); and Krueger, (1974)) and (d) the expected additions to Government stocks in time 't+1,' generated by policymakers' support price decision in time 't'.

Empirical results for the criterion function model were ambiguous. For case two (correct sign) the taxpayers' interest dominated, which is consistent with behavioral model results in that Government cost variables were significant. The criterion function model is theoretically appealing, but much was sacrificed in its use. The estimated policy equation of the criterion function is too simplistic, due to imposition of theoretical restrictions. To obtain this analytically derived policy equation

much was sacrificed. Restrictions were imposed on the number of independent variables in the supply, demand, and policy equations. Thus, empirical results of the criterion function policy equation refer to the influence of only one variable--the net change in Government stocks--on policymakers' decisions. Statistical results were insignificant for this variable, indicating that it did not influence policymakers. Also, the estimated policy equation is dependent on the structure of the policy preference function. If its specification changes, so does the estimated policy equation. For instance, the objective function in this research consisted of economic welfare associated with the following economic agents: consumers, processors, taxpayers, and policymakers. This model could be respecified to include dairy farmers. As a result, the mathematics used to derive the policy equation would increase in complexity and impose even more theoretical restrictions. Thus, although the criterion function model is theoretically appealing, the policy equation in the behavioral model is more realistic.

In contrast, the behavioral model allowed for a larger set of independent variables to be tested for their influence on policymakers' determinations of the support price for MDP. Empirical results of the behavioral model yielded estimates that were statistically significant and supported existing empirical findings. Although the model does not follow an explicit economic paradigm, it appears to be a more realistic model of policy choice.

Implications for Future Research

Future research will examine a process of reestimating the criterion function model without imposing restrictions. In addition, as data become available, policy equations will be estimated using updated data, specifically for campaign contributions. Finally, empirical results of the behavioral model identified significant explanatory variables affecting policymakers' choices. Research could use these results to work backwards to obtain a criterion function decisionmaking rule that yields this policy equation, upon deriving its first order necessary condition.

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Appendix: Variable Definitions

S = Supply of MDP produced in the United States.

P^{Spt} = Support price for MDP, set by policymakers; the output price realized by processors and the derived demand price paid by consumers as well as the purchase price paid by the Government for surplus MDP and the "trigger price" for the sale of MDP from Government stockpiles. (The trigger price equals 110 percent of the support price.)

P^{Farm} = Price paid by processors to dairy farmers; the input price.

P^{Inputs} = Price of other processing inputs.

P^{Retail} = Retail price of MDP.

M = Marketing margin between processing and retail prices.

D = Derived demand for MDP by U.S. consumers.

Y = U.S. disposable personal income.

POP = U.S. population.

$P^{Margarine}$ = Retail price of margarine (a substitute for butter).

SR = Stock removals from Commodity Credit Corporation (CCC) stockpiles; such as domestic and international outlets for sales and donations.

Sales = Sales of CCC MDP stocks, either domestic and/or international (export) sales.

Dntns = Donations from CCC MDP stockpiles, either domestic or international (Public Law 480-title II and section 416 of the Agricultural Act of 1949).

Stocks = Surplus MDP stored by the CCC equaling carryover stocks plus stock additions (SA) minus stock removals (SR).

SA = Additions to CCC stockpiles.

GR = Government revenue domestically or internationally obtained from sales of MDP stocks.

GC = Government costs of the dairy support program associated with purchasing domestic surpluses, storing surpluses in stockpiles, and distributing surpluses as donations.

SC = Storage costs associated with Government storage of surplus manufactured dairy products.

DC = Distribution costs associated with distributing donations (both domestic and international donations are considered).

$(GR - GC)^{US}$ = This net Government expenditures variable can be thought of as a general variable which includes both net U.S. Government expenditures associated with the Federal budget as well as net Government expenditures on the dairy program (GR - GC).

Y^{Farm} = Income received by U.S. farmers.

X = International variables; such as, value of U.S. exports, trade balance.

SIG = Special interest group variables, for example, campaign contributions to politicians from dairy lobbying groups.

The general form of the estimated policy equation in the behavioral model was:

Behavioral Model: Equation (17) and Variable Definitions

$$P_t^{Spt} = f\Big\{P_{t-1}^{Spt};\ (Stk_{t-1}, \operatorname{Exp}(Stk_t));\ Y_{t-1}^{Farm};$$

$$\left[\left(\frac{X}{GNP}\right)^{US},\ (X - M)^{US},\ \left[\frac{X^{Ag}}{X^{US}}\right],\ \left[\frac{X^{MDP}}{X^{Ag}}\right]\right]_{t-1};$$

$$\left[\left(\frac{GC^{MDP}}{GC^{Ag}}\right),\ \left[\frac{GC^{Ag}}{GC^{US}}\right],\ GC^{US},\ (GR - GC)^{US}\right]_{t-1};$$

(A)

$$\left[\left(P^{Spt} - P^{Wld}\right)_{t-1},\ \left(P^{Rtl} - P^{Wld}\right)_{t-1},\ CC_t\right]\Big\}$$

where:

P^{Spt} = MDP support price level chosen by Congress at the farm level.
Stk = Government (CCC) stocks of MDP on a milk-equivalent basis.

Exp(Stk) = Expected CCC stocks or additions to CCC stockpiles. Three different data sets were used: (1) Actual additions to stocks equaling CCC purchases of MDP on a milk equivalent basis. (2) Forecast additions to CCC stocks based on supply and demand estimates. (3) Actual CCC stock levels of MDP on a milk-equivalent basis.

Y^{Farm} = Income of the farm sector measured using a variety of specifications: (1) The change in net farm income (NFI) which is defined as gross farm income (GFI) minus production expenses. (2) NFI, lagged. (3) The percentage change in NFI. (4) The ratio of per capita personal farm income from farm sources only, relative to per capita nonfarm personal income. (5) The difference between per capita nonfarm income and per capita farm income.

