What Trade Data Reveal About Market Unification Throughout North American Agriculture

The Concept of "Tradability" and Evidence of Trade Expansion

The concepts of "tradability" and "non-tradability" enable us to differentiate integrated from segmented markets (Barrett and Li). A product is "tradable" between two countries if the good is actually traded or if market intermediaries are indifferent about exporting and not exporting from one country to the other. Given this perspective, the mere existence of cross-border trade at either the disaggregate or aggregate level of analysis provides *prima facie* evidence that spatial markets are interconnected and, therefore, integrated.

Explosive growth in the real (1989-91) U.S. dollar value of intra-NAFTA trade beginning in the early 1980s points to greater market integration in North American agriculture (fig. 1).[3] Since the advent of CUSTA, agricultural trade among the United States, Canada, and Mexico has increased 120 percent, rising from $11.2 billion in 1987-88 to $24.6 billion in 2000-01 in real (1989-91) terms.[4] The growth of U.S.-Canadian agricultural trade quickened immediately following implementation of CUSTA. Similarly, the growth in U.S.-Mexican trade boomed after implementation of NAFTA (fig. 2).

The fact that U.S.-Mexican trade began to take off in 1987 suggests that the Mexican agricultural economy started becoming more integrated with that of the United States as a result of liberalizing domestic reforms in Mexico in the mid-1980s. NAFTA deepened continental integration by locking in Mexico's reforms. Prior to the mid-1980s, inward-oriented and market-unfriendly policies had segmented the Mexican agricultural economy from its northern neighbors, severely constraining market integration in North America.

Despite the growth of U.S. bilateral trade with Canada and Mexico during the CUSTA/NAFTA era, cross-border markets that span country boundaries in North America are far less integrated than are the national domestic markets. Gravity models, which account for the influence of distance and market size, show that merchandise trade among Canadian Provinces was 20 times larger than trade between the Canadian Provinces and U.S. States prior to CUSTA (McCallum, Helliwell). The disparity between intra-Canadian and Canadian-U.S. trade decreased post-CUSTA to a factor approximating 12 (Hufbauer). This points to the gap still separating U.S. and Canadian markets. Similar inferences would likely be drawn for the U.S.-Mexican and Canadian-Mexican markets, provided that gravity models had been estimated that included trade among states within Mexico and/or within the United States.

Examination of intra-NAFTA export shares reveals more about agricultural market integration than changes in the absolute value of agricultural trade among the North American countries. Such shares identify the magnitude of member-to-member trade in comparison with member-country exports to the world excluding NAFTA. The rise in intra-NAFTA export shares in figure 1 shows that trade among the NAFTA countries grew faster than exports supplied by the United States, Canada, and Mexico to non-NAFTA countries. Growth in the relative importance of intra-NAFTA exports began in the early 1980s, prior to the formation of the free-trade agreements among the three countries. The post-CUSTA/NAFTA rise was steady with the exception of the dramatic, but brief, fall-off in 1995. This sharp decline coincided with the temporary curtailment of Mexico's ability to import because of the peso devaluation.

Asymmetric Integration Between the United States and Its Neighbors

Two intensity measures of trade—the bilateral trade intensity index developed by Brown and the commodity complementarity index developed by Drysdale—can be used to enrich analyses of cross-border integration.[5] These indices have been widely used to gauge regionalization and the success of regional trade agreements in promoting market integration (Vollrath, 2001; Anderson and Norheim; Dell'Aquilla et al.). Both indicators neutralize the

