Conference Draft

THE AVOCADO DISPUTE AND OTHER TECHNICAL BARRIERS TO AGRICULTURAL TRADE UNDER NAFTA

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Recent attention to agricultural trade policy has turned to issues of technical barriers, particularly sanitary and phytosanitary (SPS) regulations, that constrain movement of products across international borders. It is intuitive that there are public good arguments that make some SPS restrictions necessary to insure a safe food supply and protect domestic animal herds and plant stocks from pests and diseases. In other cases, regulations rationalized on technical grounds seem to lack firm scientific foundations and appear, at least to potential beneficiaries of expanded trade, to be imposed primarily to shield domestic producers from competition. That such controversies arise is not surprising. Their likelihood is suggested by the economic theory of regulation, sometimes referred to as "capture" theory. Applied to technical trade barriers, the theory suggests that when there is doubt about the merit of a technical restriction, domestic interest groups will often succeed in obtaining protective decisions from domestic regulatory agencies.

Both NAFTA and the WTO address issues of SPS and other technical trade barriers. Under NAFTA, it was agreed that each country retains the right to adopt SPS measures to protect human, animal, and plant life and health, that each country has the right to establish appropriate levels of protection, and that SPS measures must be based on scientific evidence, be non-

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discriminatory, and be applied only to the extent necessary. The WTO provides even stronger language about the use and misuse of technical trade barriers. In both cases, multilateral dispute settlement procedures are established. If an arbitration panel decides that an import regulation violates the NAFTA or WTO provisions, the non-compliant country has the option of either changing the measure or keeping it and compensating the challenging country for the value of impaired trade.

In light of the economic theory of regulation, the NAFTA and WTO provisions that address technical trade barriers are institutional innovations intended to moderate the influence of domestic interest groups on their national regulatory agencies. One hope of these agreements is that the enunciation of the principles for SPS regulations and the mere existence of binding adjudicatory mechanisms will contribute to negotiated resolution of some disagreements without recourse to the formal dispute settlement process.

This paper examines developments about SPS barriers between Mexico and the United States since the initiation of the NAFTA negotiations in 1990. Technical barriers that impede trade have been opened to renewed scrutiny in this context. One of the most controversial cases subject to reexamination has been the long-standing U.S. ban on imports of Mexican Hass avocados. Within the framework of the NAFTA negotiations and its subsequent implementation, Mexico has sought opening of the U.S. avocado market for the past six years.

The Mexican argument has been that its principal avocado producing region has low incidents of pests of quarantine significance, that the Hass avocado is not a preferred host for some pest of concern, and that Mexican exporters have developed a systems approach to handling fruit for export that has proven effective in eliminating risks of pest infestations being carried abroad. The Mexicans have viewed continuation of the avocado ban as motivated by the economic interests of U.S. producers, who benefit from domestic prices well above levels for their exports.

The U.S. avocado industry, which is concentrated in southern California, has bitterly contested the possible opening of any part of the domestic market. The industry acknowledges that it receives prices well above those of Mexican exports, but argues that its concern is not price but risk of pest infestation. The domestic producers have challenged the Mexican arguments about pest risks and the effectiveness of the systems approach to risk management. California representatives have made emotional claims about their industry being destroyed if the avocado import ban is lifted even partially. Moreover, with respect to NAFTA they have sought to turn the theory of regulation on its head by making the argument that *domestic interests* are being sold out to political expediency in the rush to free trade.

Caught in the middle of this controversy has been the U.S. Department of Agriculture. The USDA's Animal and Plant Health Inspection Service (APHIS) and Agricultural Research Service (ARS) have been engaged in intense bi-national technical negotiations with Mexican authorities about the pest survey evidence and export protocols that might sustain an easing of the import ban. After four years of negotiations, in September 1995, APHIS accepted a Mexican work plan proposing a systems approach to pest risk mitigation. With some further safeguards, a proposed rule was published by USDA in July 1995 that would allow imports into the northeastern United States of Mexican avocados grown and processed under specified conditions.

Imports would be limited to the winter months when the risk of establishment of pests would be further mitigated by adverse weather. The geographic and seasonal restrictions of USDA's proposed rule imply that the partial easing of the avocado import ban would open less than five percent of the annual U.S. market to Mexican products. Still, the domestic avocado industry has fought against this rule in public and behind closed doors. Thirteen months after the proposed rule was published, USDA announced it would not ease the avocado ban before the start of at least one more winter shipping season. Thus, at this point, the ban remains in effect.

What can be made of the avocado SPS dispute and why does it matter? In this paper we develop three arguments. First, a review of the scientific evidence and decision-making process leads us to conclude that the presumption of capture of the regulatory process by the domestic industry is the most plausible hypothesis to maintain in the avocado case to date. While economists and other social scientists may be on thin ice making independent assessments of the scientific evidence *per se*, our conclusion that capture of the regulatory decision remains the most plausible hypothesis is based on the characteristics of the industry (returns to large fixed investments protected by the price differential created by the import ban), the evaluations of the scientific evidence offered through the regulatory process, the behavior of the domestic industry in its attempts to influence the regulatory decision, and the response by policy decision makers.

The second argument concerns the economic impacts of possible lifting of the avocado import ban. Our key point is that economic cost-benefit analysis ought to play an explicit role in decision-making about SPS regulations. The NAFTA and WTO provisions on these regulations emphasize the credibility of their scientific basis but are silent about their economic impacts. In many cases, sound science and sound economics will correspond--as when pest risks have expected economic costs that outweigh the benefits of trade. These cases provide an implicit economic rationale for the scientific focus of the international agreements. However, some SPS regulations may have net economic costs even if they have solid scientific justification--for example, when regulations create welfare losses exceeding the domestic costs from possible pest infestations. In these latter cases, the SPS regulations are not good economic policy in terms of maximizing national welfare, but such regulations would not violate the SPS agreements of NAFTA or the WTO.

To illustrate the role of economic analysis in SPS decisions, we use estimates of supply and demand similar to those in previous studies of the U.S. avocado industry to evaluate the effects of easing the U.S. restriction on imports from Mexico. We examine the results in two models (long run and short run) under four assumptions about the probability of a pest infestation (ranging from essentially zero risk to certainty of infestation) and three assumptions about the costs of an infestation in terms of pest-control expenses and reduced yields.

When no pest infestation occurs, our analysis suggests that a complete opening of the U.S. market results in lower prices, increased consumer surplus, less producer surplus, and a net welfare gain--the usual economic impacts of eliminating a trade barrier in both our long-run and short-run models. If pest infestation occurs it imposes an additional loss of producer surplus--a "double whammy" hits the domestic industry from elimination of the ban in this case. In our worst case scenario, the domestic industry suffers quite severe declines in profits and output, indeed declines consistent with the dire rhetorical fears expressed by domestic growers during

the past few years. But most of the producer losses come from the effect of free trade on domestic prices not from pest infestations. There remains a net U.S. welfare gain from complete opening of the market even when pest infestation occurs with certainty.

The results are a little different under a partial lifting of the avocado import ban, as contained in the USDA proposed rule. In this case, the consumer and net welfare gains from trade are relatively small and can be exceeded by the costs of pest infestation. Surprisingly, consumers bear more of the risk from the economic effects of pests than producers. For limited trade with high probabilities of pest risk, expected consumer surplus, producer surplus and net welfare decline. Consumer surplus increases with partial easing of the import ban and lower pest-risk levels. The expected gains are sufficient to offset expected producer losses and raise net welfare except when pest risks are high.

When trade is limited, pest infestations increase the losses of producers resulting from imports in a long-run model (with elastic supply and demand), as was the case under free trade. In a short-run model (with inelastic supply and demand), when trade is limited, the increased producer surplus from the higher domestic prices that result from an infestation-related reduction in supply more than offsets the loss of producer surplus due to higher production costs and lower yields. Thus, pest infestations have the net effect of reducing the loss of producer surplus (compared to limited trade without pest infestation) in the short-run model. This is a curious result given the often-voiced claims of domestic producers that it is pest infestation not price they are concerned about from the proposed partial lifting of the avocado ban. Our economic analysis suggests that their greatest fear should be of imports occurring without pest infestation. We are not Machiavellian enough to suggest that the producers would hope pest infestations occur if the import ban is partially eased, but we do believe that imports occurring without pest risk are what they fear.

The final section of our paper puts the avocado case into a broader perspective. The principles enunciated by NAFTA and the WTO are important because questionable technical barriers to trade can be a substantial obstacle to achieving the gains from trade that should otherwise occur. We briefly discuss some of the other SPS disputes which have arisen recently for U.S.-Mexico trade and the broad stakes that resolution of these cases would address.

Economic Characteristics of the Avocado Industry

Whatever the merits of the avocado quarantine on phytosanitary grounds, there are strong incentives for domestic producers to oppose imports from Mexico. The U.S. avocado market typically generates sales around $250-300 million dollars. Production costs, particularly land and labor costs are widely acknowledged to be much lower in Mexico, and the quarantine has sustained domestic prices at levels that exceed those of the export-quality Mexican fruit. Avocado production also involves substantial investment costs. Establishing an orchard requires land clearing, grading of access roads, installation of drip irrigation systems, and propagation of young trees. Once the establishment costs are incurred, trees can remain productive for as long as 40 years. The total accumulated cost of establishing an orchard in the Southern Coast region of California during its initial six years has been estimated at $15,372 per acre in 1992. This supports the assertion by the president of the California Avocado Commission (CAC) that California growers have over $1 billion invested in the avocado industry.