(X/GNP^{US}) = The ratio of the value of U.S. exports to the U.S. gross national product (GNP), measuring the relative importance of the export market.

$(X - M^{US})$ = The value of the U.S. net trade balance, exports minus imports.

$(X^{Ag} / X^{US}$ = The ratio of the value of U.S. agricultural exports relative to the value of total U.S. exports, measuring the relative importance of the agricultural export market compared with the U.S. export market.

(X^{MDP} / X^{Ag}) = The ratio of the value of U.S. dairy exports relative to the value of U.S. agricultural exports, measuring the relative importance of dairy exports compared with agricultural exports.

(GC^{MDP} / GC^{Ag}) = The ratio of Government costs associated with the dairy program relative to total Government costs associated with the

agricultural sector, measuring relative expenditures on the dairy program compared with agricultural expenditures.
(GC^{Ag} / GC^{US}) = The ratio of Government costs associated with the agricultural sector relative to total U.S. Government expenditures, measuring relative expenditures on agricultural programs compared with total Government expenditures.

$(GR\text{-}GC)^{US}$ = Net U.S. Government expenditures, Government revenue minus Government costs.

$(P^{Stp} - P^{Wld})$ = MDP support price minus the MDP world price.

$(P^{Rtl} - P^{Wld})$ = MDP U.S. retail price paid by consumers minus MDP world price.

CC = Campaign contributions by political action committees (PAC's) to congressional and presidential candidates.

(SA - 1.1*Sales) = Net change in Government stocks of MDP, aggregated on a milk-equivalent basis and equaling stock additions (SA) minus total sales (domestic and international).

Chapter 14

Global Grain Stocks and World Market Stability Revisited

Stephen Martinez and Jerry Sharples*

Introduction

We examine in this chapter how well grain stocks have performed since the late 1970's in adding stability to world grain markets.[1] First, we examine the world-aggregate grain data and find that stocks adjustments have been doing a better job of enhancing world market stability since the late 1970's than they did earlier. Then we examine country data to see who may have provided that added stability. The United States has played a dominant role in providing stability to the coarse grain market, while the European Community (EC) has adjusted stocks to help stabilize the wheat and coarse grain markets in recent years. Reductions in these stabilizing stocks resulting from global free trade talks could have important implications for market stability.

In the late 1970's and early 1980's, many studies examined world grain market stability and grain stocks issues (Houck and Ryan, 1980; Blandford, 1983). These studies were in response to grain shortages and the increase in grain market volatility in the 1970's. They generally concluded that world grain price volatility was excessive due to suboptimal management of the world's grain stocks. Further, the forces creating that volatility were not expected to diminish. Various national and multinational solutions were proposed either to improve management of stocks or to reduce other destabilizing forces affecting world grain markets. Several studies further suggested that only a few countries,

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[1] In this report, "grain" refers to wheat plus coarse grains.

mainly the Unites States, used their grain stocks in a way that adds stability to world grain markets (Josling, 1980; Sharples and Goodloe, 1984).

As global grain stocks grew in the 1980's, interest in the topic waned. Now, after nearly a decade, interest in market stability and grain stocks has been rekindled. There were two main reasons for the renewed interest. First was the sharp drop in world grain stocks. World wheat and coarse grain stocks dropped to 18 percent of world use in 1990, near the record low of 16 percent in 1974. Second was the discussion of actual and potential policy changes that could change stockholding behavior of governments and individuals around the world. Examples of the latter were the new U.S. farm legislation and the GATT negotiations.

The Global Picture

Evidence since the late 1970's suggests that the world's grain stocks are doing a better job of protecting consumers from the year-to-year volatility of the world's grain production (table 1). One measure of stock performance is to compare the volatility of global grain consumption with the volatility of global grain production. If the former is less than the latter, then that is evidence that adjustments of end-of-year grain stocks reduced the effect of production variability on consumers.[2]

The variation of world wheat production around trend, as measured by standard error, was 16.7 million tons (5 percent of total wheat production) during 1960-77 (table 1). The standard error of consumption in those years was 10.4 million tons (3 percent of total wheat consumption). Thus, the world's wheat stocks helped stabilize grain consumption. From 1978 to 1989, the standard error of wheat production remained at 16.7 million tons (3 percent of average wheat production) but the standard error of global wheat consumption declined to only 6.7 million tons (1 percent of wheat consumption) evidence that the world's wheat stocks provided even more protection to consumers than in the earlier years.

[2] We use "volatility" and "variability" interchangeably, although "volatility" is associated with more negative connotations.

Table 1--Measures of annual dispersion from trend in world wheat and coarse grain price, production, and consumption over specified years

Item	Unit	1960 to 1977	1978 to 1989
Wheat production:			
Standard error	*Metric tons*	16.7	16.7[1]
Coefficient of dispersion	*Percent*	5.3	3.4[2]
Wheat consumption:			
Standard error	*Metric tons*	10.4	6.7
Coefficient of dispersion	*Percent*	3.3	1.4
Wheat price:[3]			
Standard error	*Dollars/ton*	29.4	21.3
Coefficient of dispersion	*Percent*	34.0	14.1
Coarse grain production:			
Standard error	*Metric tons*	17.9	44.3
Coefficient of dispersion	*Percent*	3.2	5.7
Coarse grain consumption:			
Standard error	*Metric tons*	14.8	10.5
Coefficient of dispersion	*Percent*	2.6	1.4
Coarse grain price:[4]			
Standard error	*Dollars/ton*	17.5	18.7
Coefficient of dispersion	*Percent*	24.5	16.6

[1]Standard error of deviations from trend.

[2]Coefficient of dispersion (CD) is expressed in percentage terms and is calculated by dividing the standard error by the mean and multiplying the result by 100. It is a unitless measure of variation, which removes the effect of production levels on variability.

[3]U.S. Gulf f.o.b. hard red winter (ordinary) wheat price.