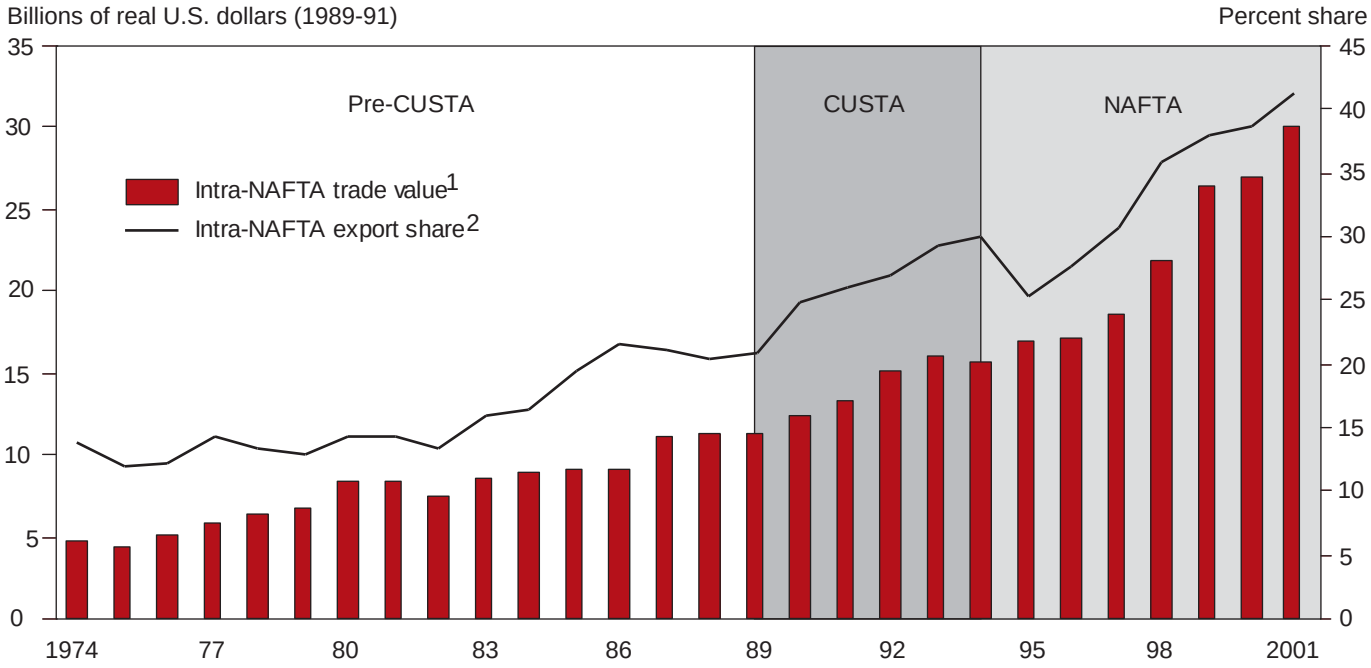
[3] Data used in this analysis are, for the most part, from ERS's International Bilateral Agricultural Trade (IBAT) database derived from UN Comtrade.

[4] These figures are expressed in real 1989-91 U.S. dollar terms.

[5] The bilateral trade intensity index is the product of the complementarity and trade-bias indices. Drysdale's complementarity index is sum of the product of exporter revealed-comparative-advantages and importer commodity import market shares. See, Vollrath and Johnston for a concise and intuitive statement showing the interrelationships among these measures and Appendix B for algebraic formulation of the indices used in this study.

Figure 1

Trade shares show that intra-NAFTA agricultural trade grew faster than NAFTA trade with the rest of the world

