
INTERNATIONAL TRADE DEVELOPMENTS

A Decomposition of North American Trade Growth Since NAFTA

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Total trade with NAFTA partners increased 78 percent in real terms between 1993 and 2001, compared to 43 percent with the rest of the world. This article compares the nature of U.S. trade growth with Canada and Mexico, to that with non-NAFTA partners. Analyzing the composition of this growth provides insights into whether the United States is trading more of the same goods with NAFTA partners, trading new products, or upgrading the quality and variety of products. Quality upgrading and variety upgrading is shown to explain a part of U.S.-Mexico trade growth.

Introduction

U.S. trade with Canada and Mexico is up sharply since the North American Free Trade Agreement (NAFTA) went into effect in 1994. Between 1993 and 2001—from the year prior to NAFTA implementation to the present—U.S. imports from Canada and Mexico have doubled in real terms (up 100 percent in value) while U.S. exports to its NAFTA partners have risen by 77 percent. Such changes in U.S. trade growth are substantially higher than those measured with the rest of the world.

Such sizeable changes in U.S. trade patterns warrant closer scrutiny. This article offers some basic insights into the nature of U.S. trade growth since NAFTA. Recent academic research offers a simple but informative approach to decomposing trade growth. This decomposition can be used to establish some basic facts about the nature of trade growth over the period 1993 to 2001. This period is of interest because it begins just before NAFTA entered into force on January 1, 1994.

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Trade growth occurs when countries trade more of the same goods, or begin trading new goods. This growth can be broken down into three parts: changes in quantity (units of goods being traded), changes in price (unit prices for these goods), or changes in quality or variety of goods being traded (number of varieties traded, often represented by increasingly differentiated tariff line classifications). One feature worth noting among the recent changes in U.S. trade patterns is the latter—changes in variety. A noticeable contributor to increased U.S. exports to both Canada and Mexico has been a net increase in the number of product categories traded—as set out in the Harmonized Tariff Schedule (HTS) of the United States. Similarly, a large part of the increased imports from Mexico can be attributed to trade in a greater number of HTS lines.

Results

Some basic facts about recent U.S. trade patterns are reported in table 1. U.S. imports and exports with Canada and Mexico have increased at higher rates than that with non-NAFTA countries, with U.S. trade reorienting toward NAFTA partners since 1993. In real terms (adjusted for inflation), U.S. exports to Canada and Mexico are up by 35 and 93 percent, respectively, while U.S. exports to the rest of the world are up only 20 percent. U.S. imports from Canada and Mexico are

Table 1
Value of U.S. goods trade with NAFTA partners and the rest of the World, 1993 and 2001

Trade flow/Country	Year		Trade Growth
	1993	2001	1993 to 2001
	Billion (2001) dollars		Percentage change
U.S. Exports to:			
Canada	107	145	35
Mexico	47	91	93
Rest of world	357	431	20
World	511	666	30
U.S. Imports from:			
Canada	129	217	69
Mexico	45	131	190
Rest of world	495	785	59
World	669	1133	70

Source: Calculated from official data of the U.S. Department of Commerce, and authors' calculations.

up by 69 and 190 percent, respectively, while U.S. imports from the rest of the world are up by 59 percent.

With such a notable shift toward trading with NAFTA partners, this article endeavors to explain the nature of this trade growth since 1993. While the direct effects of NAFTA on trade growth are outside the scope of this article,² a methodology proposed by Hummels and Klenow (2002) has been adopted in this analysis to decompose trade growth into the three potential sources of trade growth outlined above. Their approach captures changes in the number of varieties traded (measured in HTS lines at the 10-digit level), as well as changes in price and quantity of goods already traded.

Trade growth between 1993 and 2001 is shown in table 1, column 3. The results of the decomposition of this trade growth are reported in table 2, specifically, the percentage change during this period in the trade volume attributable to each potential source of change—changes in varieties traded, changes in the quantity of products already traded, and changes in the prices of products already traded.³ These results can be interpreted as the growth in trade volume that would have occurred if the other two factors were constant. For example, the quantity of U.S. imports from Canada

increased by 48 percent during the 1983-2001 period (see table 2, column 2). If real prices of these imports had remained constant, and the number of traded HTS lines remained constant (i.e. no increased variety in goods traded), then the 48-percent increase in U.S. imports from Canada would be due solely to the 48 percent increase in quantity. The reported percentage changes in prices and in HTS lines traded have similar interpretations. The product of the three components is the total trade growth.⁴