[4]U.S. Gulf f.o.b. corn price (no. 2).

Sources: U.S. Department of Agriculture, For. Agr. Serv., PS&D Database, November 1990. U.S. Department of Agriculture. Econ. Res. Serv., *Wheat Situation and Outlook Yearbook* and *Feed Situation and Outlook Yearbook*. Various years.

During 1960-77, coarse grain stocks were not nearly as effective as wheat stocks in reducing the year-to-year variability of consumption. The standard error of production was 17.9 million tons (3 percent of coarse grain production), and the standard error of consumption was 14.8 million tons (3 percent of coarse grain consumption). The reason

probably relates to the fact that the major consumers of coarse grains are livestock rather than people. Livestock numbers and feeding rates can be more easily adjusted to the grain supply. Since 1978, the world's coarse grain stocks were extremely effective in offsetting the huge increase in production variability. The standard error of production more than doubled to 44.3 million tons (6 percent of coarse grain production), but the standard error of consumption dropped to 10.5 million tons (1 percent of coarse grain consumption).

Another measure of market volatility is the deviation around trend in annual grain prices. The data show a significant reduction in the volatility of wheat and coarse grain prices since 1978, as measured by the coefficient of dispersion (table 1). Theory suggests that reduced price volatility might be caused by improved management of the world's stocks or by other forces such as a reduction of trade barriers (Grennes and others, 1978).[3]

Stocks Behavior: Selected Countries

The rules for managing the world's grain stocks are set by countries. There is no explicit global strategy. To understand how the world's stocks are managed, one needs to examine stocks management in the major grain stockholding countries. Guiding our examination of country data are two questions. To what extent do major grain producing countries manage year-end stocks to offset their own production variability, and as an associated issue, to what extent do these countries pass domestic production variability onto the world market and make it more volatile? To what extent do these countries adjust their grain stocks to absorb some of the grain market volatility generated by other countries?

Results show which countries tend to be the major sources of world grain market volatility, and which countries adjust their stocks in ways adding stability to the world market.

Previous studies have suggested that the Soviet Union is the most important potential "transmitter" of production variability to the grain market while the United States (and to a lesser extent Canada and several

[3] The term "management" in this chapter does not imply that stocks are adjusted with any particular objectives in mind. Adjustments in stocks may simply be an outgrowth of domestic policies.

other countries) has contributed to market stability through stock adjustments. Grain stocks in the EC made no noticeable contribution to world grain market stability (Sharples and Goodloe, 1984; Blandford, 1983; Josling, 1980).

A recent report by Sharples and Krutzfeldt (1990) gives an overview of who are the world's current major holders of grain stocks and how those stocks are used. They conclude that, as in the past, the United States still holds most of the world's buffer stocks that are available to the world market to help stabilize it.

The country analysis reported here is a more quantitative followup to the Sharples-Krutzfeldt report. Using revised methods and more recent data, we examine the major conclusions of reports of the late 1970's and early 1980's.

We proceed by separately examining the wheat and coarse grains stocks behavior in selected countries because stocks behavior differs between the two. We also compare more recent behavior, based on 1978-89 data, with that observed in earlier years (1960-77) to see if there is evidence of change in a country's grain stocks management strategies. The two time periods were divided at 1978 because that year marked the beginning of several significant events in the world grain markets:

(1) Import variability in China increased,
(2) Soviet grain production leveled off, and
(3) An upward trend began in EC grain net exports.

By examining differences between the two time periods, one can gain insight into how changes in country policies have affected stock adjustments. Relating observed stockholding behavior to country policies or examining optimal stockholding, however, is a topic for further exploration.[4]

Stocks Adjustments and Domestic Production Variability

A major source of supply instability in a country is domestic grain production. When any major grain producing country has an unusual

[4] See Gardner (1979) for a detailed discussion of the theory behind optimal stock levels and a thorough reference listing for literature in this area.

harvest, it can adjust to that shock in any of three ways: by adjusting domestic grain consumption, by adjusting the amount of grain stocks carried over to the next year, or by adjusting the quantity traded. The choice of action could have a significant effect on the stability of both the domestic and world grain markets.

For example, suppose that an importing country had an unusually poor wheat harvest 1 year. It might fully domestically absorb the effect of the poor harvest by cutting back on consumption and/or reducing carryover stocks. On the other hand, it could completely "export" its production shock into the world market by maintaining trend consumption and trend stock levels and by increasing wheat imports to offset the poor harvest. Conversely, when the harvest was above normal, the country could consume more and also build up ending stocks, or it could simply reduce imports. A strategy of relying on the world market to offset most of it own production variability could add instability to the world market.

India, Argentina, and the United States illustrate extreme cases of each of the three possible responses to domestic coarse grain production shocks. In India, practically all coarse grain production is consumed domestically (fig. 1). Coarse grains consumption varies from year to year in response to changes in production. India apparently did not use trade or adjustments in coarse grain stocks to offset production variability.

In Argentina, most production shocks are passed onto the international market (fig. 2). Consumption and stock levels are relatively stable. In the United States, coarse grain production has been highly variable since the late 1970's, but consumption has been considerably less variable due to offsetting stock adjustments (fig. 3). The magnitude of year-to-year changes in both U.S. production and stocks are huge by world standards in the 1980's. However, the production shocks did not result in large changes in coarse grain exports. U.S. stocks, rather than the world market, absorbed most of the production variability.[5]