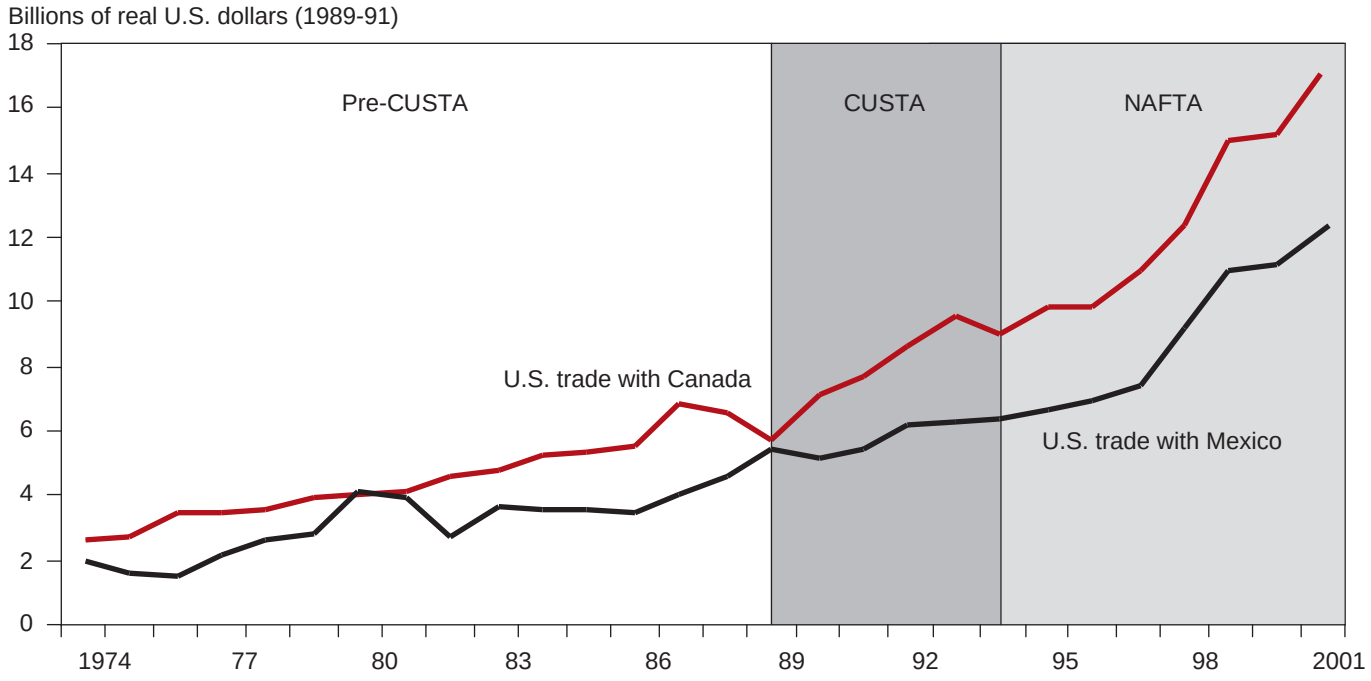


[1]Intra-NAFTA trade value is the total value of U.S., Canadian, and Mexican trade with each other.
[2]Intra-NAFTA export share represents the share of NAFTA-partner trade with each other compared with their exports to all foreign markets.

Source: ERS IBAT data derived from UN Comtrade deflated by FAOSTAT trade indices.

Figure 2

U.S. agricultural trade with Canada and Mexico shows accelerated growth after CUSTA/NAFTA



Source: ERS IBAT data derived from UN Comtrade deflate by FAOSTAT trade indices

impact of country size, account for both partner exports and imports, and require no modeling assumptions because they are purely data-driven (Hertel).

Bilateral trade intensity indices show the relative importance of a specific exporter in supplying imports to a particular country in comparison with other supplying countries. They also identify the relative importance of the importing partner in absorbing exports provided by a particular country in comparison with other foreign import markets. Bilateral trade intensities depicting total U.S. agricultural trade with Canada and Mexico show that "neighborliness" is clearly an important factor in overall U.S. and Canadian trade (fig. 3)[6]. These indices reveal that between 1974 and 2001, U.S.-Canadian (U.S.-Mexico) agricultural trade was, on average, 3.7 (4.4) times greater than would have been predicted in the absence of 1) trade inducements, such as preferential trade arrangements and comparative advantages, and/or 2) impediments to trade, such as relatively large distances, comparatively high transportation costs, language differences, discriminatory barriers to trade, etc.

