Agricultural and Resource Economics
ARE UPDATE

Giannini Foundation of Agricultural Economics, University of California Vol. 21, No. 2 Nov/Dec 2017

ALSO IN THIS ISSUE

Korean Free Trade Agreement Renegotiation: California Agriculture Has Much to Lose

Hyunok Lee, William A. Matthews, and Daniel A. Sumner

South Korea is a major export destination for U.S. and California agriculture. Key California farm exports to Korea include: oranges and related citrus, almonds, rice, walnuts, beef products and cattle hides, dairy products, and hay. The Korea-U.S. Free-Trade Agreement has been in force for five years and allowed California farm exports to Korea to compete on an even footing with the other major agricultural exporters with which Korea also has FTAs. Current renegotiations, while focused on industrial products, could place California agricultural exports at risk.

The Korea-U.S. Free Trade Agreement (KORUS-FTA) was completed by the end of 2008 but finally approved by the U.S. Congress in 2011 and implemented beginning in 2012. California agricultural exports to Korea rose substantially from 2009 to 2012 and have fluctuated between $800 million and $1 billion since then (Figure 1). Since 2011, Korea has been a consistently important export destination receiving between 4% and 5% of California agricultural exports. (We follow normal practice and use the name "Korea" to refer to the Republic of Korea, which is also known as South Korea.)

Korea ships substantial manufactured goods to California and the United States (with familiar brand names such as Hyundai, LG, and Samsung), but exports only trivial amounts of food or agricultural goods here mostly in the form of processed specialty items sold by retailers targeting ethnic populations.

The United States and Korea initiated a renegotiation of the KORUS-FTA in early October 2017, which is similar to the high-profile renegotiation of NAFTA. In motivating the need to reopen an agreement that is just five years old, the U.S. Trade Representative Robert Lighthizer emphasized that the amount by which U.S. imports from Korea exceeded exports to Korea had expanded and that this "imbalance" would be a U.S. focus of the renegotiation efforts.

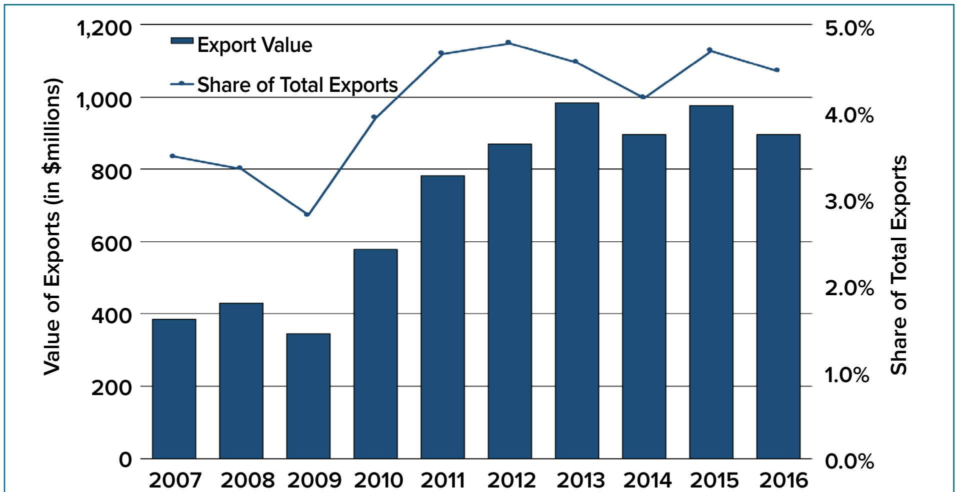

Figure 1: Value and Share of Total California Agricultural Exports to Korea, 2007–2016

Source: UC Agricultural Issues Center, California Agricultural Exports, multiple years

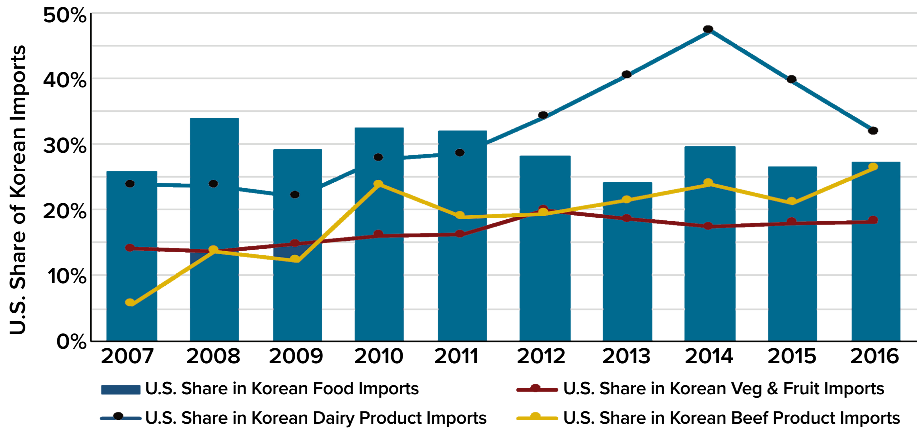

Figure 2: U.S. Share of Total Food and Selected Products imported by Korea
Source: Korean Statistical Information Service. http://kosis.kr/eng/

This article examines the importance of the KORUS-FTA, in particular the potential consequence of ending the agreement for California agriculture. We first review the KORUS-FTA and what it has done and is doing about trade barriers for California agricultural exports. Then, we examine the Korean economy and trade patterns to assess the growth potential for California agricultural exports. We then review the recent patterns of Korean agricultural products from California and consider how the KORUS-FTA is affecting those imports. Finally, we place these renegotiations in the context of global trade patterns and negotiations.