Development of the Proposed Rule for Limited Import Access[**]

The avocado dispute appeared early on the NAFTA agenda when the U.S. Secretary of Agriculture met with the Mexican Minister of Agriculture in June 1990 to discuss issues that might be addressed in the negotiations.[1] Considered a difficult area for the discussions, since the initial meeting scientists from USDA and Mexico's Direccion General de Sanidad Vegetal (DIGSV) have sparred over data requirements, research design, and interpretation of research results concerning possible lifting of the import ban. The technical debate has centered on the assessment of pest populations, the host status of Hass avocados for fruit flies, and the adequacy of various proposed pest-risk mitigation strategies. This debate has dominated the agenda of many meetings of a joint Phytosanitary Working Group and has been closely monitored by industry representatives, trade policy makers, and elected officials in both countries. The principal events over the past six years are summarized in table 1.

Shortly after the 1990 Ministerial meeting, DIGSV submitted a "Work Plan to Produce Avocados of the Best Quality." The work plan proposed that APHIS allow avocados produced and marketed under the terms of DIGSV's export registration program in the state of Michoacan to enter the United States. APHIS quickly rejected this work plan. The principal flaw cited by APHIS was that it addressed only one of the insect species that concerned the agency. However, APHIS regarded four species of host-specific pests and four species of fruit flies as "pests of quarantine significance."[2] Since there were no effective post-harvest treatments to eradicate these pests on Hass avocados, APHIS wanted DIGSV to supply evidence that a specified area was free of a pest, or evidence that a pest did not attack Hass avocados, before it considered a change in the quarantine.[3]

When U.S. and Mexican animal and plant health officials met in October 1990, the Mexican delegation agreed to submit another work plan.[4] The second work plan was to include evidence that the proposed districts in Michoacan were free of host-specific pests, along with research results which would demonstrate that Hass avocados were not a host for fruit flies,

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[**] For additional discussion of the history of the avocado dispute, see Roberts, Donna and David Orden, "Determinants of Technical Barriers to Trade: The Case of U.S. Phytosanitary Restrictions on Mexican Avocados, 1972-1995," in *Understanding Technical Barriers to Agricultural Trade* (David Orden and Donna Roberts, editors), St. Paul, MN: International Agricultural Trade Research Consortium, Department of Applied Economics, University of Minnesota, 1996. This section and the one that follows, in particular, draw on this earlier paper.

[1] Memo, D. Scot Campbell, Director, Operational Support, APHIS/IS, 6/6/90.

[2] The four host-specific pests were: *Heilipus lauri, Conotrachelus aguacatae, and C. perseae* (seed weevils),and *Stenoma catenifer* (a seed moth). The four fruit fly species were *Anastrepha ludens* (the Mexican fruit fly), *A. fraterculus, A. serpentina, and A. striata*.

[3] Letter from A. Thiermann, Deputy Administrator, International Services, APHIS, to J. Gutierrez, Director General, DIGSV, 10/1/90.

[4] Minutes of Meeting of US-Mexico Free Trade Initiatives, Animal and Plant Health, 10/31/90.

diminishing the importance of fruit fly population levels in the Michoacan avocado growing regions.[5]

During the following year, the most important discussions between APHIS and DIGSV centered on consideration of a systems approach to mitigate the pest risk associated with importing avocados from Michoacan. The U.S. delegation to the bilateral discussions outlined a seven-point export protocol that "would combine various procedures which in their totality could possibly allow Mexico to move Mexican avocados to limited areas of the United States without risk to U.S. avocado production areas."[6] Discussion of such a systems approach signaled official recognition that it was unlikely for the proposed districts in Michoacan to be designated as completely pest-free.

In May 1992, APHIS refused to accept the revised DIGSV work plan. The principal shortcoming cited was that the fruit fly host status research had not been conducted with sufficient scientific rigor.[7] APHIS argued that not only would DIGSV have to increase the number of fruit in its controlled experiments, but it would also have to sample a minimum of 100,000 fruit in the field under different environmental conditions and at different times of the year to demonstrate that Hass avocados were not a fruit fly host. APHIS also asked DIGSV to substantiate some of its claims about eradication of host-specific pests in the Michoacan avocado groves.

The request for additional information to support the host-specific pest-free status of the proposed Michoacan districts was quickly addressed by DIGSV. One month after the request, USDA and Mexico's Ministry of Agriculture signed a Memorandum of Understanding which stated that the U.S. tentatively agreed that "Based on information provided by Mexico the U.S. accepts that avocado fruit from areas in Michoacan determined through survey and fruit cutting are free of seed pests."[8]

Agreement on the risk posed by fruit flies would prove to be more elusive. A group of experts from the federal and state governments of both countries met again in July 1992 to address this issue. This contentious meeting would prove to be pivotal about the data required to support the claim that Hass avocados were not a host for fruit flies.[9] An ARS participant in the meeting noted that unpublished studies showed that Hass avocados were hosts to fruit flies. Another ARS delegate pointed out that since avocados in general were "good hosts," a research protocol to demonstrate that the Hass variety was not would have to be quite rigorous.

The Mexican delegation's position was substantially different. In DIGSV's view, four observations supported a research protocol that was less extensive than that proposed by the U.S.

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[5] Letter from Glen Lee, Deputy Administrator, PPQ, to J. Gutierrez, Director, DIGSV, 5/28/92.
[6] Draft of Briefing Paper: Avocados from Mexico, APHIS/IS, 9/17/91.
[7] Letter from Glen Lee, Deputy Administrator, PPQ, to J. Gutierrez, DIGSV, 5/28/92.
[8] Minutes of the Eighth Meeting of the U.S. - Mexico Technical Working Group, June 18, 1992.
[9] "Mexican Bi-National Technical Meeting on Data Requirements to Support Non-Fruit Fly Status for Hass Variety Avocados," memo from S. Sudduth, Senior Agricultural Biologist, Pest Exclusion Branch, California Department of Food and Agriculture, to Isi Siddiqui, Assistant Director, Division of Plant Industry, 7/17/92.

delegates. First, *A. ludens* populations were low at the altitudes where avocados orchards were located. Second, the other two fruit fly species under discussion had never been observed in the Michoacan area. Third, although the published scientific literature had documented the susceptibility of some varieties of avocados to fruit flies, the evidence that the thick-skinned Hass avocado was a host was scant. Fourth, evidence of fruit fly infestation had not been found in exported avocados during the past 20 years.

The Mexican delegation's arguments did not persuade U.S. plant health officials to change their position on the requirement for additional research. Consequently, DIGSV officials agreed at the conclusion of the meeting to draw up a research protocol that would examine the susceptibility of Hass avocados to three species of fruit flies.[10] An ARS official also recommended that DIGSV officials begin to collect trapping data in the growing area to support their assertions about the absence or minimal presence of these fruit fly species.

In August 1992, ARS officials reviewed the research protocol submitted by DIGSV. Again, ARS concluded that the proposed research was inadequate to prove non-host status for Hass avocados. This conclusion was based in part on recent ARS research that had shown that fruit flies would oviposit on Hass avocados under forced-infestation laboratory conditions.

DIGSV submitted its third work plan, which explicitly featured a systems approach to mitigate risk, in October 1992.[11] Although DIGSV proposed extensive risk mitigation procedures in its work plan, it provided little or no information to substantiate its assertions that avocado pests had been eradicated, fruit fly populations were low, and that fruit flies would not infest unharvested Hass avocados. The emphasis on extensive risk mitigation procedures rather than on an extensive risk assessment indicated that, in DIGSV's view, APHIS only needed to be concerned with the pest status of the commodity at the end of the risk mitigation system. Nonetheless, many of the ARS and APHIS scientists who reviewed the proposed work plan continued to criticize Mexico for its failure to provide information that would allow a rigorous pest risk assessment, noting that such an assessment would be a necessary first step in designing an effective system to mitigate risk. Although the internal USDA debate over the new work plan continued for several months, the final consensus once again was that Mexico's work plan was inadequate.

In the first few months of 1993, APHIS and DIGSV officials continued to try to resolve the impasse on Mexico's work plan in a series of meetings of the joint Phytosanitary Working Group. At a meeting in mid-1993, the U.S. delegation indicated that they were still unable to assess Mexico's third work plan because of insufficient information about the risk posed by fruit flies in the avocado producing districts. A sub-group of scientists within the Phytosanitary Working Group continued to negotiate the details of data requirements and research design for assessing fly-related risks throughout the summer and fall of 1993. In November 1993, USDA

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[10] The U.S. delegation announced that further review of the literature had prompted them to drop their request for information on one fruit fly species, *Anastrepha fraterculus*.

[11] "Preclearance Work Plan for Shipment of Hass Variety Avocados From Mexico to the United States," Direccion General de Sanidad Vegetal, Government of Mexico, October, 1992.

and DIGSV signed a protocol that outlined the research that DIGSV would undertake with oversight and review provided by U.S. plant health officials.[12]

By June 1994, the fruit-fly host-status research on Hass avocados was complete. DIGSV submitted the results to the U.S. delegation at the Phytosanitary Working Group meeting, along with a new work plan. On July 5, 1994, the Mexican government formally requested that APHIS amend is import regulations to permit entry of avocados from approved orchards in specified municipalities in Michoacan.

In the July 1994 work plan, Mexico asserted that its survey results demonstrated that the host-specific avocado pests had been eliminated from the districts participating in the avocado export program and that fruit fly populations were low in these districts. It outlined monitoring activities for future pest detection and presented evidence that fruit flies do not attack unharvested Hass avocados under actual growing conditions. It also specified pre-harvest, harvest, packing, transport, shipping, and distribution procedures that would minimize the risk of there being any pests on exported avocados. DIGSV concluded that the low prevalence of pests and extensive risk-mitigation practices detailed in the work plan constituted a system approach that posed negligible risk for U.S. agriculture.