The bilateral trade intensities depicting each country's exports with the other are often asymmetric. U.S.-Canadian indices for total agriculture show that Canada's importance as a market for U.S. exports averaged 1.4 times greater than the importance of the United States as a market for Canadian exports during 1974-88, prior to CUSTA. By 1989, the relative importance of the Canadian and U.S. market for each other's exports had reached virtual parity, with suppliers in both countries sending 4.7 times more goods to their neighboring market than was typical elsewhere in their respective foreign markets. While the geographical importance of partner trade continued to increase post-CUSTA for both countries, Canadian exporters became relatively more reliant upon the U.S. market than vice versa. By 2001, Canada exported 5.5 times more agricultural goods to the United States than to its other foreign markets; while the United States exported 4.2 times more goods to Canada than elsewhere.

Shifting attention to U.S.-Mexican trade, the indices reveal that the geographical importance to Mexican exporters of the U.S. market is twice that of the importance of the Mexican market to U.S. exporters. The strong reliance of Mexico on the U.S. market reached a peak in 1992, at which time Mexican exports to the United States were 10.6 times greater than expected in a scenario with no special inducements or impediments to trade. Thereafter, Mexico's bilateral export intensity with the United States steadily declined, falling to 7 in 2001.

U.S. Agricultural Market Integration with Canada and Mexico, Overall

A summary indicator of U.S. agricultural integration is best provided by taking a simple average of the two intensity measures showing the U.S.-partner trade relationship, one that describes the situation when the United States is the exporter and the other when the United States is the importer. The simple average simultaneously accounts for both countries' exports and imports and puts bilateral trade in the context of global trade. The bilateral-trade-intensity averages in figure 4 indicate that both the U.S.-Canadian and the U.S.-Mexican agricultural markets have become more integrated within the last 25 years. The U.S.-Canadian intensities more than doubled between 1974 and 2001, rising to 4.9. The intensities characterizing U.S.-Mexico trade, which have consistently been higher than those typifying U.S.-Canadian trade, also rose during this period, reaching 5.8 by 2001.

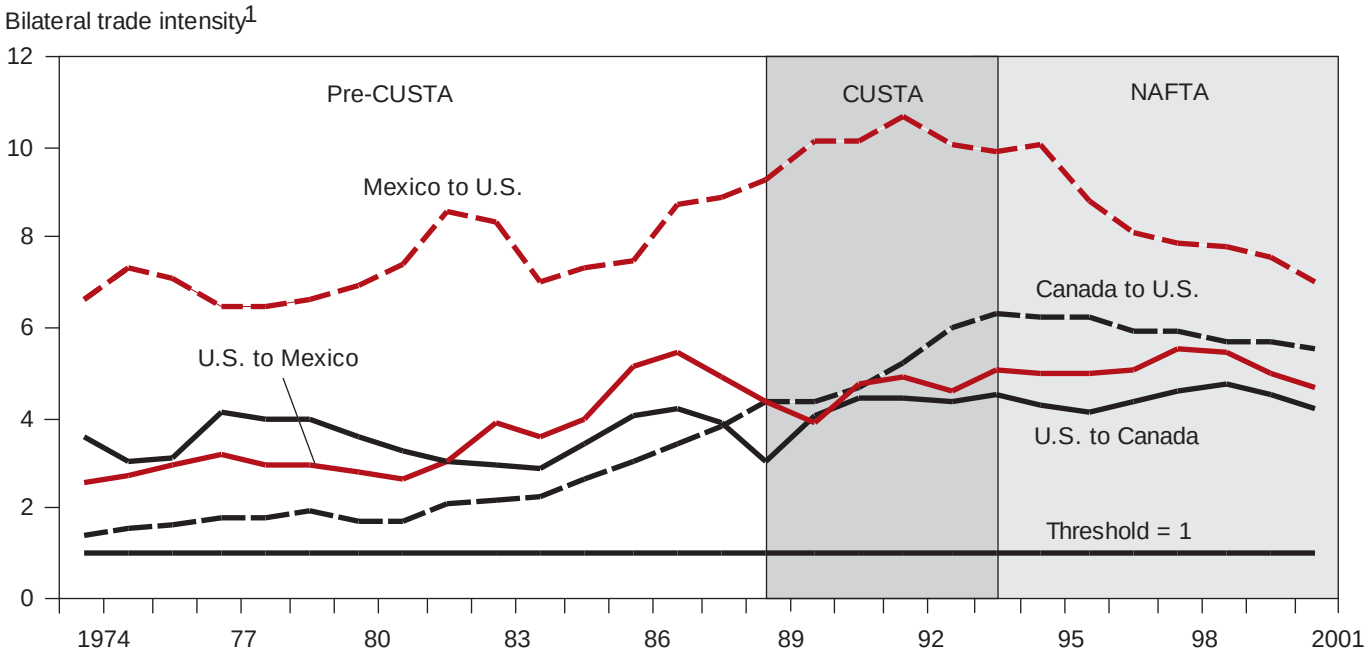
Changing market fundamentals deepened the integration of U.S.-Canadian agriculture beginning in 1981, when the two countries' average bilateral trade intensities began their ascent, rising from 2.2 to a peak of 5.4 in 1994 (fig. 4). CUSTA may have boosted this integration during the early years of the agreement—as evidenced by the detectable 1989-94 rise in these intensities—but CUSTA appears not to have enhanced U.S.-Canadian integration subsequently. By 2001, U.S.-Canadian intensities had fallen modestly to 4.9. The leveling-off of U.S.-Canadian bilateral trade intensities suggests that the importance of Canada (the United States) as a market for U.S. (Canadian) agricultural goods has reached a plateau.