KORUS-FTA Reduced the High Barriers to California Agricultural Exports

Before the improved market access, many Korean agricultural trade barriers were quite high. Garlic, onions, peppers, and citrus had tariffs over 100%. Most fruits and juices were in the range of 50%. Almonds and tomato paste faced 8% tariffs, while dried plums, olives, raisins, and cherries faced tariffs of between 18% and 24%. Many fresh and frozen vegetables, lemons and limes, wine, avocados, pistachios, and shelled walnuts face 27% to 30% tariff rates. Dairy tariffs ranged from about 40% for cheese to 176% for milk powder. In addition to these tariffs, there were additional technical barriers and restrictions that reduced imports.

The KORUS-FTA immediately eliminated dozens of important agricultural tariffs and has already phased out dozens of others. Tariffs already set to zero include those for almonds, asparagus, avocados, spinach, tomato paste, shelled walnuts, and wine among many more.

Naturally, U.S. products that compete most directly with important Korean farm products were scheduled to be phased out more slowly. Among these are apples, lettuce, peaches, strawberries, and other berries. The longest phase-out periods of 15 to 20 years were reserved for directly competitive products such as Korean-style fresh mandarins, in-shell walnuts, chestnuts, beef offal, table grapes arriving during the Korean production season, and Asian-style pears.

As with most agreements, the KORUS-FTA did not achieve complete free trade and some products will continue to face complicated sets of trade regimes. Fresh, in-season oranges received a gradual increase in the quantity of zero-tariff access, but no elimination of the over-quota tariff that remains very high. Many dairy products also received expanded quantity access rather than tariff elimination, but feed whey and ice cream had tariffs slated for elimination. Garlic, ginger, onions, pepper, and sweet potatoes—which are staples in Korean food—face tariffs and the potential for special safeguards against rapid jumps in imports, as did apples and beef. Rice, which is subject to significant quantity access under the World Trade Organization rules, got no additional access under the KORUS-FTA.

Korea Is an Important and Growing Market for Agricultural Imports

Korea has a population of more than 50 million, but is unlikely to grow given little immigration and very low birth rates. Average per capita purchasing power of consumers in Korea is about $36,000—roughly equal to that of Spain and Italy, and about two-thirds that of the United States. Overall, Korea has the 11th largest economy in the world. Korea is highly urban, with about 2% of gross domestic product (GDP) from farming. At the same time, agriculture continues to have considerable political and policy influence, in part because it was a mainstay of the economy just two generations ago and also because most farms are still small, with average farm incomes below the urban average.

The Korean economy depends on trade. It is the fifth or sixth largest exporter in the world. It is the most export-oriented large economy with exports equivalent to more than one-third of national income (in GDP). Besides industrial and consumer goods, Korea is a major exporter of cultural services such as popular music, TV dramas, and movies. China accounts for about 25% of Korean exports with about 13% shipped to the United States. About 22% of all Korean imports come from China, with another 11% each from Japan and

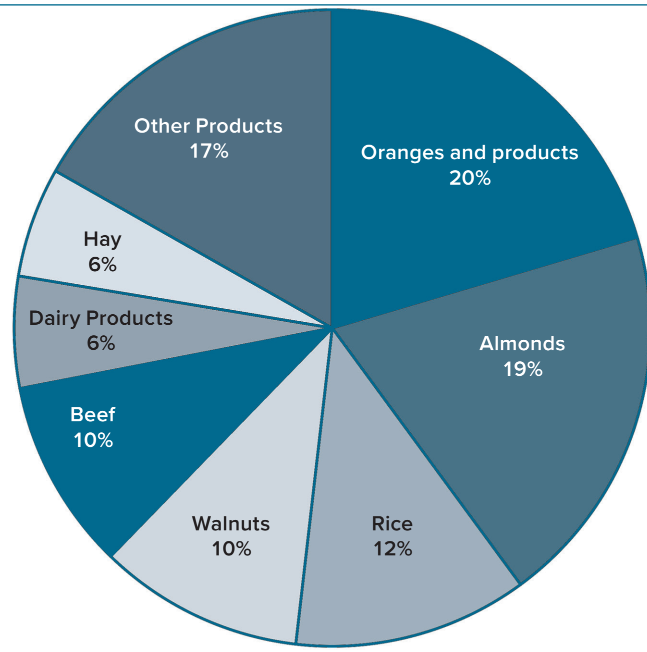

Figure 3: Shares of 2016 California Agricultural Exports to Korea by Commodity (Total = $895 million)

Source: UC Agricultural Issues Center, California Agricultural Exports, multiple years

the United States. Petroleum from the Middle East comprises another 11% of imports.

Because of the importance of trade to its economy, Korea has 17 free trade agreements with major exporting countries such as Australia, India, Canada, Chile, Peru, Turkey, and Viet Nam. It also has FTAs with the EU and other parts of Europe. Many of these FTAs are with countries that can supply agricultural products competing directly with those from California. This plethora of agreements means that, rather than giving an advantage, the KORUS-FTA allows U.S. exporters to have equally favorable access as these other export sources.

The value of the Korean won relative to the dollar affects year-to-year export and import values. The price of the Korean won jumped 40% from 2008 to 2009 before declining by about 20% in the following year. The Korean won then fell gradually by another 10% through 2014 before rising again in 2015. The global price of agricultural commodities, especially grains, oilseeds and dairy products, have fallen in dollar terms since 2013–2014, and this has reduced the value of Korean agricultural imports over the past few years.