ARS scientists, who had consistently been critical of the Mexican research effort over the previous three years, continued to find fault with the execution of part of the research conducted under the joint protocol. Nonetheless, they concluded:

> "The overall comparison of lab[oratory] and field cage Hass avocados demonstrated (in agreement with other studies of avocados) that fruit attached to the tree shows considerable resistance to fruit fly attack and this resistance coupled with other components of a systems approach has great promise as a quarantine procedure."[13]

Over the next three months, U.S. officials worked with their Mexican counterparts on minor revisions to the work plan. The proposed work plan was viewed as complete in September 1994. The following month, DIGSV submitted the required pest population survey data.

The final Mexican work plan remained under review by APHIS until July 1995. At that time, USDA published a proposed rule on the importation of avocados from Mexico in the Federal Register.[14] The proposed rule recommended that the quarantine regulations be amended

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12 "Protocol for testing host status of avocados for fruit flies of the genus Anastrepha," APHIS, 11/93.

13 "ARS Review of Research Report from Mexico on Host Status of Hass Avocado for Anastrepha Fruit Flies", Ken Vick, National Program Leader, Stored Product Insects and Plant Quarantine, USDA/ARS, 7/21/1994.

14 Federal Register, 7 CFR Part 319, Docket 94-116-3, pp. 34832-34842, 07/03/95.

to allow "fresh Hass avocado fruit grown in approved orchards in approved municipalities in Michoacan, Mexico to be imported into certain areas of the United States, subject to certain conditions." The area to which USDA proposed allowing imports was restricted to the northeastern part of the United States (nineteen states and Washington D.C.) far geographically from the domestic avocado growing regions.

In its proposed rule, APHIS reported the findings of its independent evaluation of the Mexican work plan. It also provided responses to comments received during public hearings and in writing on the basis of an Advanced Notice of Proposed Rulemaking that had been published for the avocado quarantine in November 1994. APHIS defended the use of a systems approach to mitigating pest risk, citing other situations in which a systems approach was used by the United States to facilitate import and export of fruits and vegetables and the success of the DIGSV system approach for exporting avocados to Japan.[15] APHIS asserted that the nine mitigation measures which were elements of their proposed systems approach went beyond the Mexican work plan of September 1994 in response to its concurrence with many of the public comments that suggested "some additional safeguards would be necessary to prevent introduction of plant

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[15] Japan is well-known for its vigilance in enforcing exacting phytosanitary regulations. It does not need to be concerned about host-specific pests because avocados are not produced domestically. But Japanese growers produce a wide variety of fruit that are preferred hosts for the fruit flies that supposedly concern the California industry. Some in the U.S. industry seem to be unaware that Mexico already meets the standards for exporting avocados directly to Japan. For example, one representative from an avocado cooperative said, "Scientifically, I don't see any evidence that's remotely close to proof from the Mexican side. It's not the same protocol we'd have to use to prove that our fruit was okay if we shipped it somewhere like Japan." ("Crossing the Border: Debate over Quarantine May be in Final Stage," *California Grower*, March 1995, pp. 37 - 41.)

pests."[16] APHIS concluded that the agency's proposed systems approach would provide an adequate level of security to domestic growers. Based on the results of a quantitative pest risk assessment it had undertaken, APHIS reported that with the proposed systems approach in place a seed pest or fruit fly outbreak was estimated to occur on average less than once every 1,000,000 years and a stem weevil outbreak might occur on average once every 11,402 years.[17]

A crucial aspect of the dispute about whether the Mexican work plan provided adequate pest risk protection concerned the value of the evidence that had been presented about the prevalence of pests in Michoacan and the host status of unharvested Hass avocados for *A. ludens*. In its proposed rule, APHIS acknowledged that it shared many of the concerns that had been raised by the domestic industry about the DIGSV surveys and research being limited in scope or flawed in various technical dimensions. As a consequence, APHIS proposed more comprehensive surveys for host-specific pests during each growing season than had been proposed in the work plan. In particular, APHIS proposed that these surveys would have to include areas with "backyard" or wild avocado fruit and all orchards and properties contiguous with orchards seeking approval to export. APHIS also noted that it would require a higher

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16 These mitigation measures are field surveys; trapping and field treatments; field sanitation; host resistance; post-harvest safeguards; winter shipping only; packinghouse inspection and fruit cutting; port-of arrival inspection; and limited U.S. distribution, as described in Miller, Charles, Alan Green, Victor Harabin and Russell Stewart, "A Systems Approach for Mexican Avocado," unpublished report, U.S. Department of Agriculture, Animal and Plant Health Inspection Service, May 1995.

17 This same report notes that if avocados were imported with no regulatory controls except for port-of-entry inspections, a seed weevil outbreak might occur every 95 years, a stem weevil outbreak might occur every 7 months, a seed moth outbreak might occur every 355 years, and a fruit fly outbreak might occur every 72 years ("Importation of Avocado Fruit (*Persea americana*) from Mexico: Supplement Pest Risk Assessment," USDA/APHIS, May, 1995.)

standard for trapping to detect fruit fly population levels than DIGSV had carried out in its research. Trapping for Medfly would also be required as a precaution, even though Medfly had only been detected in southern Mexico.

While APHIS concluded that the proposed requirements for avocado shipments from Michoacan made it unlikely that pest infestations would occur in imported fruit, in light of its reservations about the DIGSV survey and research results, it also proposed that permits for exports be limited to the winter period November-February. APHIS noted that during this season, not only would weather conditions in Michoacan reduce pest risks, but weather conditions in the northeastern United States would preclude establishment of pests infestations if they were carried across the border. With this final provision, APHIS concluded that it was unnecessary to establish Michoacan as a pest-free zone prior to allowing Hass avocado imports. APHIS noted that the alternative to its proposed rule was to make no change in the quarantine. It rejected this alternative because "there appears to be no pest risk reason to maintain the prohibition on avocados in light of the safeguards that would be applied to their importation."

Industry Opposition to Changes in the Import Ban

From the outset of the NAFTA negotiations, the domestic industry had monitored the discussions for evidence that the avocado quarantine might be changed. One concern frequently expressed by the industry was that the avocado quarantine would be sacrificed to the political initiative underlying the trade agreement negotiations. This claim might be termed an aggressive strategy by the industry in the sense that it turns on its head the conventional argument about capture of regulatory processes by domestic interest groups. Numerous declarations were made

by the U.S. growers to the effect that "science might be traded off in a rush to sign a trade deal"[18] or that the Mexican government was treating the avocado pest issues as "a political problem that can be overcome by political persuasion--not an issue that will be decided by scientific evidence."[19]

The domestic opposition to any easing of the import ban was both vocal and industrious. The publication in November 1994 of an advanced notice of proposed rulemaking was indicative of the extent of the efforts. The industry press reported that its sources "confirmed that the powerful CAC (California Avocado Commission) and other interests are indeed using political clout to stall the new rule."[20] USDA confirmed that it was not required by law to publish an advance notice of proposed rulemaking but that it sometimes chose to do so when it was "deeply concerned about getting the public's comments and the industry's comments."[21]

The most well-orchestrated opposition to easing of the import ban was coordinated by the CAC. The CAC submitted a 266-page report for the public record on the advanced notice. The CAC's written submission included commissioned reports and letters from entomologists and tropical fruit specialists, entomology journal articles, letters and comments from current and retired government scientists, and several studies on the economic impacts of pest infestation. In nearly nine hours of testimony at two hearings, about sixty people--including growers, industry representatives, state and local government officials, and scientific consultants--voiced their

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18 "Free Trade with Mexico," Betsey Blanchard Chess, *California Grower* , 6/91, p. 19.
19 S. Taft and N. Traner, The Eco Farms Grower newsletter, 3/27/91.
20 *World Food Chemical News*, 1/11/95, p. 4.
21 Statement by Jeffrey Kirmsee, Office of the General Counsel, USDA. Transcript of the Meeting in San Diego, CA to discuss the Advance Notice of Proposed Rulemaking, 11/29/94, p. 12-13.

objections. APHIS also received written comments from 291 individuals who opposed changing the terms of the quarantine. Most of the letters were from growers in California, but opposition was also registered by prominent participants in the agricultural policy community, such as the American Farm Bureau Federation, the Western Growers Association, and the Florida Fruit and Vegetable Association. Twenty-four members of the Californian delegation to Congress also signed letters that opposed changes in the import ban.

At the heart of the CAC argument was the claim that allowing imports of Mexican avocados under the proposed systems approach in Mexico's 1994 work plan posed an unacceptable risk of pest infestation to domestic groves. The industry asserted that the surveys of pest incidence had failed to establish low population levels in the Michoacan growing area. It also argued that the proposed monitoring protocols were inadequate and that Hass avocados are a better host of fruit flies than Mexico acknowledged. It pointed out that no approved post-harvest pest treatments are available and argued that the proposed pre-harvest, harvest, packing, transport, shipping, and distribution measures did not sufficiently mitigate the pest risk. The industry also expressed concern that any infestations of domestic groves that resulted from importation of Mexican avocados would be costly to contain due to U.S. pesticide regulations and the close proximity of the domestic groves to residential neighborhoods.