Many factors have contributed to the integration (segmentation) of U.S. and Mexican agriculture. Market-oriented reforms in Mexico in the mid-1980s, anticipation of an impending trade agreement between both nations, and implementation of the NAFTA legislation undoubtedly contributed to the post-1984 2.2-point rise in the two countries' average trade intensities to

[6] Neighborly trade is also important for the four subsectors comprising total agriculture--bulk commodities, fresh produce and horticultural products, processed intermediates, and high-value processed products. In cases involving the United States and its NAFTA trading partners, bilateral intensities depicting each subsector always exceeded 1 post-CUSTA/NAFTA, except for Canadian bulk exports in 1991. These empirical findings underscore the relative importance of intra-NAFTA trade, even in such areas as bulk commodities where the United States competes internationally with both Canada and Mexico.

Figure 3

U.S. agricultural exports to Canada (Mexico) were substantially greater than would have been anticipated in the absence of special inducements and impediments



1A bilateral trade intensity value of 1 signifies that a trading partner is no more or less important than a country's typical trading partner, where importance is gauged by the presence of such factors as preferential trade agreements, resource endowments, geographic location, and trade barriers

Source: ERS. IBAT data derived from UN Comtrade.

7.5 in 1995. By 2001, the average U.S.-Mexican intensity had fallen to 5.8. This downward shift reflects, in part, loss in the value of the Mexican peso after the 1995 devaluation.[7] It also reflects a conscious policy reorientation in Mexico towards greater geographic market diversification. Post-NAFTA, Mexico established bilateral trade agreements with the EU, Chile, Costa Rica, and Mercosur[8] in an attempt to broaden its foreign market beyond the United States.

Growth in Complementarity of U.S.-Canadian and U.S.-Mexican Agricultural Trade

The structure of U.S., Canadian, Mexican, and global agriculture has undergone major shifts in recent years. But what does this mean for society at large? To help answer this question and to draw inferences about economic welfare, this report uses Drysdale's complementarity index. This index links one country's export specializations with its trading partner's commodity import shares across the spectrum of all traded goods. Put another way, it measures the degree to which the exporter's commodity profile of comparative advantages corresponds with the importance of each commodity in its trading partner's import basket. Upward sloping complementarities provide evidence that the structural change taking place is consistent with more efficient use of global resources.