Food and agricultural products account for about 5% of Korean imports, following oil and industrial equipment and materials in importance. Korea imports about $25 billion in food and agricultural products from a variety of sources, including 25% to 30% from the United States. As shown in Figure 2, the U.S. share of Korean agricultural imports has not changed much over the past decade. Given Korea's FTAs with other countries, the 2012 KORUS-FTA has no clear impact on the U.S. share of overall Korean agricultural imports. However, the U.S. share of fruit and vegetable imports has grown by a modest amount from about 14% to 18%, while the share of beef and cattle hides has risen from about 6% in 2007 (after a BSE scare) to 13% in 2008 and then doubling to 26% by 2016. The dairy import share rose from about 24% in 2007 to a peak of 47% in 2014 (when milk prices peaked) before declining to 32% in 2016.

California Agricultural Exports to Korea

A diversified portfolio of California-grown agricultural products is shipped to Korea. Figure 3 shows that in 2016, out of $895 million in exports to Korea, oranges (including mandarins and similar products) and almonds topped the list of export products—each with about 20% of all California agricultural exports to Korea or about $180 million each.

Korea was a particularly important destination for oranges, and beef products and cattle hides, accounting for about 27% of total exports of each from California. Hay, rice, and walnuts are among the other major export products, with about 18% of hay exports and 7% of rice and walnut exports destined for Korea.

Table 1 (on page 4) documents variations in the share of California exports sent to Korea for six important products (oranges, almonds, walnuts, beef and cattle hides, dairy, and hay) over the past decade. (Among the top exports, we exclude rice because its exports are subject to strict import quotas.) For simplicity, in Table 1 we show the difference of Korea's share in 2011 of California exports for each product.

Table 1 shows that with implementation of the KORUS-FTA in 2012, Korea's share of exports grew for California almonds and oranges, while exports of walnuts, hay, and beef and cattle hides remained relatively steady or were modestly lower. The share of California dairy exports destined for Korea varied annually from 2011 to 2016 due to influences from other export destinations such as China, and competitors in Korean markets, but were generally down. Overall, there is no clear evidence that lower barriers increased Korea's share of California exports as other destinations also expanded their imports.

Table 1: Changes in the Shares of California Exports Shipped to Korea for Six Major Agricultural Products, (Index 2011 = 100).

	Dairy	Hay	Almonds	Oranges	Beef	Walnuts
2007	62	283	64	87	76	100
2008	54	66	64	93	97	108
2009	58	23	88	76	76	91
2010	69	88	90	88	97	101
2011	100	100	100	100	100	100
2012	70	101	129	142	92	116
2013	57	92	139	124	72	93
2014	75	91	158	102	79	105
2015	80	97	140	123	88	96
2016	71	88	131	119	104	88

Source: UC Agricultural Issues Center, California Agricultural Exports, multiple years

Additional Considerations and Concerns

This article has documented the importance of the KORUS-FTA for California agricultural exports in aggregate and for specific commodities. Initiation of renegotiation at the demand of the United States has potential consequences, even if relatively little change occurs in the agreement itself. Therefore, additional considerations are useful to state explicitly.

First, U.S. buyers are major beneficiaries of low tariff access to Korean (almost exclusively non-agricultural) products. Some of these, such as cars, music videos, consumer electronics, and refrigerators are directed to consumers. Others, such as trucks, business-oriented electronics and shipping services, are inputs that make production in the United States, including in agriculture, more productive. The import side of trade is as important for an economy as the export side.

Second, if the U.S. were to exit or greatly modify a free trade agreement with one of the world's largest economies, it would be a signal that the U.S. government is not a reliable negotiating partner. That would make any planned negotiations much harder. Even worse, U.S. industries that participate in global commerce would be seen as less reliable because the U.S. government may change the conditions under which long-term relationships were developed. Importers from and exporters to the United States would naturally look for alternative trading partners.

Finally, it is impossible to consider trade with Korea outside the geopolitical context. Unlike the democratic and peaceful Republic of Korea (South Korea), North Korea brutalizes its own people and threatens the world including South Korea, Japan, and most directly the United States. A close economic relationship with Korea is one way that the United States can signal determination to continue to isolate North Korea and effectively reduce the threat and perhaps soon help the people of North Korea enjoy the freedom and prosperity of their southern compatriots.

Suggested Citation:

Lee, Hyunok, William A. Matthews, and Daniel A. Sumner. "Korean Free Trade Agreement Renegotiation: California Agriculture Has Much to Lose." *ARE Update* 21(2) (2017): 1–4. University of California Giannini Foundation of Agricultural Economics.

AUTHORS' BIOS

Hyunok Lee is a research economist in the ARE Department, William Matthews is a project scientist at the UC Agricultural Issues Center, and Daniel Sumner is the director of the UC Agricultural Issues Center and the Frank H. Buck Jr. Distinguished Professor in the ARE Department, all at UC Davis. They can be reached by email at hyunok@primal.ucdavis.edu, wamatthews@ucdavis.edu, and dasumner@ucdavis.edu, respectively.

For additional information, the authors recommend:

Lee, H. and D.A. Sumner. 2009. *The Prospective Free Trade Agreement with Korea: Background, Analysis, and Perspectives for California Agriculture.* June 2009. UC Giannini Foundation of Agricultural Economics Information Series 09-2. http://giannini.ucop.edu/InfoSeries/092_KORUS_FTA.pdf.

Lee, H. and D.A. Sumner. 2011. "South Korea-U.S. Free Trade Agreement Will Lower Export Barriers for California Products." *California Agriculture*, 65: 66-72.