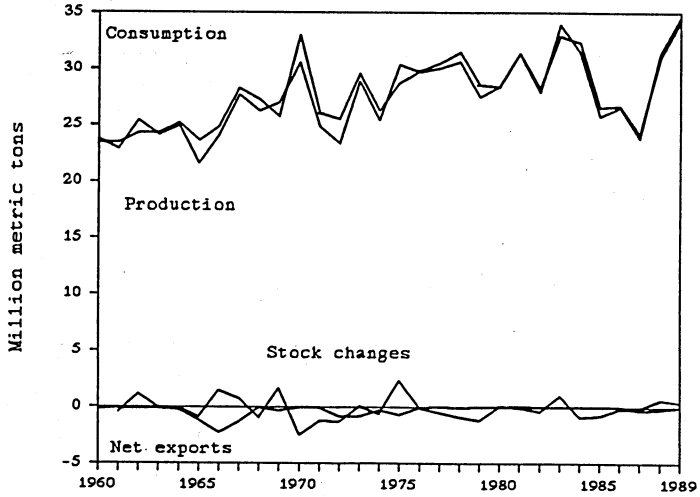
These three examples indicate that these countries each pursued different coarse grain policy strategies. Argentina's year-to-year changes in production have been a source of world grain market volatility, while

[5] The fact that net exports showed little variability, however, does not mean that U.S. production variability failed to generate instability on the world market. World prices reacted to the large fluctuations in the quantity of coarse grains supplies available for export from the United States.

India and the United States passed on relatively little of their production shocks to the world market. Stocks absorbed production shocks in the United States. India represents a rare case where consumption rather than stocks absorbed most of its production shocks.

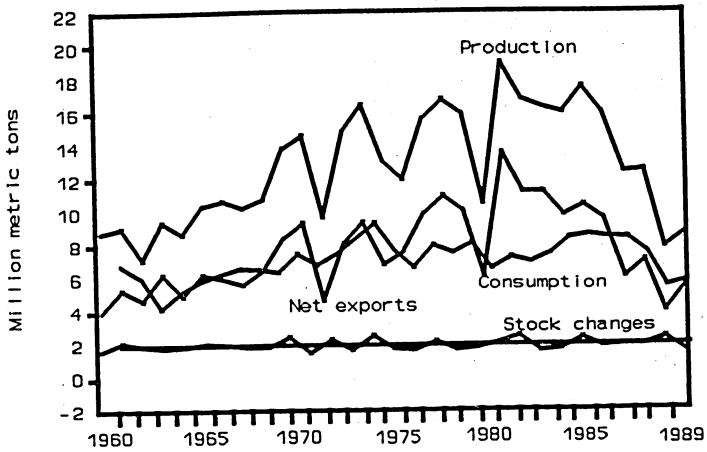
Most major grain producing countries attempt to stabilize grain consumption. If domestic stocks do not adjusts to offset production shocks, then the affected country usually adjusts trade. Therefore, a country that does not adjust stocks is likely to be transmitting domestic production variability to the world market. In this way, the tradeoff between stock and trade adjustments becomes linked to world grain market stability.

Figure 1
India coarse grains, 1960-89



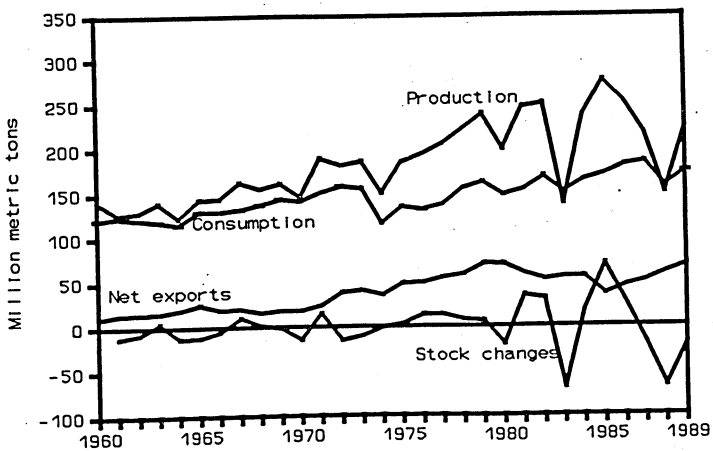
Source: U.S. Department of Agriculture, PS&D Database, For. Agr. Serv., Nov. 1991.

Figure 2
Argentina coarse grains, 1960-89



Source: U.S. Department of Agriculture, PS&D Database, For. Agr. Serv., Nov. 1991.

Figure 3
U.S. coarse grains, 1960-89



Source: U.S. Department of Agriculture, PS&D Database, For. Agr. Serv., Nov. 1991.

Destination of Domestic Production Shocks

For most major grain producing countries, adjustments to production shocks are not as obvious as in the above examples. However, simple regressions can be used to suggest how they have responded to domestic production shocks. The following equations were estimated for each country for each of two time periods, 1960 to 1977 and 1978 to 1989:

$$(1) \qquad C = (a_1 * Q) + e_1$$

$$(2) \qquad T = (a_2 * Q) + e_2$$

$$(3) \qquad S = (a_3 * Q) + e_3$$

where Q is the change in production[6] from the previous year, C is the change in domestic use, T is the change in net exports (exports minus imports), and S is the adjustment in stocks.[7] Specifying the equation in this manner forces the equality, $a_1 + a_2 + a_3 = 1.0$, which is convenient for comparison purposes. A larger coefficient suggests greater adjustments in response to production shocks. Estimates of the coefficients in the production shock absorption equations, (1) to (3), are presented in table 2 (wheat) and table 3 (coarse grains).

Wheat Results

The Soviet Union has by far the largest production variability, as measured by standard error (table 2, column 2). The United States is second, and China is third. In relative terms, however, Argentina, Australia, and Canada have the most production variability (column 3). Note the low relative production variability since 1977 in Eastern Europe, the EC, China, and India.

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[6] Similar equations were estimated for 1960 to 1982 in Sharples and Goodloe (1984). However, they used supply (production plus beginning stocks) rather than production as the independent variable. Use of supply provided ambiguous results for major stockholding countries because volatility of beginning stocks would affect the results.

[7] S measures the difference between the change in stocks in the current period and the change in stocks in the previous period:

$$S_t = (E_t - B_t) - (E_{t-1} - B_{t-1})$$

where E is ending stocks and B is beginning stocks.