Increased Variety Creating New Goods to Trade

Trade growth that can be attributed to greater variety of goods is shown in table 2, column 1. Dubbed the “extensive margin” by Hummels and Klenow, this factor captures changes in the number of varieties being traded, and has proven important in particular for U.S. imports from Mexico. The 8.3 percent increase in the extensive margin for U.S. exports to Mexico, and the 3.4 percent increase for Canada suggest that a growing number of U.S. industries have entered these markets as new exporters to NAFTA partners. Some of these commodities that the United States did not previously export to Mexico in 1993 but did in 2001 include, for example, new types of video monitors and projectors, radio cassette players, and laser reading systems disks.⁵ However, some of the new lines simply represent a

² There is considerable academic interest in the question of whether NAFTA has been trade diverting or trade creating. Romalis (2001) argues for trade diversion, and finds little direct evidence of trade creation. However, using only the HTS lines traceable from 1980 to 2000, his results do not capture the variety-type of trade creation. The Canada-United States Free Trade Agreement, on the other hand, has been found to be more trade creating, on balance (Clausing, 2001).

³ Adjustments to the data were made to account for HTS lines with missing quantity information and with unusually large price and quantity changes.

⁴ For example, U.S. imports from Canada increased 69 percent (see table 1) and the product of the three components (see table 2) is 69.8 [(1.044*1.483*1.097)*100=169.8, or 69.8 percent]. The discrepancy between 69 and 69.8 is due to an adjustment for missing quantity data.

⁵ These HTS lines include 852439 (discs for laser reading systems), 852460 (recording cards with a magnetic stripe), 852712 (pocket size radio cassette player), 852830 (video projectors).

Table 2
Decomposition of trade growth between 1993 and 2001: Percent change in bilateral trade attributable to changes in the variety, quantity, and price of traded goods

Trade flow/country	Change in variety of traded goods ¹	Change in quantity of traded goods ²	Change in price of traded goods ³
	(Extensive Margin)		(Intensive Margin)
U.S. Exports to:			
Canada	3.4	47.0	-7.1
Mexico	8.3	147.6	-17.8
Rest of world	0.0	20.9	-13.4
World	7.4	19.2	-13.2
U.S. Imports from:			
Canada	4.4	48.3	9.7
Mexico	23.8	74.4	46.6
Rest of world	6.9	45.7	0.9
World	20.7	49.3	6.3

¹ Net increase.

² Measuring HTS lines for already existing goods in 1993.

³ Measuring change in average real price per unit of U.S. goods already existing in 1993.

Source: Calculated from official data of the U.S. Department of Commerce, and authors' calculations.

reclassification of the same commodities.⁶ An increase of 24 percent in Mexican exports to the United States is explained solely by the addition of HTS lines. There also appears to be a sizeable increase in the extensive margin for total U.S. imports from the world, although this may overstate the measurement of growth in the extensive margin.⁷ These findings correspond to existing economics literature on variety and trade.⁸

Changes in the extensive margin have important consequences for economic modeling of trade agreements and the interpretation of those results. Many commonly used trade policy models focus on the intensive margin, missing the effects of an increase in the number of traded goods on the affected economies.

⁶ An example of a reclassification of U.S. exports to Mexico is vodka, which changed from the 10-digit HTS 2208600000 in 1993 to HTS 2208906300 in 2001.

⁷ The true size of growth in the extensive margin may be overstated since this exercise treats new 10-digit lines as new goods. Ten-digit lines may, in some cases, be established for purposes other than economists' conventional idea of product differentiation. For instance, different sizes or even different container sizes of the same exact product may have different lines. Compliance with existing trade policies may also generate new 10-digit lines.

⁸ Krugman (1981) and Romer (1994) offer theoretical models that incorporate extensive margins; Klenow and Rodriguez-Clare (1997) and Feenstra, Madani, Yang and Liang (1999) provide empirical evidence of variety effects and trade.

Increased Trade in Existing Goods

The Hummels-Klenow methodology also measures trade growth within already existing HTS lines, dubbed the "intensive margin." The intensive margin can be further decomposed into quantity changes (changes in the number of units traded; see table 2, column 2), and price changes (changes in the average price of the traded units; see table 2, column 3). Column 2 reports quantity changes—changes in the average number of units sold—within an HTS line that showed traded products in both 1993 and 2001. Importers in the United States, as well as U.S.-based exporters in other countries, have reported sizeable increases in the quantities sold during the period that NAFTA has been in effect. The quantity changes for both exports and imports were largest for Mexico: U.S. export quantities to Mexico rose by 148 percent, and U.S. import quantities from Mexico rose by 74 percent. The counterpart markets in Canada have also experienced double-digit percentage increases in this quantity measure.