Office of the U.S. Trade Representative, https://ustr.gov/trade-agreements/free-trade-agreements/korus-fta.

Office of the U.S. Trade Representative. October 2017. USTR Lighthizer Statement on the Conclusion of the Second Special Session of the U.S.-Korea FTA Joint Committee. https://ustr.gov/about-us/policy-offices/press-office/press-releases/2017/october/ustr-lighthizer-statement

Are There Yield Benefits With Genetically Engineered Corn?

Colin A. Carter, Xiaomeng Cui, and Dalia Ghanem

A New York Times article entitled "Broken Promises of Genetically Modified Crops," recently showed that U.S. and Western European corn yields have followed similar trends over the past two decades. This was taken as evidence that genetically modified (GM) crops have no yield benefits, since most of Western Europe does not grow GM corn. We believe this conclusion is inaccurate because the yield comparison is flawed.

Genetically modified (GM) crops (developed through the application of biotechnology to agriculture) are currently grown on more than 460 million acres worldwide, including about 175 million acres in the United States. Most of the global area sown to GM (or genetically engineered) crops is devoted to corn, soybeans, cotton, and canola. This relatively new technology has tremendous potential for agriculture because it introduces desirable traits into plants and produces new varieties of plants more quickly and efficiently than traditional plant breeding. Furthermore, genetic engineering can develop plant traits that could not be achieved through traditional plant breeding.

Even though enhanced global food security is somewhat dependent on the uptake of GM crops, the technology remains controversial. The U.S. has rapidly adopted certain GM crops (including corn, soybeans, cotton, and sugar beets), but the European Union has slowed the introduction of biotech crops in Europe and elsewhere. In particular, the Europeans have discouraged developing countries from adopting GM technology. This goes against the wisdom of the late Dr. Norman Borlaug, agronomist and Nobel Peace Prize laureate, who argued that global food insecurity will not disappear without this new technology.

One of the various benefits associated with genetically modified organisms (GMOs) is the expectation of higher yields, largely due to better pest and weed control. This is due to the fact that some GMOs are resistant to herbicides (i.e., weed control) and some are resistant to insects (i.e., pest control). An article in the New York Times (NYT) last year, "Broken Promises of Genetically Modified Crops," questioned whether GMOs actually help improve global food security by raising crop yields. This piece by Danny Hakim argued that GMOs have not boosted crop yields in the United States, a conclusion that was reached by visually comparing corn yield trends in the U.S. to those in Western Europe and judging that the two trend lines are very similar.

To be fair, Hakim also drew support from a 2016 National Academy of Sciences (NAS) report, which found little evidence that U.S. corn yields increased at a higher rate after GMOs were introduced, compared to before. The NYT claim that the adoption of GMOs has failed to improve yields is partly based on the data shown in Figure 1 below, which reports average corn yields in the U.S. and Western Europe from 1985 to 2014.

GM corn was first grown in 1996 and by 2006 it accounted for over 50% of the U.S. corn plantings. The date of introduction of this technology is shown on Figure 1, but keep in mind that the GM corn adoption rate did not reach 80% in the U.S. until about 2008.

At face value, the two solid plotted lines in Figure 1 suggest that GMO adoption did not alter the trend line in average corn yields, as there is not much difference between the trend lines in Western Europe and in the United States. However, this does not imply that a difference in trends, or lack thereof, could be attributed solely to GMO adoption.

Surprisingly, the yield analysis in the NAS report was no more sophisticated than what subsequently appeared in the NYT article. While the NYT compared U.S. against European yields, instead the NAS publication

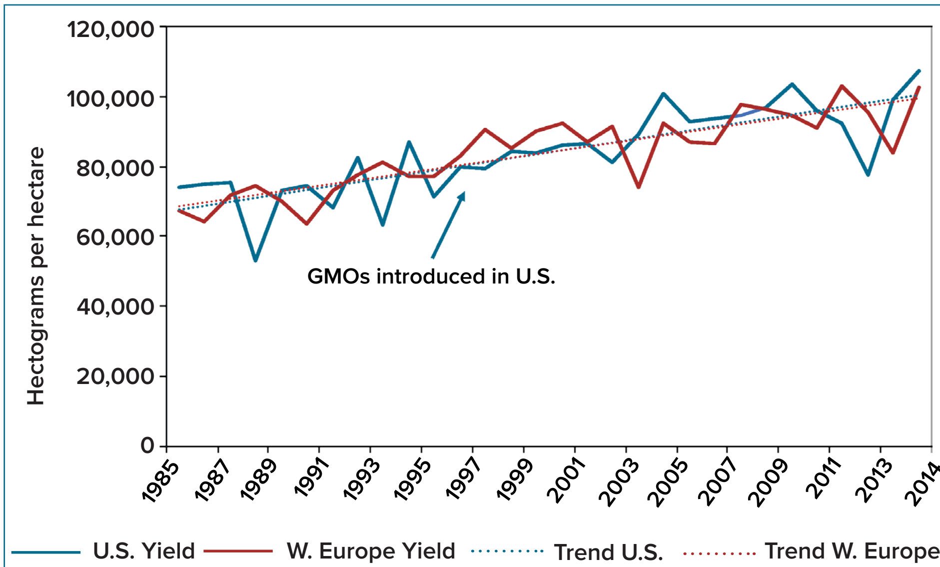

Figure 1: Historical Corn Yields in the United States and Western Europe, 1985–2014

Source: Compiled from FAO data

examined U.S. crop yields before and after the introduction of GM corn in 1996. Slightly different approaches, but both were visually looking for a change in trends without controlling for any other yield-related factors that may have been changing at the same time.