The CAC's technical advisors, including scientists from the state's universities, were particularly skeptical of the pest surveys Mexico had submitted with its proposed work plan. In their professional opinions, the risk mitigation procedures detailed in the work plan were predicated on surveys that were limited in scope and flawed in execution. Many of the technical

advisors concurred with one plant physiologist who stated, "The research conducted in 1993-1994 did not provide conclusive data to base a work plan on, rather, it only provided the preliminary framework on which to base a long term research program" which would last, at a minimum, 4 to 5 years.[22] Their technical criticism of the pest surveys was detailed, including, for example, objections to incorrect trap placement, weak trapping bait, insufficient climatological records, and inadequate trapping densities.[23]

On the basis of their various objections, the California avocado growers recommended that the proposed work plan for amending the avocado quarantine be rejected. The CAC proposed that Mexico should be allowed to export avocados only if it could establish pest-free zones, the imported avocados were treated with a pesticide which assured at a very high probability level that exotic pests were eliminated, or additional scientific research unequivocally established that Hass avocados were not hosts of pests which are injurious to avocados and other fruits and vegetables grown in the United States.[24]

The conditions specified by the CAC for amendment of the avocado quarantine would effectively preclude importation of Hass avocados from Mexico for the foreseeable future. The first condition, establishing and maintaining a pest free zone, requires substantial eradication, monitoring, and quarantine enforcement costs well beyond the perimeters of commercial export

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22 Statement by Marylou Arpaia, Cooperative Extension Horticulturalist, University of California, Riverside, before the USDA/APHIS hearings on the Advance Notice of Proposed Rulemaking Concerning the Importation of Fresh Hass Avocado Fruit Grown in Michoacan, Mexico, Docket No. 94-116-1, 11/30/94.

23 Statement by the California Avocado Commission, Docket No. 94 -116-1, 1/3/95.

24 Statement by the CAC for Docket No. 94-116-1, ANPR Concerning the Importation of Fresh Hass Avocado Fruit Grown in Michoacan, Mexico, ½/95, p. 2.

groves in Mexico. Although it might eventually prove feasible technically, such an approach was regarded as uneconomical by Mexican officials who believed pest risks were already negligible. On the second condition, all parties agreed that no adequate post-harvest treatment is available. The third condition, strictly interpreted, also cannot be met. The results of DIGSV's 1993-94 fruit fly host status research had already indicated that fruit flies will attack Hass avocados shortly after they have been harvested. Additional research to rigorously establish the host status of unharvested Hass avocados could only confirm that they are non-preferred hosts, instead of the higher standard of "unequivocal non-host" that the CAC recommended.

Final Decision Postponed

Having failed to stop publication of the proposed rule following the public hearings and comment period on the advanced notice of proposed rulemaking, the CAC mobilized for the public comment period on the proposed rule itself. USDA announced that an unusual five hearings would be held in August 1995, including one devoted to presentations by experts in risk analysis.

The most visibly contentious of the five public hearings was held in Escondido, California on August 30, 1995. The CAC sponsored its own informational meeting a week before the hearing, held a protest rally, and organized attendance by opponents of the proposed rule. Over 1500 people showed up for the hearing, forcing use of access by closed-circuit television in addition to the scheduled 700-person auditorium. Testimony was again presented by a range of political representatives, scientists and producers. The CAC also organized a letter-writing

campaign against the proposed rule. APHIS received more than 2000 written comments, mostly expressing opposition to easing of the avocado ban.

The outpouring of opposition orchestrated by the CAC was effective in the short term. After the public comment period closed on October 16, 1995, USDA announced it was unlikely to make a decision on a final rule to allow avocado imports in time for the 1995-96 winter shipping season.[25] The CAC kept up its pressure in early 1996. Claiming that a final rule was imminent, it threatened legal action to block any lifting of the ban.[26] This was a credible threat. New USDA rules are subject to judicial review, and an APHIS decision in another long-standing dispute (to allow imports of four genera of nursery stock in sterile growing media) had been challenged in court in February 1995. The domestic avocado industry also attempted to stop a USDA decision to ease the avocado import ban through amendments to congressional appropriations legislation that would have required further pest risk studies.

In early March 1996, the CAC placed provocative full-page advertisements in several national newspapers asserting (against the backdrop of a hangman's noose) that "The USDA is about to sign the death warrant for a billion dollar American industry."[27] Later in March, the CAC filed a new petition with USDA on the avocado ruling. It claimed that pest surveys results for 1995-96 showed higher levels of host-specific and fruit fly infestations in Mexican orchards than had previously been reported. The CAC argued that the new results invalidated the

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[25] "U.S. Delays Lifting Ban on Mexican Avocados," Peter Tirschwell, *Journal of Commerce*, 10/26/95, p.10A.

[26] "USDA Said to Be Nearly Ready To Lift Ban on Mexican Avocados," Peter Tirschwell, *Journal of Commerce*, 2/06/96, p. 2A.

[27] For example, *The Washington Post*, 3/11/96, p. A16.

proposed systems approach to pest risk mitigation, and urged USDA to reconsider its proposed rule in light of this new evidence, even though the formal public comment period had closed. The CAC also claimed there had been procedural irregularities in the rulemaking process that involved violation of federal conflict-of-interest law and substantive ex-parte communications with USDA personnel.[28]

The claims made by the CAC in late March caused further delay in USDA decision making and laid the foundation on both substantive and procedural grounds for the potential legal challenge by the CAC if a final rule easing the avocado ban were published. By August, the CAC's president asserted that the chance of USDA making a final rule in time for the 1996-97 winter shipping season had "been greatly reduced by all the scientific input sent in to the USDA in the past six months."[29] Shortly after, in late August, USDA announced it would postpone any decision, and would determine over the next few months whether the public comment period should be reopened in 1997.[30]

The Presumption of Capture

While there remains some uncertainty about the final outcome, a number of observations can be made about the avocado case at this time. The economic theory of regulation provides a conceptual framework for these observations. The theory postulates that concentrated domestic interest groups with high stakes in a particular decision will often achieve regulatory decisions

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[28] "American Avocado Growers Uncover New Field Surveys on Mexican Avocado Pest Infestations," PR Newswire, 3/28/96.
[29] "Growers Get Update on Battle Over Mexican Avocados," Jason Terada, *Los Angeles Times*, 8/8/96, p. B6.
[30] USDA Move Spells Relief for California Avocado Sector," Peter Tirschwell, *Journal of Commerce*, 8/30/96, p. 3A.

to their benefit (often income transfers) at a net cost to society. Whether international negotiations can affect the outcomes of the regulatory process in a constructive manner is therefore an important institutional consideration with respect to sanitary and phytosanitary regulations and other administered trade barriers.

The characteristics of the avocado industry in the United States are consistent with the generic description of special interests with high stakes that dominate decision-making processes, as described by the theory of regulation. Large start-up costs and long periods over which these initial sunk costs can be recuperated through the established groves give the existing industry a strong incentive to maintain any barriers that provide domestic producers with a favorable price differential. The industry is highly concentrated in (primarily) one region of one state. While a modest number of small producers give the industry a degree of public presence, there are also a number of very large producers with concentrated stakes in the outcomes of any regulatory decisions.

Beyond the characteristics of the industry, several other circumstances related to the avocado quarantine are also consistent with features identified in the theoretical literature as favoring capture of a regulatory process by special interests. Unlike some trade-related issues of public health or environmental degradation, issues related primarily to risk of pest infestation in domestic crops are not likely to generate intensive involvement among the general public. The highly technical character of the scientific evidence that must be evaluated also weighs in favor of an influence on the regulatory process by domestic producers. The technical regulatory evaluation rests within an executive branch agency within the USDA, and the final decision with

the administrative hierarchy of this department and the executive it serves. Again, these are factors that favors the access and influence of domestic producers.

In the avocado case, there is also a long-standing and well-documented (indeed, beyond dispute) history of political activity by the avocado growers to protect their perceived interests. This history has involved extensive interaction with APHIS and USDA both at the technical level and through higher-level administrative and political channels. The extensive efforts made to facilitate consultation with the industry and to make formal arrangements to receive its inputs concerning the avocado import ban attest to the effectiveness of the industry's efforts to participate in the regulatory process.

While economists and other social scientists evaluating phytosanitary regulations are particularly cognizant of the political-economy forces affecting the decision process, they are of necessity also dependent on complex and often divergent arguments by entomologists and other physical scientists. A serious issue of research methodology arises. If capture of the regulatory process has occurred, social scientists will not find formal agency assessments providing technical support for changes in regulations, and will have to piece such an assessment together independently. In the avocado case, the USDA's proposed rule provides some of the requisite technical analysis. Our review of the development of the proposed rule indicates an extensive period of deliberation and evaluation leading to specification of the system approach under which APHIS was willing to propose easing of the avocado import ban. The historical record of the technical negotiations indicates that DIGSV sought market access with relatively limited technical justification. There is also indication that APHIS and ARS pressed DIGSV for

more extensive scientific evidence about the prevalence of pests and the host status of Hass avocados. Assuming this multi-year investigative process was undertaken at a rigorous technical level, failure to allow avocado imports would seem to be *prima facie* evidence of capture of the decision making process by the domestic industry despite scientific evidence of minimal pest risk.

With respect to the pest surveys that were cited by the CAC in its March 1996 petition to USDA, it may or may not eventually be concluded by APHIS that pest risks are sufficiently higher than initially calculated to warrant continuation of the import ban. Meanwhile, it is worth noting that an intensive mobilization against any decision to relax the import ban, including the presentation of "new" evidence late in the administrative process, parallels events in the mid 1970s when earlier reevaluations of the avocado quarantine were undertaken.[31] In the reevaluation under NAFTA, USDA and DIGSV tentatively agreed as early as June 1992 that certain districts of Michoacan were free of host-specific pests. Thus, there were three years for subsequent surveillance about the incidence of pests before the public comment period on the proposed rule was closed.