A recent analysis using Drysdale's index has divided agriculture into two agricultural subsectors--field crops and non-farm, high-value products (HVP) (Vollrath, 2001).[9] Figure 5 depicts the changing complementarity patterns characterizing U.S.-Mexican and U.S.-Canadian trade in field crops and HVP. The right-hand

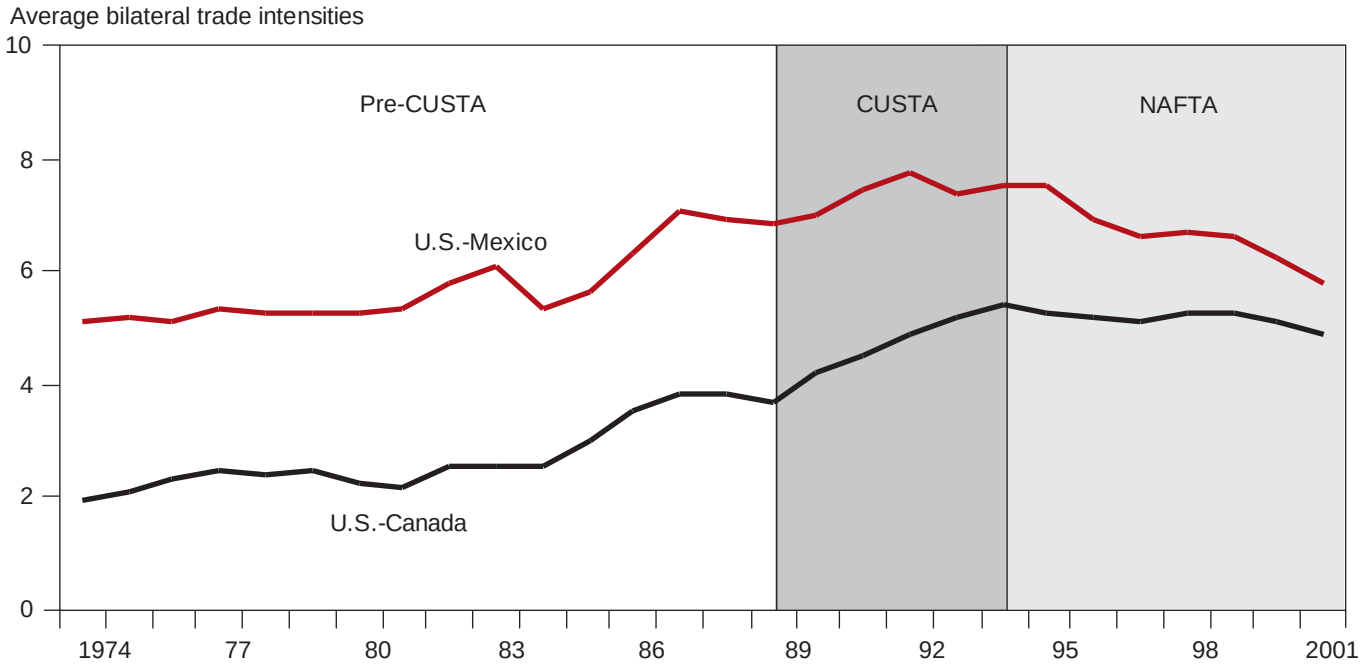
[7] Shortly after the peso devaluation in 1995, the United States became a relatively less important market for Mexican exporters because the higher value of the dollar increased the price of U.S. imports in Mexico, lowering demand. Mexico continued to be an increasingly important market for U.S. exporters as prices for Mexican goods in the United States fell due to the devaluation of the peso. But by 1999, lower income had eroded the purchasing power of Mexican consumers and the relative importance of Mexico as a market for U.S. exports fell.