Table 2--Allocation of domestic wheat production shocks for the major stockholding countries/regions, 1960/61-77/78 versus 1978/79-89/90

Country	Production: Average	Production: Standard error[1]	Production: CD[1]	Proportion of production deviations absorbed by --: Domestic use	Trade[2]	Stocks[2]
	Million metric tons			--------*Percent*--------		
China:*						
1960-77	29.7	3.3	11	0.20	0.23	0.57
1978-89	75.6	6.4	8	.26	.19	.55
Soviet Union:*						
1960-77	81.7	13.9	17	.09	.25	.66
1978-89	87.6	12.5	14	.04	.22	.74
United States:**						
1960-77	41.6	4.0	10	.04	-.21	1.17
1978-89	62.0	9.4	15	-.06	.35	.71
EC-12:**						
1960-77	42.8	3.4	8	.22	.35	.43
1978-89	67.3	5.3	8	.09	.23	.68
India						
1960-77	17.9	2.6	14	.40	.38	.22
1978-89	41.4	2.5	6	.37	.03	.60
Canada:**						
1960-77	16.3	4.0	24	.02	.16	.82
1978-89	23.2	4.5	19	.05	.54	.41
Australia:**						
1960-77	9.6	2.2	23	.34	.66	
1978-89	15.3	3.7	24	-.08	.45	.63
Eastern Europe:*						
1960-77	25.3	1.9	7	.51	.27	.22
1978-89	37.2	3.0	8	.66	.28	.06
Turkey:**						
1960-77	8.8	1.2	14	.19	.22	.59
1978-89	13.3	.9	7	-.13	.86	.27
Argentina:**						
1960-77	6.8	2.0	29	.22	.73	.05
1978-89	9.8	2.5	25	.05	.98	-.03
Mexico:*						
1960-77	2.0	.3	15	.15	.60	.25
1978-89	3.5	.6	17	.24	.51	.25

See footnotes at end of table.

Continued--

Table 2--Allocation of domestic wheat production shocks for the major stockholding countries/regions, 1960/61-77/78 versus 1978/79-89/90 --Continued

Country	Production: Average	Production: Standard error[1]	Production: CD[1]	Proportion of production deviations absorbed by --: Domestic use	Trade[2]	Stocks[2]
	Million metric tons			--------*Percent*--------		
South Africa:						
1960-77	1.3	.2	15	.09	.67	.24
1978-89	2.2	.5	23	.01	.61	.38
World:						
1960-77	312.8	16.7	5	.19	---	.81
1978-89	484.3	16.7	3	.28	---	.72

--- = Not applicable.
[1]See definitions in table 1.
[2]"Trade" is defined as exports minus imports, and "Stocks" is defined as ending stocks minus beginning stocks.
*Major importer in 1985-89.
**Major exporter in 1985-89.
Source: U.S. Department of Agriculture, PS&D Database, For. Agr. Serv., November 1990.

Results show that major grain producers tend to protect their consumers from domestic production variability, as indicated in table 2 by the low coefficients shown under "Domestic use" (column 4). Eastern Europe is a major exception. The lower income countries of India, Mexico, and China also exhibit a tendency of having their consumers absorb a higher proportion of domestic production variability.

The countries that in recent years have used trade to absorb much of their production variability are Argentina, Turkey, South Africa, Mexico, Canada, and Australia (see the coefficients under "Trade" (column 5). At the other extreme, trade has not been used by India in recent years to offset the variability of domestic wheat production.

Most of the major wheat producing countries use end-of-year stock adjustments to offset at least part of their domestic production variability (see the coefficients in the "Stocks" column). For example, the Soviet

Union, which has to contend with highly variable production, apparently uses wheat stocks to offset a large portion of that variability.[8] Wheat stocks in Eastern Europe and Argentina, however, absorbed very little of their production variability in recent years.

Some significant changes have occurred since 1977 in how countries respond to their own wheat production variability. Stocks have become more important in offsetting production variability in the EC and in India, and less important in the United States and Canada.

Coarse Grain Results

The United States dominates the coarse grain story (table 3). More than twice as much coarse grains are produced in the United States as in any other country, and over recent years the biggest shocks to global production have come from the United States. Note that the standard error of coarse grain production for the United States was 42.7 million tons since 1978/79, whereas it was only 12.8 million tons for the rest of the world.

During 1960-77, the United States let domestic use absorb about half of the production variability with much of the remainder absorbed by stock adjustments. Since then, however, stocks have played a very important role in absorbing the extreme production variability. Over the last 30 years, the United States has not tended to "export" its production shocks by adjusting the quantity exported.

After the United States, the Soviet Union has the second largest standard error of production (table 3). Results show that, in the most recent period, domestic use absorbed much less of its production variability. The Soviets turned to the export market, not to stocks, to provide more stability to consumption.

The EC and Eastern Europe exhibited low absolute and relative levels of coarse grain production variability since 1960. Their stocks coefficients in table 3 indicate that they both increased their use of stocks to absorb domestic production shocks since 1978/79.

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[8] One must discount conclusions that are drawn from grain stock numbers for the Soviet Union and China. Their stock numbers are subject to substantial error.

A Note on Global Aggregate Stock Adjustments

At the global level, there are only two ways for the world as a whole to respond to year-to-year changes in grain production: by adjusting consumption or carryover stocks. Results since the late 1970's show that the world's wheat consumers absorbed about 28 percent of year-to-year production variability, and ending stocks absorbed the rest (table 2). Thus, stocks provided substantial, but far from complete, protection to the world's wheat consumers from production shocks.

An analysis of world totals for coarse grains after 1977 show that (1) there was a substantial increase in the variability of production, and (2) stock adjustments became much more important in absorbing production shocks (table 3). These global results for coarse grains were mainly caused by what was happening in the United States.

