

Agricultural Trade Liberalization and The Environment in North America: Analyzing the “Production Effect”

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Purpose

This paper seeks to estimate the impacts of the North American Free Trade Agreement (NAFTA) and the Uruguay Round Agricultural Agreement (URAA) on environment stresses caused by three key North American agricultural sub-sectors—beef, corn and vegetables—in relation to the "production effect."

Methodology

The paper examines the production, trade and historical record of trade policies for beef, corn and tomatoes before and after NAFTA came into force and the URAA and seeks to determine what "production effect," if any, was caused. The production effect is the effect of trade liberalization in providing economic incentives to expand or contract production of a particular product. The environmental impacts of these changes in production are briefly discussed. Increases in production are generally equated with increases in environmental impacts, except in cases where production is increased via improved yield (without increased inputs) or technological advances.

In all cases, the paper distinguishes the impacts on production of trade liberalization agreements from those of exogenous variables, such as weather conditions, exchange-rate movements, consumer preferences, changes in real income and technological improvements. After isolating the estimated effect of trade agreements on production, an assessment is made as to whether this effect translated into real production decisions that would carry environmental impacts. The author emphasizes that the environmental consequences of liberalization in the sector gaining markets may be significantly reduced or even nullified either by price inelasticity in the production of agriculture or by yield enhancing technological change.

Main Findings

Few environmental impacts from trade liberalization in these sub-sectors are demonstrated. The three case studies illustrate that exogenous factors have more often exerted a greater influence on production levels than price changes associated with trade liberalization. The production effect is reduced by biological lags and the fact that agricultural producers almost always employ all of their productive capacity. Some sectors where environmental effects have been felt have seen increases in efficiency; however, the increases in efficiency in these sectors were not sufficient to compensate for increased production (scale) effect. NAFTA has induced a shift in chemical and water usage from Mexico to the US (corn) and from the US to Mexico (tomatoes). The effects of the relocation of the environmental effects should be considered at the North American level given its shared environment and ecosystems. It should be noted that the sectors included below are assessed on the basis of the estimated environmental effects of a one percent change in production among the NAFTA partners.

¹ This summary of Porter's paper was prepared by the CEC, and does not necessarily reflect the views of the author.

Beef

In the case of beef production, it is estimated that NAFTA only had a substantial effect on Canadian beef exports to the US, increasing exports by an amount representing approximately 5.6 percent of Canada's annual beef production between 1994 and 2000. The CUSTA, exempting Canada from the US Meat Import Act (of 1979), encouraged US packing companies to invest in slaughtering in Alberta. However, for the most part the Canadian and US beef sectors were already being integrated into a single market and were not significantly hindered by border restrictions. Moreover, this increase did not likely have a great effect on beef production considering the inherent biological time lag involved in cattle-raising and the fact that "cattle cycles" respond to price signals in an unpredictable and often contradictory manner.

Beef exports to all three countries from all three countries have increased since NAFTA. Changes in US exports to Canada and Mexico are demonstrated to be only partially due to NAFTA and are a small fraction of American beef production, causing little production effect. Increases in Mexican cattle exports to the US are considered to be more a result of the peso devaluation and economic instability.

Corn

Following NAFTA (1994–2000), US corn exports to Mexico more than doubled, however trade liberalization can only account for a 12 percent increase. This increase in US exports to Mexico is in part explained by GMO maize being shut out of the European market. Despite the high level of chemical usage in US corn production, these exports, represent only one percent of the US maize production (of 232 MMT average in 1994–2000) and likely had no bearing on the area planted to corn, and therefore little change in resulting environmental impacts. Price elasticity of US corn production is also extremely low, with farmers rarely adjusting planting practices in response to price changes and changes in yield being unpredictable from one year to the next.

In the first seven years after NAFTA was signed, a pronounced production effect on corn was witnessed in Mexico, with maize planting area falling by 3 percent, maize production by 4.7 percent and maize yields by 2 percent. However, the contraction occurred in the higher-yield irrigated sector, as opposed to the rain-fed production sector, which showed an 18 percent increase during 1995–2000 over its previous six-year average.

Environmental Effects—Corn

The rain-fed sector uses much less chemical input than the irrigated sector, the pollution from which is a serious problem in Mexico. This would suggest that a reduction in pesticide use has occurred, greater than what would be indicated by the 3 percent decrease in maize planting area. An increase in the rain-fed maize sector, however, would likely result in increased deforestation and soil erosion.

A further environmental concern related to NAFTA is the potential loss of maize biodiversity due to the replacement by monocrops and the reduction of traditional cultivators to non-farm employment. In marginal quality planting regions, traditional landraces of maize have been a strategic defence against crop losses. Little evidence currently exists, however, to suggest that this "genetic erosion" is occurring.

Tomatoes

Tomatoes account for 24 percent of all US vegetable imports from its NAFTA trading partners and exports from Mexico increased by 83 percent between 1993 and 1998, which translates to between 1.6–3 percent of the average total Mexican production in the 1994–2000 period. Mexican exports of tomatoes (mainly from Sinaloa and Baja California) to the US have increased

by 75 percent since NAFTA came into effect, and NAFTA is considered to be responsible for 8 to 15 percent of this increase. Canadian exports of tomatoes to the US increased by 3000 percent.

Mexican bell pepper exports to the US increased by 53 percent, exports of cucumbers by 50 percent, and exports of squash by 83 percent. However NAFTA is considered responsible for very little of the rise in bell pepper exports, around 3 percent of cucumber exports and 1 percent of squash exports. Increased US demand, peso devaluation and weather conditions are considered much more important in these export increases.

Environmental Effects—Tomatoes

The Mexican tomato export increases resulting from NAFTA can, however, be considered responsible for a larger share (6 to 10 percent) of production increases in the regions where the bulk of Mexican tomato production occurs. NAFTA is therefore responsible for some of the significant environmental impacts that have been witnessed in these regions, including groundwater depletion and contamination of soil and surface water by chemical inputs, whose application in Mexico's tomato industry have gone unregulated. However, NAFTA-induced exports are not responsible for any additional farmland cultivation or intensification of production, as technological improvements helped to decrease the amount of land used, as well as the amount of inputs used per hectare. It should also be noted that the increase in Mexican production resulted in a decrease in the planted area of Florida-based tomato sector. In fact, tomato production declined 20 percent in Florida (and the growing area devoted to them by 22 percent), where production is more chemical-intensive than in Mexico. Tomatoes are more water-intensive to grow than any other crop in the United States—using twice as much as grain corn, sorghum, and wheat. The result has been a 2–3 percent reduction in agro-chemical usage in Florida. However, only a relatively small proportion of this reduction can be considered to be the result of NAFTA.

URAA

The paper finishes by suggesting that the URAA has done little to liberalize agricultural markets and production and thus has had minimal environmental impacts. Products that already had low tariffs were further liberalized, while highly protected sectors generally remained unchanged. This was frequently a result of having used years with relatively high protection measures as the baseline period, such that reductions in protection measures relative to the baseline were easily made or did not need to be made at all. The URAA has done little to improve market access or reduce tariffs in the case of the three commodities studied here, with the exception of US beef exports to Japan.