Taking these considerations together, it seem reasonable to conclude that a *presumption* that the domestic industry has captured the decision-making process on the import quarantine on Mexican avocados (in the sense of the economic theory of regulation) is a plausible hypothesis to maintain up to this point. The logical alternative hypothesis is that there has not been capture of the decision making process because of non-negligible risk of pest infestation associated with

[31] See Roberts and Orden (cited earlier) for the history of the dispute in the 1970s.

partial easing of the import ban. Maintaining this alternative hypothesis requires the assertion that over a four-year period APHIS failed to conduct an adequate pest risk assessment on scientific grounds. Given the long history of technical and public discussions of the issues, this assertion seems less plausible than those required to make the case for undue influence of the domestic industry on the decision making process.

The Economic Effects of Easing the Avocado Ban

The preceding discussion of the reevaluation of the avocado import ban has underscored the concept that domestic interest groups will often achieve protective regulations when there is uncertainty about the merit of specific technical trade barriers. It can also be argued that even the new NAFTA and WTO criteria designed to insure that SPS measures are not pernicious still impart an institutional bias favoring capture of the decision making process by domestic producers. The bias arises because the evaluation process focuses on the level of pest risk but does not explicitly take into account the economic costs and benefits of SPS barriers. Thus, in the avocado case, for example, if APHIS were to find a non-negligible risk of pest infestation, it would be required to continue the ban, whatever the economic consequences. In some SPS cases, a quarantine could result in large transfers to producers--through higher domestic than foreign prices--to avoid small potential costs of a pest infestation. Such an outcome would not be good economic policy, but would not violate the NAFTA and WTO principles.

To evaluate these economic issues for the case of U.S.-Mexico avocado trade, we examined the effects of full or partial easing of the import ban on American producers and consumers in long-run and short-run models under four assumptions about the probability of a

pest infestation affecting domestic production and three assumptions about the costs of an infestation in terms of pest-control expenses and reduced yields. Previous economic analyses of the effects of importation of Mexican avocados of which we are aware either did not consider impacts on consumers (Garoyan, 1995; Carman and Cook, 1996), evaluated the effects of a pest infestation while restricting supply to domestic sources (Evangelou et. al., 1993), or assumed there was essentially zero pest risk (APHIS, 1995).[32] Each of these analyses is incomplete in an important dimension.

Our basic estimates of avocado supply and demand are derived from the specifications utilized by Evangelou et. al. and Carman and Cook. Evangelou specified demand as a linear function of wholesale prices and supply as a linear function of lagged farm-level prices and production. An alternative demand specification by Carman and Cook incorporates disposable income and advertising expenditures, and utilizes a nonlinear Box-Cox transformation.

Rescaling the available data to common units (short tons) and corresponding New York wholesale prices (in constant dollars), we derive estimates of a linear supply function that is inelastic in the short run (0.28, when lagged quantity is held constant) and elastic in the long run

[32] The references are: Carman, Hoy and Roberta Cook, "An Assessment of Potential Economic Impact of Mexican Avocado Imports on the California Industry," presented at the I.S.H.S Economic Division Meetings, Rutgers University, August 1996; Evangelou, P, P. Kemere, and C. Miller, "Potential Economic Impacts of an Avocado Weevil Infestation in California," unpublished paper, USDA/APHIS, August 1993; Garoyan, Leon, "Proposed Rule for the Importation of Fresh Hass Avocado Fruit Grown in Michoacan, Mexico," report prepared for by the California Avocado Commission by Management Research Associates, Davis, California, August 1995; and the economic analysis reported by APHIS as part of the proposed rule in July 1995.

(1.18, when quantity is in a steady state).[33] Our linear estimate of demand is inelastic (-0.45) but reestimation of the Carman-Cook demand specification yields a price flexibility of -0.65, corresponding to an elasticity of -1.53. Thus, our estimated supply and demand functions give point estimates that span a range from inelastic to elastic behavioral responses.

An initial equilibrium representing the U.S. avocado market can be calculated for various combinations of the estimated supply and demand functions. To complete an analysis of the effects of easing the import ban, requires a Mexican supply function, an estimate of the import quantity under the proposed partial easing of the quarantine, estimates of the probabilities of pest infestations, and estimates of the cost of these infestations.

In our analysis, the assumption is made that Mexican supply is perfectly elastic at the wholesale price for delivery of avocados from Mexico to New York calculated by Garoyan ($878/ton). The assumption of a perfectly elastic supply is realistic for a partial easing of the import ban, but is an oversimplification for an evaluation of the effects of the quarantine being removed completely, since the expanded traded would then put upward pressure on the Mexican price.

The quantity of California avocados shipped to the northeastern region (defined as in the proposed rule, which includes Garoyan's North East and East Central regions) during the four

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[33] Our estimates are based on annual data from 1960-1990. New York wholesale prices for 1975-1990 were obtained from the Agricultural Marketing Service (AMS) of the U.S. Department of Agriculture and are identical to those used by Evangelou et al. To extend our sample period, wholesale prices for the period 1960-1974 were backcast by regressing wholesale prices on farm level prices for 1975-1990, then using the coefficients of this regression and farm level prices for 1960-74 to approximate wholesale prices during the early years for which they were not available.

winter months at prevailing domestic prices is reported by Garoyan to have averaged 3,819 tons during 1986-95. For our models of the proposed partial easing of the import ban, we divide the domestic market into two submarkets--the northeastern winter regional market and the national aggregate for all other regions and seasons. The domestic price in the northeastern winter regional market is assumed to fall to the free-trade level for imports from Mexico, inducing greater consumption than at past domestic prices. An aggregate price for the rest of the U.S. market is determined by an equilibrium of domestic supply and demand with the northeastern winter regional demand excluded.[34]

Estimates of the probabilities of pest infestations have been pivotal to the avocado dispute. Firko (1995) made the estimates utilized by APHIS.[35] Among four pests (fruit flies, seed weevil, stem weevil, and seed moth), he estimated that the maximum probability of an infestation occurring in the United States for partial easing of the import ban under a systems approach to risk mitigation was $\pi_{AM} = 0.00345$, the probability of a pest infestation associated with the introduction of stem weevil. Firko estimated that the probability of infestation of stem weevil had a minimum value $\pi_{Am} = 1.35x10^{-6}$.

Firko's estimates of the probabilities of pest infestations have been considered too low by the domestic industry. Nyrop (1995), estimated that the time expected to pass before an

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[34] Forming a single national aggregate excluding the northeastern winter market is obviously an oversimplification that ignores seasonal supply constraints and demand fluctuations. The added seasonal complexity would imply greater adjustments outside of the northeastern region during the winter season (but less effects during other seasons) than our simple aggregation.

[35] Firko, Michael J. "Importation of Avocado Fruit (*Persea americana*) from Mexico, Supplemental Pest Risk Assessment," BATS/PPQ/APHIS/USDA, May 1995.

infestation of stem weevils occurred under the 1995 proposed rule ranged from less than one year to 20 years.[36] We treat the corresponding probabilities of pest infestation due to stem weevils in a particular year as $\pi_{NM} = 1.0$ and $\pi_{Nm} = 0.05$. The four alternative probability estimates from Firko and Nyrop (Am, AM, Nm, NM) are used to characterize the range of risks of pest infestation (from essentially zero to certainty) that might be associated with either partial easing or complete removal of the avocado import ban.

The final parameters affecting our economic analysis are estimates of the costs associated with a pest infestation, which are modeled as a proportional shift in the domestic supply function. The magnitude of the shift depends on the increase in production costs caused by the pests. Based on a review of technical papers and personal communications, Evangelou et al. estimated that weevil infestation would cause a 41 percent increase in marginal cost due to increased application of pesticides and a 20 percent reduction in yield. Evangelou et al. indicated that they considered these estimates to somewhat overstate the likely increase in production costs.

To provide a range of possible results, our analysis considered three possible impacts on production costs of a pest infestation, centered on the estimates by Evangelou et al. The largest impacts were assumed to involves a 60 percent increase in marginal costs and a 20 percent reduction in yield (denoted a 60-20 impact). The remaining two impacts were assumed to be a 40 percent increase in marginal costs and a 10 percent reduction in yields (40-10), and a 20 percent increase in marginal costs with no reduction in yield (20-0).

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[36] Nyrop, Jan P. "A Critique of the Risk Management Analysis for Importation of Avocados from Mexico," report prepared for the Florida Avocado and Lime Committee and presented at the public hearings on the avocado proposed rule, Washington D.C. and elsewhere, August 1995.

Some of the issues that arise in putting these various parameter estimates together to evaluate the economic effects of either full or partial easing the avocado import ban are illustrated in figures 1 and 2. The first figure shows the effects of free trade when a pest infestation may raise domestic costs. The domestic price P_{D1} falls to the world price P_W and consumer surplus increases (by C+D+E) whether or not an infestation occurs. Producer surplus falls by C+D (the trade effect) and additionally by G (the infestation effect) if pests raises production costs and lower yields with certainty, shifting domestic supply from S to S'. Consumers are always better off, producers are always worse off, and the net effect on welfare (E-G) can be positive or negative. On a probabilistic basis, the expected domestic supply function will lie between S and S', with its location depending on the assumed level of pest infestation risk.