The figure used in the NAS study is reproduced below as Figure 2. The NAS described their visual inspection of Figure 2 as showing that after the introduction of GM traits in the U.S., yields remained on the same linear trend line as before. This may be true, but it is not a serious attempt to answer the question of whether or not genetic engineering has boosted yields.

In other words, the NAS report merely looked for a change in the slope of the trend in yields after 1996, for some evidence that genetic engineering caused an increase in yields. The NAS authors saw no change in the slope of the trend line in Figure 2 and then they improperly concluded that it implied that there was no evidence that GMOs have improved yields.

A Similar Trend is Not Evidence of Causal Effects

In order to make a claim about the causal effect of GM crop adoption in the U.S., we must know the counterfactual, i.e., what would have happened to U.S. corn yields if GMOs were not adopted. Of course, we cannot observe this counterfactual. So in practice, as the NYT article did, we could use other countries as a "control group" that can provide such a counterfactual.

For an accurate comparison, this control group should have the same farming practices, corn varieties, soil quality, acreage trends, percent of irrigated corn fields, weather, and climate trends—simply everything that could affect yield has to be the same in this control group as in the U.S., except for GMO adoption. The question that we raise is whether Western Europe constitutes an appropriate control group for the U.S. in the case of corn yields.

In the United States, over 92% of the corn acreage is now planted to GMOs. Beginning in the late 1990s, the rate of GM corn adoption was 50% by 2005, 80% by 2008, and 90% by 2013, with both herbicide tolerant (HT) and insect resistant (IR) traits.

Although most corn in Western Europe is non-GMO, Spain has adopted GM corn varieties since 1998. Approximately 25% of the corn acreage in Spain is devoted to GM corn, and Spain accounts for almost 20% of total corn production in Western Europe. Therefore, Western Europe violates the basic definition of a control group, since some of its corn is produced using GM seeds that are insect resistant (also known as Bt corn). In addition to Spain, Portugal also plants GM corn and about 10 years ago France grew a limited amount of GM corn.

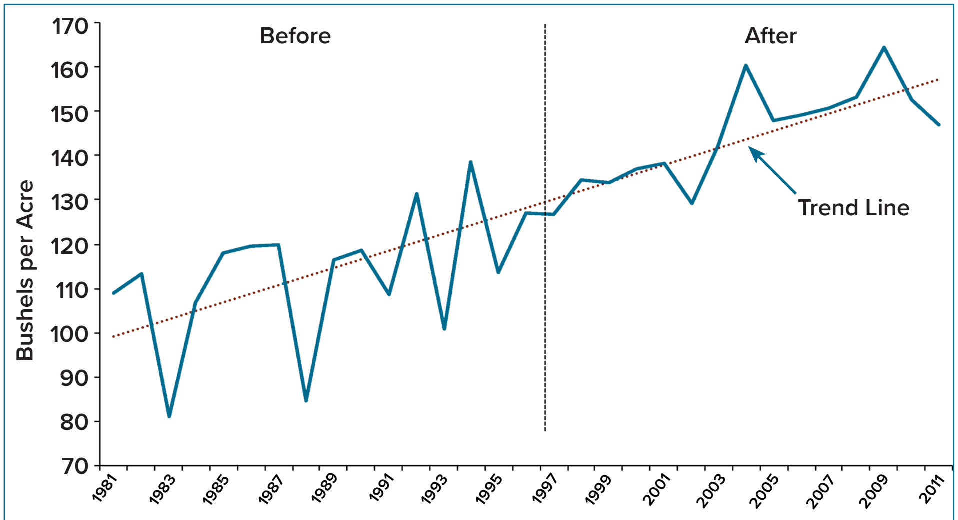

Figure 2: Historical Corn Yields in the United States, 1981–2011

Source: United States Department of Agriculture, National Agricultural Statistics Service

Another issue associated with comparing the U.S. to Western Europe is that Europe does not use the same corn varieties as in the United States. The germplasm in European corn varieties may differ from that in the U.S. varieties, and improvements in germplasm through plant breeding is largely a separate issue from the insertion of genetic material into existing germplasm through genetic engineering. Therefore, any comparison of yield trends should control for genetic improvement of the varieties over time, separate from the role of biotechnology.

We know that any yield improvement for corn could be attributed to either plant breeding and/or genetic engineering. Of course, it is possible that GMOs do not boost yields if weeds or insects are not a problem. Since GMOs allow for zero or minimum tillage, this could also raise yields compared to conventional corn, due to soil moisture conservation.

It is also important to note that Western Europe is a relatively small producer of corn, compared to the United States. Farms are much smaller in Europe and crop-input intensity is higher. The added intensity will enhance yields in Europe. In addition, U.S. corn acreage expanded from 66.8 million acres in the early 1990s to around 86 million acres recently, an increase of over 19 million acres. Over the same time period, corn acreage in Western Europe went from 5.6 to 6.4

million acres, an increase of only 0.8 million acres. Therefore, comparing "average" yields in these two regions is like comparing apples to oranges.

Most corn expansion in the U.S. occurred in the northern region, like the Dakotas. The colder climate in these areas limits the total amount of heat accumulated over a growing season, which is expected to result in lower corn yields than in the Corn Belt. Furthermore, the large expansion of U.S. corn acreage is likely to bring more marginal land into production and lead to changes in crop rotations, which can put downward pressure on corn yields.