Although different analytical methods were used, world-total conclusions, drawn from table 3, are consistent with results in table 1 for the latter time period. The world results for wheat in table 2, however, suggest that consumers absorbed more of the world's wheat production variability after 1977, which appears to contradict findings in table 1.

Quantifying Transmission of Production Shocks

An estimate of the magnitude of a country's production variability that is transmitted to the world market is obtained by multiplying the domestic production standard error by the fraction absorbed by domestic trade (table 4). The result suggests the potential that a country has for transmitting domestic instability to the world. This potential can be high if domestic production variability is high and/or relatively large adjustments in trade occur in response to changes in domestic production.

Major sources of shocks to the world grain market were the Soviet Union, Argentina (exporter), the United States (exporter), Canada (exporter), and Australia (exporter). Consistent with earlier studies, results show that the Soviet Union (a major grain importer) transferred the most domestic production variability onto the world wheat market (table 4). The standard error of wheat production in the Soviet Union is relatively large compared with some of the other major producing countries. For this reason, the potential for transmitting instability is high even though stocks absorb most of the production shocks.

Table 3--Allocation of domestic coarse grain production shocks for the major stockholding countries/regions

Country	Production			Proportion of production deviations absorbed by --		
	Average	Standard error[1]	CD[1]	Domestic use	Trade[2]	Stocks[2]
	Million metric tons			--------*Percent*--------		
United States:**						
1960-77	159.5	13.3	8	0.47	0.16	0.37
1978-89	220.5	42.7	19	.18	-.04	.86
Rest of world:[3]						
1960-77	400.4	13.6	3	.74	.05	.21
1978-89	553.5	12.8	2	.66	-.05	.39
China:**						
1960-77	54.2	4.0	7	.63	.02	.35
1978-89	87.2	4.5	5	.34	.01	.65
Soviet Union:*						
1960-77	72.3	11.4	16	.61	.22	.17
1978-89	95.2	11.3	12	.33	.56	.11
EC-12:**						
1960-77	61.0	4.3	7	.33	.56	.11
1978-89	82.3	4.7	6	.17	.27	.56
Eastern Europe:*						
1960-77	48.9	2.6	5	.79	.08	.13
1978-89	65.9	4.2	6	.37	.29	.34
India:						
1960-77	26.1	2.1	8	.87	.00	.13
1978-89	29.4	3.1	10	.87	.01	.12
Canada:**						
1960-77	17.0	2.2	13	.35	.19	.46
1978-89	22.9	2.7	12	.04	.29	.67

See footnotes at end of table.

Continued--

Table 3--Allocation of domestic coarse grain production shocks for the major stockholding countries/regions -- Continued

Country	Production			Proportion of production deviations absorbed by --		
	Average	Standard error[1]	CD[1]	Domestic use	Trade[2]	Stocks[2]
	Million metric tons			--------*Percent*--------		
Argentina:**						
1960-77	12.2	2.0	16	0.22	0.73	0.05
1978-89	15.1	3.8	25	.16	.83	.01
Mexico:**						
1960-77	9.9	.9	9	.43	.46	.11
1978-89	14.0	1.7	12	.22	.79	-.01
South Africa:**						
1960-77	7.6	1.9	25	.05	.45	.50
1978-89	9.2	3.2	35	.03	.58	.39
Australia:**						
1960-77	3.8	.8	21	.22	.52	.26
1978-89	6.9	1.4	20	.03	.81	.16
Turkey:						
1960-77	6.2	.6	10	.68	.02	.30
1978-89	8.4	.7	8	.15	.42	.43
World:						
1960-77	559.9	17.9	3	.70	---	.30
1978-89	774.0	44.3	6	.18	---	.82

--- = Not applicable.

[1]See definitions in table 1.

[2]"Trade" is defined as exports minus imports and "Stocks" is defined as ending stocks minus beginning stocks.

[3]World total less United States.

*Major importer in 1985-89.

**Major exporter in 1985-89.

Source: U.S. Department of Agriculture, PS&D Database, For. Agr. Serv., November 1990.

Table 4--"Standardized" annual domestic production shocks transferred to the world grain market[1]

Country	Wheat		Coarse grain		Total	
	1960-77	1978-89	1960-77	1978-89	1960-77	1978-89
			Million tons			
Soviet Union	3.5	2.7	2.5	6.3	6.0	9.0
Argentina	1.5	2.4	1.5	3.1	3.0	5.5
United States	.8	3.3	2.1	1.7	2.9	5.0
Canada	.6	2.4	.4	.8	1.0	3.2
Australia	.7	1.7	.4	1.1	1.1	2.8
European Community-12[2]	1.2	1.2	2.4	1.3	3.6	2.5
South Africa	.1	.3	.8	1.9	1.0	2.2
Eastern Europe[2]	.5	.8	.2	1.2	.7	2.0
Mexico	.2	.3	.4	1.3	.6	1.6
China	.8	1.2	.1	0	.9	1.2
Turkey	.3	.8	0	.3	.3	1.1
India	1.0	.1	0	0	1.0	.1
Total	11.2	17.2	10.8	19.0	22.0	36.2

[1]Values in this table are obtained from the equation:
S = F * E where: S (million tons) is the portion of the average annual change in domestic production that is transferred to the world market, F is the fraction of the annual change in domestic production that is absorbed by changes in net trade volume (a_2 in tables 2 and 3), and E is the standard error of production from trend (from tables 2 and 3).
[2]The region is treated as one country.

Although wheat production variability in Argentina is not as high as some of the other top-producing countries, the potential for transmitting instability is still quite high. This situation is largely due to the substantial portion of production variation that is absorbed by trade adjustments.

In the United States, coarse grain production variability has increased dramatically in the latter period. Although a small percentage of this variability is exported to the world coarse grain market, extremely variable production makes the United States an important source of potential market instability.