The analysis is more complicated when only a limited quantity of imports are allowed. Ignoring regional submarket considerations, the limited imports would lower the domestic price if there is no pest infestation, but not to the world price level. The effects on consumers, producers and net welfare are fractions of the outcomes with unrestricted free trade. Pest infestation reduces domestic supply and affects the domestic price in the opposite direction from imports. The equilibrium price can rise or fall. When the domestic price rises, as shown from P_{D1} to P_{D3} in figure 2, consumers are worse off (by c+d). Producers surplus rises (by c) with the higher prices but falls due to higher production costs (by f+I+k). Producers may be better or worse off than at the initial equilibrium (better if c>f+I+k). Producers may also be better or worse off than with trade but without a pest infestation (better if c+e>i+k). Whatever the outcome for producers, social welfare falls (by d+f+I+k) compared to its level at the initial

equilibrium, or compared to its level with trade but without pest infestation (by d+f+I+k+g) which results in price P_{D2} in figure 2.[37]

In the case of the USDA proposed rule to allow limited avocado imports, there is the additional complication of dividing the national market into the northeastern winter regional market and an aggregate of the remaining regional and seasonal markets. In our empirical analysis, we incorporate this division of the national market, as described above. This aspect of the analysis is not depicted in figure 2 in order to simplify illustration of the effects of pest infestation when imports are limited.

Model Results

The economic effects for the avocado case are shown in tables 2 and 3 for a long-run model with estimated elastic supply and nonlinear demand. The initial equilibrium with avocado imports prohibited occurs at a domestic price of $1385 and output of 132,430 tons. Consumer surplus is $134.4 million and producer surplus is $91.6 million. When trade is completely liberalized and no pest infestation occurs, the domestic price falls to $878, consumption increases 68 percent, and domestic production declines 47 percent. Consumer surplus rises by $87.5 million, producer surplus falls by $55.2 million, and the net welfare gain is $32.3 million (14 percent of initial consumer plus producer surplus). Free trade has a devastating effect on the

[37] If the net effect of trade and a pest infestation is for the equilibrium domestic price to fall (not shown), consumers are made better off and producers worse off than without trade or pest infestation, consumers gain less, and producers may lose more or less than with trade but without pest infestation, and net welfare may rise or fall (compared to the initial equilibrium) depending on whether the net consumer gain from lower prices exceeds the infestation losses of producers.

domestic industry because it eliminates the large price differential sustained by the import ban.

A pest infestation exacerbates the negative effects of free trade on the domestic producers, and reduces the net welfare gain. In the worst case scenario of certain infestation and highest costs (60-20), producer surplus falls by an additional $18.4 million in our long-run model. There remains a net welfare gain even in this case, although it is reduced to $13.9 million. Thus, even when free trade is bad phytosanitary policy, it is good economic policy, in the sense of raising net welfare. For probabilities of pest infestation at Nyrop's minimum (Nm) or lower, the effect of an infestation on expected producer surplus is less than $2 million, and the expected net welfare gain remains above $30 million.

The partial easing of the import ban of USDA's proposed rule for avocados has smaller economic effects than free trade when no pest infestation occurs, as shown in table 3. The domestic price (for the aggregate market with the northeastern winter regional demand excluded) falls by 1.3 percent (from $1385 to $1368) as domestic consumption displaced from the northeastern winter market is absorbed by a combination of expanded consumption elsewhere and reduced domestic supply. Consumer surplus increases by $2.2 million outside of the northeast (not shown separately in the table) and producer surplus falls by a similar amount (the net welfare gain is only $33,337 outside of the northeastern winter market). In the northeastern region, winter consumption increases and consumer surplus rises by $2.5 million as the price falls to that of imports from Mexico. The net national welfare gains is $4.7 million (about 2 percent of initial total consumer plus producer surplus). Thus the limited opening of trade under the

proposed partial easing of the import ban has positive effects on northeastern winter consumer surplus, limited positive effects on other consumers and net welfare, and limited negative effects on domestic producers.

Pest infestations have a substantial effect on the domestic market when imports are restricted under partial easing of the import ban. For the worst case scenario, increased marginal costs and lowered yields reduce producer surplus by $45.8 million. This effect far exceeds the price effect of limited trade without pest infestation--a comparison of levels of impact that is consistent with the claim by producers that it is pests not price that they are concerned about under the proposed rule on avocado imports. The reduced total supply also pushes the equilibrium domestic price (excluding the northeastern winter regional market) up from $1385 to $1795 in the long-run model. The increased price offsets $31.1 million of the loss of producer surplus, leaving a net loss of $14.7 million, still almost seven times as large as the loss from limited trade alone.

A larger economic effect of the pest infestation is felt by consumers outside of the northeastern winter market. With the increased domestic price in the worst case scenario, their consumer surplus falls by $43.5 million. Thus, most of the economic impact of pest risk is borne by consumers outside the northeastern winter market not by producers when trade is opened only to the limited extent that has been proposed.

The potential losses to consumers and producers from pest infestation are large enough (under any of our assumption about the costs of an infestation) that the net welfare losses, which range from $13.6 to $55.7 million, swamp the welfare gains achieved by limited trade without

pest infestation. Thus, for high probabilities of pest risk, the proposed limited easing of the avocado import ban is both bad phytosanitary policy and bad economic policy. With high pest infestation probabilities, there is not usual capture of the regulatory process (in the sense of the theory of regulation) with continuation of the import ban versus the proposed partial easing (since domestic producers would not have influenced the outcome for their gain at either a net consumer surplus or welfare loss).

Avocado producers and their representatives seem to have overlooked the possibility of arguing that they spoke not only for themselves but for consumers as well in opposing the proposed partial easing of the ban under the high pest risks they have argued are posed by limited imports. In the numerous discussions of devastation of the domestic industry by its representatives, we find little reference to the negative effects such devastation would have on consumers or net welfare if imports from Mexico are limited. We hasten to point out that such an argument by producers would not extend to continuing the import ban versus free trade, as shown above.

Moreover, when import access is limited, the economic effects of trade on consumers and producers diverge at levels of pest infestation risks lower than the worst probabilities that can be assumed. Expected consumer surplus rises at risk probability levels as high as the Nyrop minimum risk level (Nm), even under the assumption of highest pest-infestation costs. Producers could not claim to be representing consumer interests as well as their own in opposing any easing of the import ban in this case. The expected gains of consumer surplus exceed the expected loss of producer surplus with limited trade and pest infestation risks as high as the Nyrop minimum

(except in the case of the worst costs of an infestation), so the import ban improves expected net welfare. Partial easing of the import ban is good economic policy (raising net welfare) even at this relatively high assumed risk level.

Sensitivity of the economic results from the estimated long-run model to the underlying behavioral parameters are illustrated by comparing the above results to the outcomes for a short-run model with inelastic estimates of supply and demand, shown in tables 4 and 5. For the short-run model, the initial equilibrium with avocado imports prohibited occurs at a domestic price of $1950 and output of 140,496 tons. Consumer surplus is $189.1 million and producer surplus is $230.9 million. Consumption increases by 40 percent and production falls by 18 percent when there is free trade without pest infestation. Consumer surplus increases by $180.5 million, producer surplus falls by $137.6 million, and the net welfare gain is $43.0 million (10 percent of the initial sum of consumer and producer surplus). Pest infestations compound losses of producer surplus when there is free trade in the short-run model, but again there is always a net welfare gain even when pest infestation occurs with certainty.

As before, the effects on producers and consumers with limited trade from partial easing of the import ban and no pest infestation are much smaller than under free trade. The domestic price (outside the northeastern winter market) falls by 2.7 percent in the short-run model, total consumer surplus increases by $12.2 million, producers surplus falls by $7.1 million, and the net welfare gain is $5.1 million.

With limited imports, pest infestations again have large economic effects in the short-run model. Consumers outside the northeastern winter market again bear most of the economic costs

of pest risk. For the worst case scenario of certain pest infestation, the domestic price is pushed up to $2540 and consumer surplus falls by $66.6 million (gain of $5.2 million in the northeastern winter market, but loss of $71.8 elsewhere). There are gains in expected consumer surplus when lower risk probabilities are assumed, and these gains offset expected producer surplus losses in almost all cases. In the short-run model, as in the long-run model, partial easing of the import ban is good economic policy unless high risk probabilities are assumed.

With the domestic price pushed up to $2540 in the short-run model worst case scenario, producers are better off when the limited imports are associated with a pest infestation than when the limited imports occur without an infestation (producer surplus is greater by $8.5 million). Generally, once trade is partially opened, producers are expected to be better off in the short-run model the higher the probability of pest infestation (this was not the case in the long-run model). Producers are even slightly better off with limited trade and pest infestation than they are at the initial equilibrium, at least under our two highest assumptions about the costs of an infestation (producer surplus rises by $1.4 million in the 60-20 case and by $3.8 million in the 40-10 case).

We are not Machiavellian enough to think that producers secretly hope for partial easing of the import ban with pest infestations (nor is the magnitude of the producer surplus gain large enough given uncertainty about the model parameters to support such hopes even if they were that devious). Even so, the slight estimated gains to producers from limited trade and pest infestation raises the interesting question of whether domestic producers would clamor for reversal of a partial easing of the import ban if infestations were to occur. The more likely event,

of course, is that detection of the *presence* of pests before they impose production costs of yield losses from infestation would be used to reverse the partial lifting of the quarantine--and thus to avoid the $7.1 million decline in producer surplus caused by partial opening of trade without a pest infestation.