The U.S. and Western Europe have also experienced very different weather trends over the time period that GMOs have been grown. Figure 3 plots growing season temperature and precipitation trends in the U.S. Corn Belt, France, and Spain. The top panel shows temperature trends. Even though there was considerable year-to-year fluctuations in temperature, Figures 3 shows that there was a warming trend in France.

On average, the (growing season) temperature is now about 0.50°C higher than what it was in the mid-1990s. A warmer France would be favorable for corn yields, especially since the absolute temperature in France is relatively low. In comparison, Spain and the U.S. Corn Belt had much smaller temperature changes—about 0.25°C in Spain and 0.20°C in the U.S. Corn Belt.

Precipitation trends shown in Figure 3 are relatively stable, but they do show that, on average, France and Spain have received less rainfall during the growing season since 1996. Alternatively, the U.S. corn belt has become wetter, receiving more annual rainfall, on average, than what it received two decades ago. The difference is about 2 inches. Given the importance of temperature and precipitation for corn yield, any analysis of the yield impact of GMO adoption should control for weather patterns.

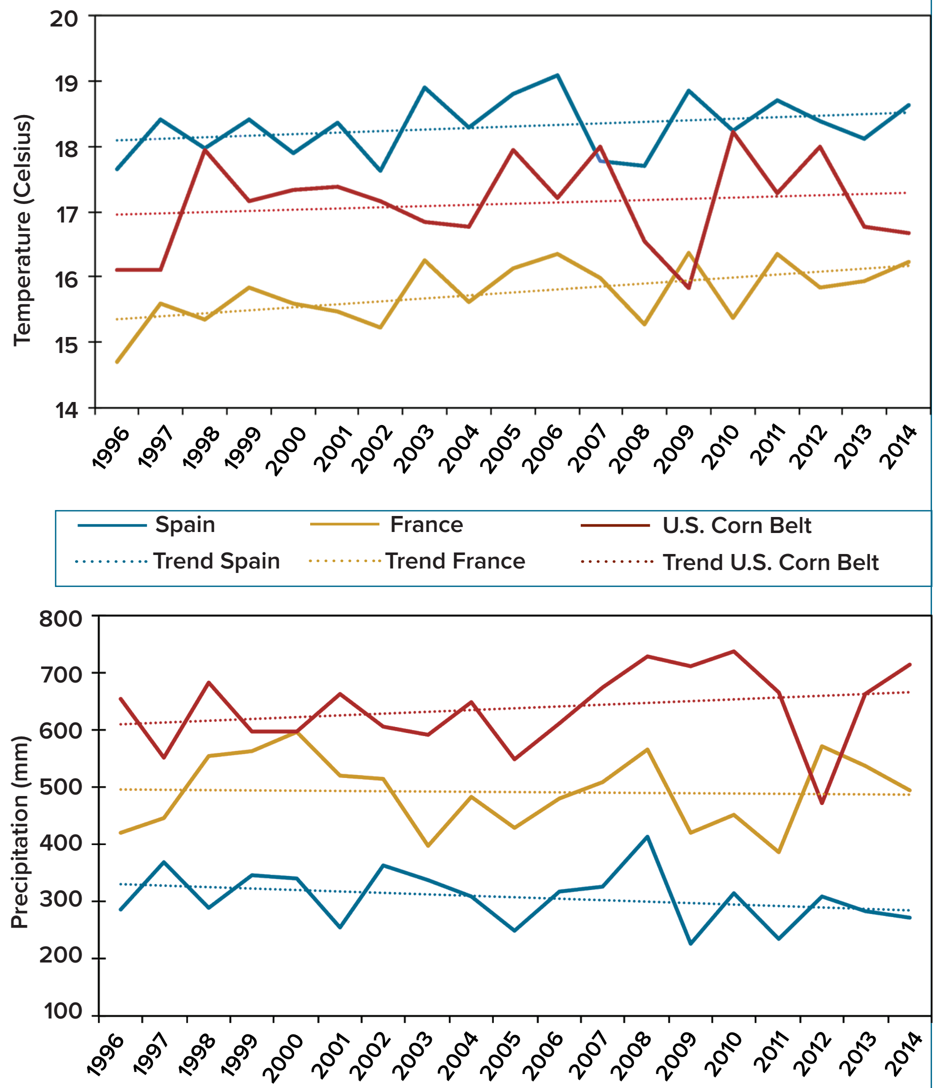

Figure 3: Temperature and Precipitation Trends in the U.S. Corn Belt, France and Spain: Growing Season

Source: World Bank for Europe data and U.S. data from NOAA

For all of the above reasons, a simple comparison of yield trends in the U.S. and Western Europe as shown in Figure 1 does not provide credible evidence regarding the effect of GM adoption. A more reliable approach would be to compare GM-adopted and GM-free counties (or provinces in Spain). However, even in this case, without accurate information on soil quality and other differences between counties, such a comparison may overlook important confounding factors.

Turning back to the NAS report and their before and after comparison, many of the above comments directed at the NYT piece apply to NAS because other factors (such as the weather) may have changed in the before versus after time periods. For instance, NAS implicitly assumed that pest and weed pressure was identical before and after 1996, which may or may not be true. In other words, NAS did not account for the possibility that GM technology could have reduced pest or weed-associated yield losses.

If this were the case, it would be a yield benefit that can be attributed to genetic engineering. The NAS conclusion is based on the assumption that yield trends would have stayed the same in the absence of GM adoption. This is fundamentally unsubstantiated for all the aforementioned reasons.