Earlier, we observed that the global evidence showed that stocks were better at providing stable levels of grain to the world's consumers after 1978. One possible explanation was that the major grain producing countries might have used their carryover stocks to absorb more of their own production variability than in previous years. If true, less of that variability would be absorbed by fluctuations in their grain trade. The data in table 4, however, contradict this explanation. Among major grain producing countries, more production variability was transferred to the world market after 1978 than before.

A second possible explanation was that since 1978 more of the world's grain stocks responded to external shocks to the world market; that is, shocks that originated outside effected the country. This possibility is examined in the next section.

Relationship Between Domestic Stocks and World Price

Countries may be unwilling to make domestic grain stock adjustments (or other domestic market adjustments) in response to the external volatility of the international grain market. They can accomplish this by putting policies in place that isolate their domestic grain market from the effects of world grain shortages or surpluses. Domestic stocks in countries following this strategy are perceived as being unresponsive to world prices. Their stocks tend to provide no stability to the world market.

On the other hand, countries can manage stocks so that they are responsive to world grain prices, by accumulating stocks when the world price falls, and by drawing them down when the world price rises. Their stocks response would tend to dampen world price fluctuations. Thus, a negative relationship between a country's grain stock levels and international price suggests that their stocks have a stabilizing impact on the world market.

Stocks Regression Equation

We used the following equation to measure this relation between stocks and world price after eliminating the effect of trend:

$$(4) S^{*} = a + bP^{*} + e, \quad S^{*} = S - \mathcal{S}, \quad P^{*} = P - \mathcal{P}$$

where S is ending stocks, *S* is trend ending stocks, P is the annual average wheat or corn (used for coarse grain) price at U.S. Gulf ports, such as and *P* is trend price. Deviations from trend (S^*, P^*) in the regression equation removes the effect of trend in the analysis. A statistically significant negative coefficient on price suggests that a country's stocks tend to have a stabilizing effect on the world market price.

Stocks and World Price Stability Results

Three major points are drawn from the results shown in tables 5 and 6. First, stocks of wheat and coarse grains appear to be much more of a stabilizing force on world markets after 1977 than before. The simple regression for the world total wheat stocks shows that stocks decreased 0.93 million tons for each U.S. dollar increase in the per ton wheat price. For 1960-77, the relationship was not as strong between world wheat stock levels and world price. Price responsiveness of world coarse grain stocks was also much higher after 1977.

Second, the United States was the major source of the world's price-responsive stocks since 1977. The U.S. stocks coefficient for wheat was nearly half the size of the world total (-0.392 compared with a world total of -0.934). The U.S. coarse grains stocks coefficient accounted for most of the world total.

The U.S. results for 1978-89 are consistent with results from other studies cited above; that is, the United States tends to hold a very large share of the world's buffer stocks of grain. As explained in Sharples and Goodloe (1984) and Sharples and Krutzfeldt (1990), U.S. stock levels tend to be driven by domestic grain policy objectives, not by world price stabilization objectives. Grain stockpiles tend to be viewed by the domestic agricultural community as undesirable.

Third, after being a destabilizing force in the world grain markets prior to 1977, EC grain stocks thereafter became a significant stabilizing force. During 1960-77, EC wheat and coarse grain stocks showed a significant positive relationship with world price as a destabilizing force on the world wheat market. Since 1977, grain stocks in the EC exhibit a significant negative relationship with price. Although the estimated coefficients are small, this change in behavior appears to be significant.

Table 5--Relationship between wheat stocks and world wheat price by leading stockholding countries

Country	Average stocks 1960-77	Average stocks 1978-89	Price coefficient[1] 1960-77	Price coefficient[1] 1978-89
	Million tons			
United States	24.1	33.0	-0.078	-0.392*
Rest of world[2]	63.7	104.5	-.138	-.542*
China	9.9	30.0	.034	-.057
Soviet Union	11.9	16.7	-.024	-.132**
EC-12	8.6	12.8	.025*	-.083*
India	4.5	9.6	-.032***	-.134*
Canada	14.5	9.2	-.120*	-.079*
Australia	2.2	4.3	-.025***	-.027
Turkey	1.8	4.2	-.012***	-.015**
Eastern Europe	1.4	1.8	-.003	.001
Argentina	.9	.6	.002	-.002
South Africa	.4	.6	-.001***	.000
Mexico	.2	.4	.001***	-.000
World	87.8	139.7	-.216***	-.934*

*Significant at the 5-percent level.
**Significant at the 10-percent level.
***Significant at the 20-percent level.

([1] S = a + bP where S is annual detrended stocks and P is annual detrended U.S. Gulf f.o.b.) hard red winter (ordinary) wheat price in U.S. dollars per ton.
[2] World excluding United States.

The EC stocks response of recent years is a new stabilizing force on the world grain market. The significant negative (stabilizing) relationship between EC stock levels and world price for 1978-89 is especially interesting since the EC grain markets are completely insulated from world prices. The change in EC stock management patterns appears to be related to the EC becoming a large grain exporter. In the 1960's and 1970's, the EC was a net importer. It turned to the world market in response to supply needs, especially for coarse grains, as indicated by the trade coefficients (tables 2 and 3). As EC exports rapidly expanded in the

late 1970's and 1980's, government export subsidies were provided to make up the difference between high internal support prices and the world price. When world prices fell, some grain apparently tended to be stored rather than exported for the government to hold down the high export subsidy payments. At higher world prices, stocks could be drawn down and exported with lower export subsidies. Hence, the stabilizing effect on world prices of EC stock adjustments likely has been caused by domestic budget considerations.

Conclusions and Policy Implications

Since 1977, world grain markets appear to be doing a better job than earlier in allocating the world's grain from year to year. Evidence of this is (1) less year-to-year variability around trend in global grain consumption, even though world production variability has increased, and (2) less world grain price volatility than prior to 1978, despite transmission of more production variability onto the world market by major producing countries. The world's grain stocks apparently are providing more market stability than they did prior to 1978.