[8] The countries belonging to Mercosur are Argentina, Brazil, Paraguay, and Uruguay.

[9] "Field crops" include farm-produced commodities that are traded on international markets. They include rice, wheat, corn, and other cereals; cotton and other plant fiber; soybeans and other oilseeds; fresh fruit and vegetables; legumes and tubers; nuts; cut flowers; tobacco; coffee; and other crops. "HVP" includes all other agricultural goods, including all sugar and sugar-containing products. Note, this analysis of complementarity is based upon trade (not production) data and only sugar that has been processed is traded across international borders.

Figure 4

Overall bilateral trade intensities characterizing U.S. trade with its neighbors suggest that U.S. agricultural market integration with Canada and Mexico has recently slowed



Source: ERS. IBAT data derived from UN Comtrade.

figures display patterns when the United States is the exporter; the left-hand figures show situations when the U.S. neighbor is the exporter.

Some interesting observations can be drawn from comparing the various complementarity series. The first is that complementarities characterizing U.S.-Mexican trade in field crops exceed those typifying corresponding U.S.-Canadian trade. This is not surprising in view of similarities in the makeup of farm production in the United States and Canada and the dissimilarities characterizing U.S. and Mexican production. Both the United States and Canada are major producers and world suppliers of grain and oilseeds. Mexico, by contrast, is an important supplier of tropical produce and of labor-intensive fruits, vegetables, and horticultural products.

A second observation relates to differences in the relative importance of field crops and HVP among the NAFTA countries. In the U.S.-to-Canada and Canada-to-U.S. cases, complementarities are highest for HVP and lowest for the primary farm commodities. This reflects, in part, the higher demand for HVP compared with primary commodities in the developed countries. For Mexican exports to the United States, complementarity indices are higher for field crops than for HVP. This can be explained by the fact that Mexico is still a developing country with a primarily staple-based supply of agricultural exports.

A third observation is that complementarities are relatively stable over time, reflecting the fact that tastes and preferences are typically slow to change. The exception to this generalization are complementarities involving Mexican exports. This exception can be explained by large variations in the value of the peso that have affected year-to-year competitiveness of Mexican agriculture in international markets.

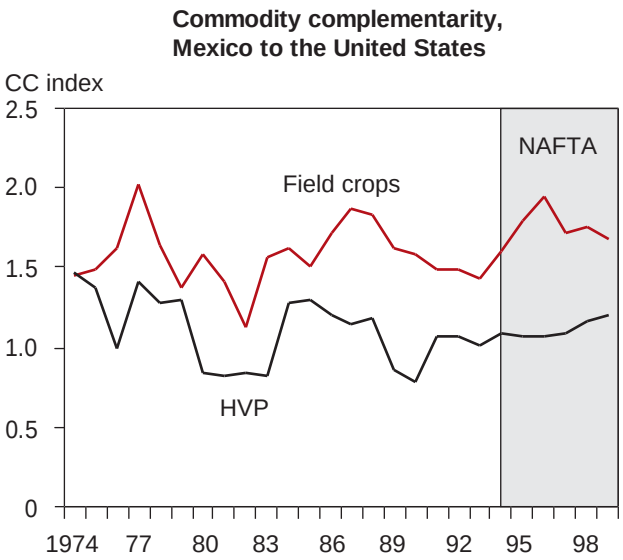
What is most interesting and economically significant in the case of Mexican-U.S. trade is that the pre-NAFTA downward trends in the complementarity indices reversed themselves during 1994-99. Upward sloping complementarities indicate that post-NAFTA allocations of U.S. and Mexican resources have resulted in better conformity to global patterns of comparative advantage in field crops—at least as far as the United States and Mexico are concerned.