Measuring the Causal Effect of GM Adoption

The ideal setting to answer the yield question is a situation where we can compare counties or provinces over time, some of which adopt GM and others that do not. By observing the same regions before and after GM adoption, we could control for factors that may change over time. Furthermore, we could use counties or provinces that never adopted GM to identify the change in crop yields in the absence of GM adoption.

A similar approach was used in a study conducted at Iowa State and Purdue University that found GMOs may have indeed increased U.S. yields. After netting out the effects of weather (temperature and precipitation), the adoption of GM corn was found in that study to be associated with a 17% yield increase (about 18 bushels per acre) in the United States.

This implies that the U.S. corn belt experienced unusually good weather for a period before GM varieties were adopted (i.e., the mid-1980s to mid-1990s), increasing the yield trend during that time period. However, this estimate of an 18 bushel/acre gain has a large confidence interval, ranging from 5 to 25 bushels. In other words, the yield gain could be as low as 5 bu/acre or as high as 25 bu/acre; hence, the exact magnitude of the effect is not precisely estimated.

The issue of GMO adoption and its impact on yields and other aspects of agricultural production is an important question, the answer to which can inform policy makers worldwide. However, there are many practical difficulties in measuring the causal effect of genetic engineering on yields. For instance, adoption rates are not necessarily recorded at the county-level, which can lead to substantial aggregation bias.

Furthermore, there are many different GM varieties typically tailored to specific locations that might have different benefits. Hence, without precise information on the GM seeds used and their expected benefit, it is difficult to interpret the yield effects of GMO adoption. Finally, GMO technology is meant to minimize crop failure and that is a potential benefit that should also be measured.

Conclusion

Genetically modified crops offer certain advantages over conventional varieties, such as reduced chemical load on the environment and reduced soil tillage. In addition, they may provide a yield advantage. It is not a simple task for an analyst to separate the effects of GMO traits from the effects of conventional plant breeding on yield. Yet some have assumed it is a simple exercise and they have questioned the yield advantage by examining simple national average yields in the United States or compared U.S. versus European yields.

We have shown that any conclusion from simple yield comparisons is unreliable for a number of reasons. We highlight this problem because the yield advantage is an important issue. The world's population is expected to increase by over 2 billion by 2050. The upward trend in population and accompanying urbanization will put increasing pressure on farmers to expand production, and the latest technology, including genetic engineering, will be required to meet the growing food demand.

Suggested Citation:

Carter, Colin A., Xiaomeng Cui, and Dalia Ghanem. "Are There Yield Benefits With Genetically Engineered Corn?" *ARE Update* 21(2) (2017): 5–8. University of California Giannini Foundation of Agricultural Economics.

AUTHORS' BIOS

Colin Carter is a distinguished professor, Xiaomeng Cui is a PhD candidate, and Dalia Ghanem is an assistant professor, all in the ARE department at UC Davis. They can be contacted by email at cacarter@ucdavis.edu, ecui@ucdavis.edu, and dghanem@ucdavis.edu, respectively.

For additional information, the authors recommend:

"Broken Promises of Genetically Modified Crops" https://www.nytimes.com/interactive/2016/10/30/business/gmo-crops-pesticides.html

"Genetically Engineered Crops: Experiences and Prospects." National Academies of Sciences, Engineering, and Medicine. 2016. Washington, DC: The National Academies Press. doi: 10.17226/23395

Whither NAFTA? Agriculture, Autos, and Migration

Philip L. Martin

During his presidential campaign in 2016, candidate Donald Trump called the North American Free Trade Agreement "the worst trade deal ever negotiated by the U.S. government." President Trump threatened to withdraw the U.S. from NAFTA if Canada and Mexico refused to renegotiate. Negotiations to revise NAFTA began in August 2017, raising questions about two of the sectors most affected by freer trade, agriculture and autos, as well as the future of Mexico-U.S. migration.

The North American Free Trade Agreement (NAFTA) is the first reciprocal and rules-based trade agreement between an industrial and a developing country. Canada and the U.S. signed a free-trade agreement in 1989 with little fanfare in the United States. Mexican President Carlos Salinas in 1990 proposed a similar FTA with the U.S. to lock pro-market Mexican policy changes into an international agreement and thus reassure foreign investors that Mexico was seeking to speed economic and job growth.

At a time when the Canada's economy was the size of the California economy, and Mexico's economy was the size of the economy of Los Angeles county, the major opposition to NAFTA was in the U.S., where presidential candidate Ross Perot predicted a "giant sucking sound" as U.S. jobs moved to Mexico. NAFTA was approved narrowly by the House of Representatives in November 1993 and went into effect January 1, 1994.

NAFTA reduced barriers to trade and investment between Canada, Mexico, and the U.S., leading to increased trade and investment in the three countries. Many U.S. firms moved manufacturing facilities to Mexico to take advantage of lower wages and relatively fast truck transport between Mexico and the United States. Millions of trucks cross the Mexico-U.S. and Canada-U.S. borders each year, and so many move goods from Monterrey Mexico to southern Ontario that U.S. Interstate 35 through the American Midwest has been dubbed the NAFTA superhighway.

As shown in Figure 1, Mexico-U.S. trade rose and so did the U.S. trade merchandise trade deficit with Mexico, to $64 billion in 2016, similar to the U.S. trade deficit with Germany and Japan. President Trump vowed to reduce U.S. trade deficits with other countries as part of his "America First" program. Even though the U.S. trade deficit with China, $347 billion in 2016, was over five times larger than the deficit with Mexico, NAFTA re-negotiations have put the Mexican trade deficit in the spotlight.