This study examines the role of each of the major grain producing countries--who are also the major holders of grain stocks--in generating instability or providing stability to world grain markets by how they manage their own stocks. The rules determining how grain stocks are managed vary among countries. In this study, we do not examine those rules. Rather, we examine actual stock adjustments. The forces determining a country's stock management behavior should be the subject of further research.

A country's grain stocks can contribute to world market stability two ways:

(1) Stocks may be used to offset a country's own production variability so that it would not need to vary its grain trade (imports or exports) to stabilize consumption.

(2) Stocks may be used to offset surpluses or shortages on the world market.

Table 6--Relationship between coarse grain stocks and world coarse grain price by leading stockholding countries

Country	Average stocks 1960-77	Average stocks 1978-89	Price coefficient[1] 1960-77	Price coefficient[1] 1978-89
	Million tons			
United States	44.3	81.4	-0.190	-1.641*
Rest of world[2]	52.6	78.3	.090***	-.086
China	15.2	27.7	.112*	.099**
EC-12	7.3	10.9	.036*	-.076*
Soviet Union	6.4	7.1	.016	-.047***
Canada	5.5	5.7	-.020***	-.034***
Eastern Europe	1.9	4.7	-.009***	-.031*
Mexico	.8	1.5	.008***	.036**
South Africa	1.3	1.4	.001	.015
India	4.7	1.3	-.044*	.014**
Turkey	.4	.9	-.009*	-.002
Argentina	.5	.6	.006**	-.002
Australia	.6	.5	-.015*	-.001
World	96.9	159.7	-.100	-1.727*

*Significant at the 5-percent level.
**Significant at the 10-percent level.
***Significant at the 20-percent level.
[1]S = a + bP where S is annual detrended stocks and P is annual detrended U.S. Gulf f.o.b. corn price (no. 2) in U.S. dollars per ton.
[2]World excluding United States.

We discovered no overall improvement since 1977 in the use of grain stocks to offset domestic production variability. Thus, we conclude that the first item above was not a source of added stability to the world grain markets. We did, however, find substantial improvement in the responsiveness of grain stocks in several important countries to world market conditions (table 7). The second item listed above appears to be a significant source of reduced instability in world grain markets since 1977, especially for wheat. Not only did the unitless measure of dispersion of wheat prices fall in the latter period, but so too did the standard error (table 1).

Table 7--Summary of absorption effect in selected countries for wheat and coarse grain

	Coarse grains		Wheat	
Country	1960-77	1978-89	1960-77	1978-89
United States	---	Stabilizing	---	Stabilizing
Rest of world[1]	---	---	---	Stabilizing
China	Destabilizing	---	---	---
Soviet Union	---	---	---	---
EC-12	Destabilizing	Stabilizing	Destabilizing	Stabilizing
Canada	---	---	Stabilizing	Stabilizing
Eastern Europe	---	Stabilizing	---	---
India	Stabilizing	---	---	Stabilizing
Turkey	Stabilizing	---	---	---
Argentina	---	---	---	---
Australia	Stabilizing	---	---	---
South Africa	---	---	---	---
Mexico	---	---	---	---

--- = If the price regression coefficient in the stocks equation is not significant at the 5-percent level (tables 5 and 6), the country is presented here as having no absorption effect.

[1]World excluding the United States.

The Soviet Union, Argentina, and the United States appear to be major sources of instability to world grain markets in recent years. Production variability is high in both the Soviet Union and the United States. Although Argentina's production variability is relatively small, a larger portion of this variability is passed on to the world grain markets. Argentina makes no world market-stabilizing adjustments in domestic grain stocks.

Most major grain producing countries "exported" more production variability onto the world market after 1977 than before. An exception was the EC.

Results of this study verify the conclusion of previous studies that U.S. stocks provided a major stabilizing force on world grain markets. Results since 1977 also show, however, that the United States was a major source of the world's grain production variability. Massive adjustments in U.S.

grain stock levels offset most of that production variability. Further, U.S. stocks were very responsive, in a stabilizing way, to world grain price movements.

Conclusions suggesting that the United States has borne the cost of holding stocks which help stabilize the world market appears to be supported more in the coarse grain market compared with wheat. Excluding the United States from the coarse grains market, one finds that the rest of the world has failed to adjust stocks to help stabilize the market in recent years. However, only a few countries are apparently responsible for having stabilizing effects in either of the grain markets.

Stock adjustments made in the EC in recent years appear to contribute significantly to world grain market stability. This conclusion is surprising. Our results indicate that in earlier years EC stocks were a destabilizing force on world markets.

Recent U.S. policy changes could lead to the United States playing a reduced role in stabilizing world grain markets. Because of the dominant U.S. role in stabilizing world grain markets, these policy changes could be very significant to all countries who participate in the world grain market. The 1990 farm act allows grain price supports to continue their downward adjustment. With price supports set closer to the low end of world market fluctuations, there would be little incentive for U.S. grain to go into Government stocks. The farm act also downsizes the Farmer-Owned Reserve. Finally, continued or expanded funding for the Export Enhancement Program (EEP) also would tend to destabilize world grain markets. The EEP likely would be used more aggressively to encourage U.S. grain exports (and reduce stocks) when grain prices were low and used less aggressively when grain prices were high.

Results of this study also raise questions about the effect of trade liberalization on the stability of world grain markets. Conventional economic wisdom is that reduced trade barriers would increase grain market stability. This change would occur by exposing a larger portion of the world's production, consumption, and stockholding to world prices. Results from this study also show, however, that the domestic policies of the United States and the EC induce market-stabilizing stocks behavior, although the effect of U.S. policies could be diminishing, as discussed above. Liberalizing trade could remove those policy-induced sources of market stabilization. Although some would argue that policy-induced stabilization is less desirable because it is subject to political whims, the

net effect of trade liberalization on world grain market stability appears less clear. This question warrants further research.

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