To summarize, our simple economic analysis for the U.S. ban on imports of Mexican avocados suggests that free trade would raise consumer surplus, lower producer surplus and increase national welfare even if pest infestations were certain to occur. With the partial easing of the ban and limited imports that have been proposed, consumer and net welfare gains from trade are relatively small and can be exceeded by the costs of pest infestation when risks of infestation are high. Consumers bear more of the economic costs from the risk of pests infestation than do producers. For high probabilities of pest risk, expected consumer surplus, producer surplus and net welfare decline with limited trade. At lower pest-risk levels, expected consumer surplus increases, and the expected gains offset expected producer surplus losses and raise expected net welfare except when pest risks are high. In the long-run model (with elastic supply and demand) pest infestations add to the losses of producers that result from lowering trade barriers, but in the short-run model (with inelastic supply and demand) the increased producer surplus from higher domestic prices more than offsets the loss of producer surplus from higher costs and lower yields--so pest infestations have the net effect of lessening the decrease in producer surplus compared to limited trade without pest infestation in the short-run model.

The Avocado Case in Broader Context

What can be made of this discussion of the avocado case in a broader context. The USDA estimates that questionable SPS and other technical barriers now impede, constrain or block U.S. agricultural exports of almost $5 billion per year. Other countries can, no doubt, make similar claims, and, no doubt, will formalize these assertions over time, as USDA has recently done. The hope for NAFTA and the WTO is that they will lead to resolution of some of these controversies, and to gains from expanded trade that does not pose health or safety risks.

In the specific context of trade between Mexico and the United States, several issues have arisen since the NAFTA negotiations in 1990. Our current research focuses in documenting how well these issues are, or are not, being addressed.

A variety of anecdotal claims have been made about Mexican SPS barriers under NAFTA. Some of these claims are to the effect that SPS barriers have been used to replace more traditional protectionist instruments as trade liberalization has proceeded. One can certainly find cases that fuel such suspicions--for example, one is naturally suspicious of Mexican technical barriers arising on grains or poultry, where tariffs or import quotas have historically provided high protection levels.

In this context, we have pointed out that SPS and other technical trade barriers may not be sound economic policy in terms of maximizing national welfare even when they are good technical policy because of pest-related or other risks. NAFTA and the WTO provide no guidance toward removing SPS barriers in such cases. Nevertheless, welfare gains may be achieved by eliminating these trade barriers. Again, when price differentials are large, potential

trade flows are large, and potential welfare gains may be positive even when pest-infestation costs are taken into account.

Another type of concern has arisen over what might be called tit-for-tat barriers. This is the admitted (or nearly so) misuse of a technical regulation to counter what is perceived to be an unjustified technical barrier of another country. The Mexican regulations on sweet cherries are widely viewed as an example of tit-for-tat occurring. The problem with these regulations is that they are taken without the foundation of a NAFTA or WTO arbitration-panel ruling that justifies compensation for impaired trade. The tit-for-tat barriers are the equivalent of vigilante justice, and threaten the rule of law.

There is also evidence that opening of trade where previously licenses have blocked imports raises legitimate SPS issues that had been masked by other nontariff trade barriers. Hence, new SPS measure that arise as liberalization occurs may or may not represent blatant efforts to subvert the movement toward more open trade in a nontransparent manner. When imports have been precluded by a binding zero quota *no matter what*, SPS evaluations are redundant, and probably are not undertaken. Trade liberalization should lead to some increase in SPS rules.

Finally, some observers contend that NAFTA has improved the institutional setting for addressing technical trade barriers, the avocado dispute and other problems notwithstanding. One dimension of this improvement comes from the formal principles and dispute settlement mechanisms. A second dimension comes from the initial negotiations and the subsequent working groups that have been operational, and which are credited with resolving a number of

SPS issues before a dispute becomes a contentious barriers to trade. These improvements are the great hope that the new institutional arrangements of NAFTA and the WTO bring to bear on SPS and other technical trade barriers. There is much work to be done on this policy frontier.

Table 1. A chronology of the avocado case, 1990-96

1990	
June	The avocado issue is resurrected at the Ministerial level during meetings to discuss multilateral and bilateral trade issues.
October	APHIS rejects DIGSV's work plan because it addresses quality, not pest risk; APHIS asks for proof that the proposed districts are free of four fruit flies and four avocado pests.
1991	
August/September	DIGSV resubmits work plan (avocado pest survey results are submitted later when survey is complete); APHIS asks for information on a fifth avocado pest; plant health officials begin to discuss using a systems approach to mitigate pest risk.
1992	
May	APHIS rejects work plan principally because the agency thought that the research which examined the host status of Hass avocados for fruit flies was inadequate.
June	Memorandum of Understanding signed by the two governments; APHIS tentatively accepts evidence that proposed districts are free of avocado pests.
July	Bi-National Technical Meeting to determine data requirements to examine host status of Hass avocados for fruit flies.
August	USDA/ARS suggests substantial modification to Mexico's proposed research protocol to test host status of Hass avocados.
October	Proposal to allow exports of Mexican avocados to Alaska is published in the Federal Register; DIGSV resubmits a revised work plan for export to the mainland.
1993	
June	After numerous technical meetings to resolve outstanding issues, APHIS states that insufficient information on fruit flies (population levels, Hass avocado host status) precludes a decision.
July	Final rule allowing exports of Mexican avocados to Alaska is published in the Federal Register.
November	DIGSV and APHIS jointly determine research protocol to test host status of Hass avocados for fruit flies.

1994	
June	DIGSV submits work plan with results of fruit fly host status research. DIGSV submits a slightly revised work plan along with pest population data. Advance Notice of Proposed Rulemaking is published in the Federal Register; hearings are held in California and Florida
1995	
July	Proposed Rule published recommending the regulations be amended to allow fresh Hass avocado fruit grown in approved orchards in approved municipalities in Michoacan, Mexico to be imported into the northeastern area of the US during November-February, subject to certain conditions.
August	Public hearings on the proposed rule held in Washington, D.C., New York, Chicago, Florida, and California.
October	Close of public comment period on the proposed rule.
1996	
March	California Avocado Commission requests that USDA reopen the public comment period based on new surveys it submits which are claimed to show that fruit flies and weevils are being found in substantially higher numbers than previously reported.
September	USDA announces that it will not publish a final rule before the start of at least one more winter shipping season and that a decision about whether to reopen the public comment period remains pending.

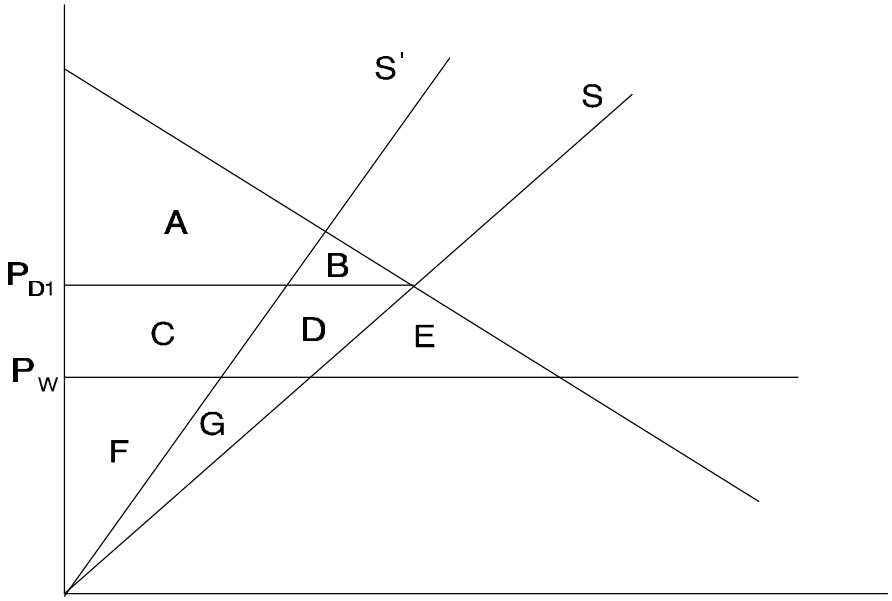

Figure 1. Free Trade

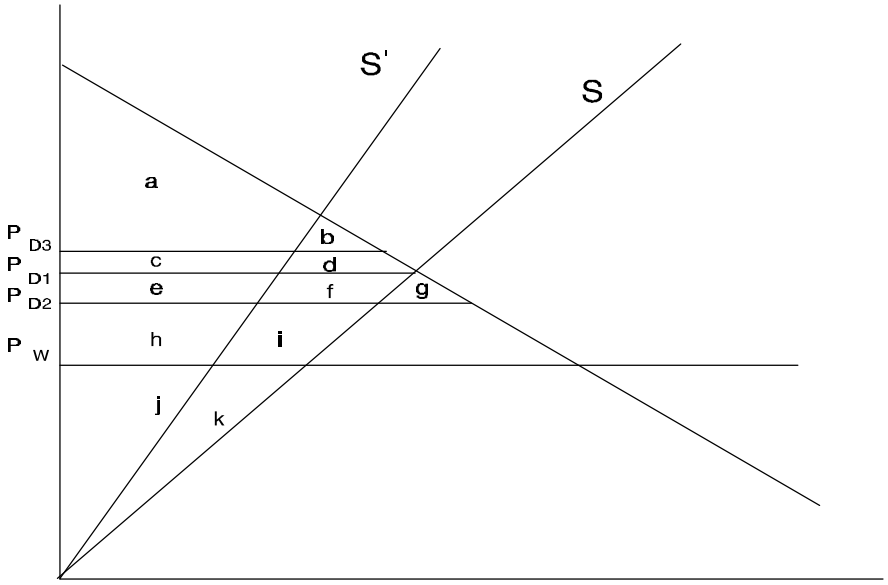

Figure 2. Limited Trade

Effects of Trade When Past Infestations Raise Domestic Production Costs

Table 2. Estimated economic impacts of avocado imports from Mexico, long-run model with free trade