Column 3 reports inflation-adjusted changes in the unit price of U.S. exports and imports by market. There are two notable results in this column. First, U.S. export prices have not kept up with inflation during this period. Real prices of U.S. goods—as measured by the GDP deflator reported by the U.S. Department of Commerce, Bureau of Economic Analysis—have risen

by 16.3 percent between 1993 and 2001, but prices of U.S. exports have not risen as fast, resulting in a relative decline in the price of U.S. exports. Second, the price of Mexican exports (average unit price) to the United States rose by a notable 46.6 percent. Such a sizeable change in relative prices may suggest the existence of sizeable changes in Mexican production costs—including exchange-rate changes—and production decisions.

Implications

Broadly, these results can be understood to differentiate between a widening (extensive margin) and a deepening (intensive margin) of the effects of international trade on U.S. industries. The distinction between price and quantity change offers a glimpse at the nature of trade growth within industries.

Changes in Export Prices of Existing Goods

There has been a minor decline of roughly 15 percent in the real prices of U.S. exports. This may have occurred because U.S. per capita incomes raced ahead of the other NAFTA countries during this period, allowing U.S. consumers to buy higher quality goods than their foreign counterparts. If U.S. firms producing relatively lower quality goods turned to export markets in response, the average quality of U.S. exports would have fallen relative to U.S. consumption, reducing the relative price of exports. In our analysis, the relative price of U.S. exports falls fastest with respect to Mexico. It is possible that prior to NAFTA, U.S. firms were targeting the higher income portion of the Mexican market. In order to reach a broader set of customers following NAFTA, U.S. firms may have chosen to lower unit prices. Another possibility is that production sharing has increased since NAFTA, and firms are selling earlier stage components to Mexico, which are lower in unit value generally than later stage components.

Changes in Import Quantity of Existing Goods

U.S. import quantities from all sources worldwide have risen substantially, which suggests that U.S. industries competing with imports in 1993 face even more competition today. As import demand is sensitive to changes in income, higher U.S. real incomes might also have contributed to this increased quantity growth. Quantity changes from Mexico are the largest of the markets considered here.

Real prices of U.S. imports have not changed much with the exception of imports from Mexico, which

have risen substantially in the years since NAFTA. Such price increases can reflect an upgrade in the quality of traded goods where access through NAFTA to consumers in the U.S. market may have induced an increase in the average quality of Mexican output that, in turn, allows Mexican producers to command higher prices.⁹

One might expect the rather large exchange-rate movements for Mexico that occurred in 1994 to have an effect on the relative prices between Mexican and the other NAFTA-partners' goods. During the period of time considered for this analysis, Mexico experienced much more rapid inflation than the United States or Canada. The difference in inflation rates was sufficient to offset the nominal depreciation of the peso, leaving only a small change in the real exchange rate—a one percent change (a real appreciation for Mexico) over 1993-2001.¹⁰

Conclusions

The above *ex post* assessment of U.S. trade data reveals a net increase along the extensive margin (variety effect), as well as a broadening of international trade activity, that is, more familiar changes in price and quantity along the intensive margin. Commodities that were not exported to NAFTA markets in 1993 are exported now, and industries that did not face competition from specific markets are facing it now. The largest changes in the extensive margin are in U.S. imports from Mexico. This suggests that a new set of industries has had to face competition from an increased variety of Mexican imports. At the same time, consumers and manufacturers have been given a broader set of suppliers, which would reduce prices and improve the selection of goods available.

This article compares the nature of trade growth with Canada and Mexico to that with non-NAFTA partners. The descriptive analysis presented above is highly suggestive of quality upgrading effects and trade in new varieties, particularly with respect to U.S. trade with Mexico. To the degree that free trade agreements lead to changes in the extensive margin, standard economic models that do not account for variety effects—many of which were used to estimate the effects of NAFTA—may underestimate the economic effects of free trade agreements. However, more formal econometric analysis is necessary in order to examine whether and to what extent, NAFTA could be attributed to these changes.

⁹ See Hummels and Klenow (2002). Also, Schott (2001) also notes that unit values of U.S. imports are higher among rich countries than among poor countries. Over time, economic growth in Mexico might be expected to raise the unit prices of Mexican exports to the United States.

¹⁰ International Monetary Fund, International Financial Statistics, June 2002, and authors' calculations. See also Robertson (2002).

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