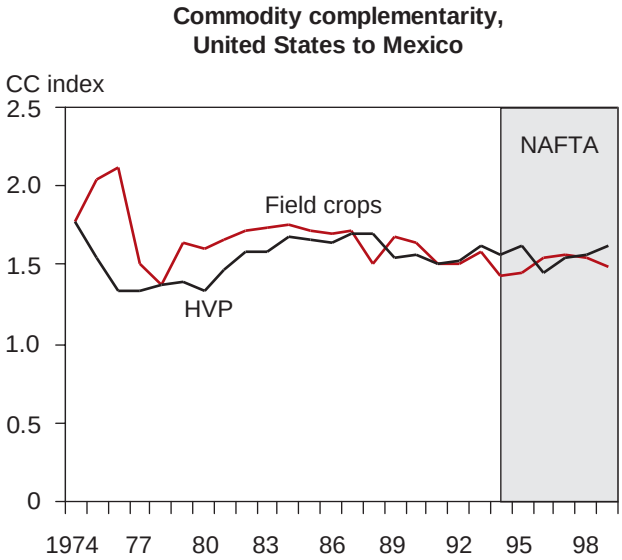
The most significant finding in the case of U.S.-Canadian trade is that all complementarity series exhibit upward-sloping trends post-CUSTA. This suggests that structural change and shifting trade patterns after 1988 have benefited the United States, Canada, and global agriculture. CUSTA and NAFTA may very well have contributed to these favorable developments.

Figure 5

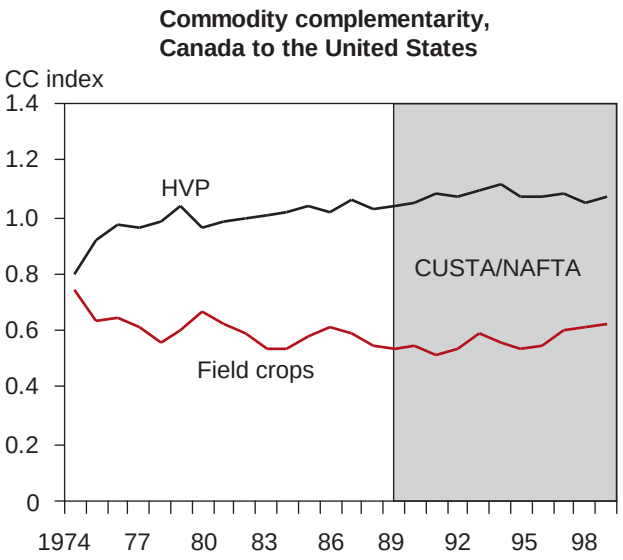
Increasing complementaries depict U.S.-Canadian and U.S.- Mexican trade in field crops and high-value agricultural products

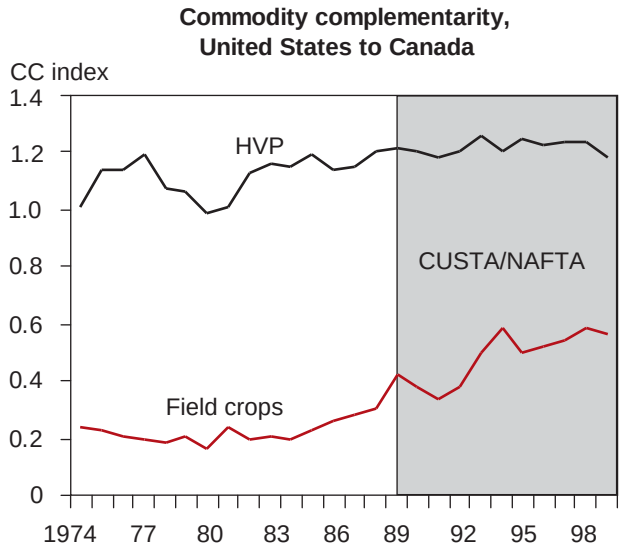
Pre-NAFTA downward trends in Mexico-to-U.S complementarities reversed themselves during 1994-98





Increased complementarities characterize post-CUSTA U.S.-Canadian trade





Source: ERS. IBAT database derived from UN Comtrade.