		Domestic Price ($/Short ton)	Domestic Output (Short tons)	Domestic Consumption (Short tons)	Import Value ($)	Consumer Surplus ($)		Producer Surplus ($)			Net Welfare Gain ($)
						Total	Gain	Total	Transfer to Consumers	Infestation Loss	
Autarchy		1385	132,340	132,430		134,382,870		91,636,967			
Free Trade (no risk)		878	83,904	222,722	121,882,204	221,930,370	87,547,500	36,833,761	55,189,763	0	32,357,737
Free Trade (and risk) (60-20)	NM (π=1)	"	41,952	"	158,716,060	"	"	18,416,881	"	18,416,881	13,940,856
	Nm (π=.05)	"	79,905	"	125,393,326	"	"	35,079,772	"	1,753,990	30,603,747
	AM (π=.00345)	"	83,615	"	122,135,946	"	"	36,707,122	"	126,640	32,231,097
	Am (π=1.35E-06)	"	83,904	"	121,882,204	"	"	36,833,711	"	51	32,357,686
Free Trade (and risk) (40-10)	NM (π=1)	"	53,938	"	148,192,352	"	"	23,678,846	"	13,154,916	19,202,821
	Nm (π=.05)	"	81,636	"	123,873,508	"	"	35,838,254	"	995,500	31,362,237
	AM (π=.00345)	"	83,743	"	122,023,562	"	"	36,763,298	"	70,464	32,287,273
	Am (π=1.35E-06)	"	83,904	"	121,882,204	"	"	36,833,734	"	28	32,357,709
Free Trade (and risk) (20-0)	NM (π=1)	"	69,920	"	134,160,156	"	"	30,694,801	"	6,138,961	26,218,796
	NM (π=.05)	"	83,073	"	122,611,822	"	"	36,469,070	"	364,692	31,993,045
	AM (π=.00345)	"	83,846	"	121,933,128	"	"	36,808,363	"	25,399	32,332,338
	Am (π=1.35E-06)	"	83,904	"	121,882,204	"	"	36,833,751	"	11	32,357,726

Table 3. Estimated economic impacts of avocado imports from Mexico, long-run model with limited trade

		Domestic Price * ($/Short ton)	Domestic Output (Short tons)	Domestic Consumption (Short tons)	Import Value ($)	Consumer Surplus ($)			Producer Surplus ($)			Net Welfare Gain (- impies loss) ($)
						Total	Gain	Loss	Total	Gain	Loss	
Autarchy		1385	132,340	132,340		134,382,820			91,636,912			
Limited Trade (no risk)		1368	130,725	137,152	5,642,906	139,101,665	4,718,845	-	89,412,656	-	2,224,256	2,494,589
Limited Trade (and risk) (60-20)	NM (π=1)	1795	85,753	92,180	"	93,354,884	2,526,401	43,554,336	76,951,094	31,132,088	45,817,906	-55,718,753
	Nm (π=.05)	1396	127,071	133,498	"	135,458,148	2,526,401	1,451,073	88,708,792	1,434,495	4,362,615	-1,852,792
	AM (π=00345)	1370	130,464	136,891	"	138,840,525	4,457,705	-	89,363,780	-	2,273,132	2,184,573
	Am (π=1.35E-06)	1368	130,725	137,152	"	139,101,665	4,718,845	-	89,412,535	-	2,224,377	2,494,468
Limited Trade (and risk) (40-10)	NM (π=1)	1634	100,385	106,812	"	108,442,499	2,526,401	28,466,722	82,017,567	23,107,417	32,726,762	-35,559,666
	Nm (π=.05)	1384	128,663	135,090	"	137,048,073	2,665,253	-	89,020,949	-	2,615,963	49,290
	AM (π=.00345)	1369	130,580	137,007	"	138,958,075	4,575,255	-	89,385,222	-	2,251,690	2,323,565
	Am (π=1.35E-06)	1368	130,725	137,152	"	139,101,665	4,718,845	-	89,412,559	-	2,224,323	2,494,522
Limited Trade (and risk) (20-0)	NM (π=1)	1475	117,464	123,891	"	125,821,613	2,526,401	11,087,608	86,631,104	10,266,095	15,271,902	-13,567,014
	Nm (π=05)	1374	129,973	136,400	"	138,354,269	3,971,449	-	89,271,005	-	2,365,907	1,605,542
	AM (π=00345)	1368	130,673	137,100	"	139,052,265	4,669,445	-	89,402,802	-	2,234,110	2,435,335
	Am (π=1.35E-06)	1368	130,725	137,152	"	139,101,665	4,718,845	-	89,412,632	-	2,224,280	2,494,565

* Average national domestic price excluding the northeastern winter regional market.

Table 4. Estimated economic impacts of avocado imports from Mexico, short-run model with free trade

		Domestic Price ($/Short ton)	Domestic output (Short tons)	Domestic consumption (Short tons)	Import Value ($)	Consumer Surplus ($)		Preoducer Surplus ($)			Net Welfare Gain ($)
						Total	Gain	Total	Transfer to Consumers	Infestation Loss	
Autarchy		1,950	140,496	140,496		189,071,119		230,894,674			
Free Trade (no risk)		878	116,223	196,445	70,435,460	369,643,632	180,572,513	93,314,846	137,579,827	0	42,992,685
Free Trade (and risk) (60-20)	NM (π=1)	"	87,013	"	96,081,433	"	"	72,033,251	"	21,281,596	21,711,090
	Nm (π=.05)	"	113,441	"	72,877,934	"	"	91,288,028	"	2,026,819	40,965,867
	AM (π=.00345)	"	116,022	"	70,611,809	"	"	93,168,508	"	146,338	42,846,347
	Am (π=1.35E-06)	"	116,223	"	70,435,530	"	"	93,314,789	"	57	42,992,628
Free Trade (and risk) (40-10)	NM (π=1)	"	99,488	"	85,128,894	"	"	81,738,825	"	11,576,021	31,416,664
	Nm (π=.05)	"	114,956	"	71,547,396	"	"	92,438,823	"	876,023	42,116,662
	AM (π=.00345)	"	116,133	"	70,514,164	"	"	93,252,841	"	62,006	42,930,679
	Am (π=1.35E-06)	"	116,223	"	70,435,491	"	"	93,314,822	"	24	42,992,661
Free Trade (and risk) (20-0)	NM (π=1)	"	112,909	"	73,345,045	"	"	91,860,054	"	1,454,792	41,537,893
	NM (π=.05)	"	116,026	"	70,608,307	"	"	93,228,423	"	86,423	42,906,262
	AM (π=.00345)	"	116,209	"	70,447,498	"	"	93,308,828	"	6,019	42,986,667
	Am (π=1.35E-06)	"	116,223	"	70,435,465	"	"	93,314,844	"	2	42,992,683

Table 5. Estimated economic impacts of avocado imports from Mexico, short-run model with limited trade

		Domestic Price * ($/Short ton)	Domestic Output (Short tons)	Domestic Consumption (Short tons)	Import Value ($)	Consumer Surplus ($)			Producer Surplus ($)			Net Welfare Gain (- implies loss) ($)
						Total	Gain	Loss	Total	Gain	Loss	
Autarchy		1950	140,496	140,496		189,071,119			230,894,674			
Limited Trade (no risk)		1899	139340	145,009	4,977,302	201,309,856	12,238,737	-	223,755,404	-	7,139,269	5,099,468
Limited Trade (and risk) (60-20)	NM (π=.1)	2540	105,839	111,508	"	122,523,752	5,210,869	71,758,236	232,350,839	60,549,671	59,093,506	-65,091,202
	Nm (π=.05)	1951	136,593	142,262	"	194,062,485	5,210,869	219,503	225,486,505	219,785	5,627,953	-416,802
	AM (π=.00345)	1902	139,144	144,813	"	200,788,946	11,717,827	-	223,885,011	-	7,009,663	4,708,164
	Am (π=1.35E-06)	1899	139,340	145,009	"	201,309,652	12,238,533	-	223,755,455	-	7,139,218	5,099,315
Limited Trade (and risk) (40-10)	NM (π=.1)	2273	119,799	125,468	"	152,816,119	5,210,869	41,465,869	234,709,251	37,973,676	34,159,100	-32,440,424
	Nm (π=.05)	1924	138,010	143,679	"	190,779,634	8,713,223	-	224,776,576	-	6,118,097	2,595,126
	AM (π=.00345)	1901	139,247	144,916	"	201,061,140	11,990,021	-	223,828,474	-	7,066,200	4,923,821
	Am (π=1.35E-06)	1899	139,340	145,009	"	201,309,759	12,238,640	-	223,755,433	-	7,139,241	5,099,399
LimitedTrade (and risk) (20-0)	NM (π=.1)	2000	134,076	139,745	"	187,548,223	5,210,869	6,733,765	230,375,353	6,655,440	7,174,549	-2,042,005
	Nm (π=.05)	1904	139,042	144,711	"	200,514,470	11,446,351	-	224,144,126	-	6,750,549	4,695,802
	AM (π=.00345)	1899	139,319	144,988	"	201,254,773	12,183,654	-	223,782,455	-	7,112,219	5,071,435
	Am (π=1.35E-06)	1899	139,340	145,009	"	201,309,835	12,238,716	-	223,755,415	-	7,139,259	5,099,457

* Average national domestic price excluding the northeastern winter regional market.