After five rounds of NAFTA negotiations between August and November 2017, the major issues were the U.S. demand to raise the North American content of goods that trade freely among the three countries and to sunset the agreement after five years unless all three countries agree to continue NAFTA.

Agriculture

The U.S. exported farm commodities worth $18 billion to Mexico in 2016, and imported farm commodities worth $23 billion from Mexico, for a $5 billion U.S. agricultural trade deficit with Mexico. The leading U.S. exports to Mexico were corn and soybeans worth $4 billion and pork and dairy products worth $2.5 billion. The leading U.S. imports from Mexico were fresh and frozen fruits and vegetables worth $11 billion, representing almost half of U.S. agricultural imports from Mexico.

Midwestern farmers producing meat and grains are NAFTA's major agricultural winners, while Florida fruit and vegetable farmers are the major agricultural losers. Mexico's major comparative advantage in fruit and vegetable production is climate, reflecting the fact that Mexico can produce tomatoes and other vegetables during the winter months when there is little U.S. production except in Florida. California farmers produce lettuce during the winter months in Arizona and the Imperial Valley, so the U.S. imports less than 10% of its lettuce.

Mexican export-oriented vegetable agriculture has been transformed over the past two decades, in part with U.S. capital and expertise. Many Mexican tomato growers farm under protected culture structures, which means they grow tomatoes and other vegetables under plastic in structures that make their farms akin to factories. Protected culture reduces pest and disease problem, while controlled entry and exit reinforces worker adherence to food safety protocols. Yields are up to three

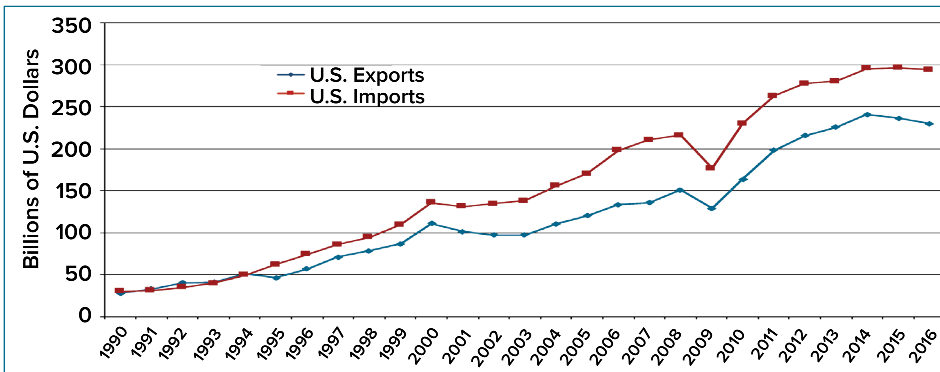

Figure 1: U.S. Trade with Mexico, 1990–2016

Source: U.S. Census, https://usatrade.census.gov/

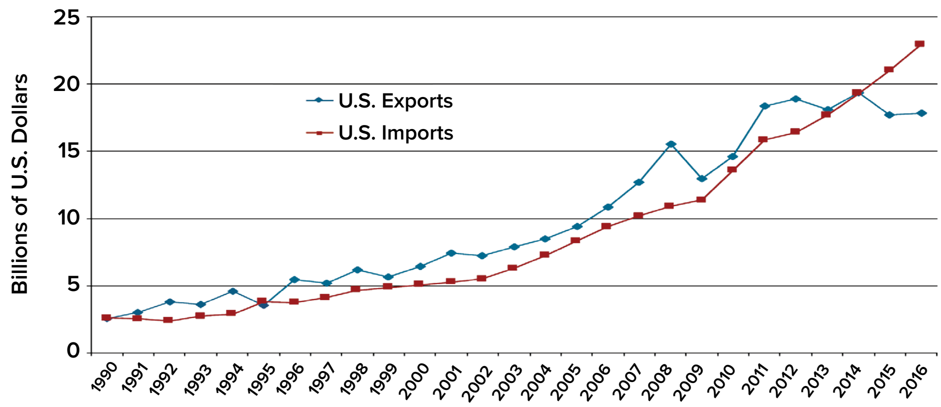

Figure 2: Mexico-U.S. Agricultural Trade, 1990–2016

Source: U.S. Census, https://usatrade.census.gov/

times higher for protected culture than in open fields.

Many U.S. growers and packers have partnerships with Mexican growers to produce for U.S. supermarkets. Produce supply chains are integrated in the sense that a U.S. grower-packer may sign a contract to supply produce year-round to a U.S. fast-food restaurant or supermarket chain, and then grow the requisite produce in both the U.S. and Mexico.

Mexico and the U.S. have made significant progress to establish science-based standards to evaluate the risk of transmitting pests and diseases across the border and to promote rapid trans-border shipments of perishable commodities. Re-negotiating NAFTA to favor U.S. producers and introducing a five-year sunset provision would likely reduce U.S. investments in Mexico's export-oriented agriculture and Mexican fruit and vegetable exports to the U.S.

Automobiles

NAFTA helped make Mexico a major auto producer and exporter. Cars and light trucks with at least 62.5% North American content trade freely between Canada, Mexico, and the U.S., prompting most of the world's major auto firms to make parts and assemble cars in Mexico, turning Mexico into the world's seventh largest auto producer and fourth largest exporter. Mexico produced 3.5 million cars and light trucks in 2016 and exported 80% of them, and production is projected to increase to five million vehicles by 2023, with four million exported.

There are about 750,000 auto-related jobs in Mexico's manufacturing sector, including 90% in firms that supply parts to highly automated assembly plants. Many Mexican auto parts are included in cars and light trucks assembled in the U.S.; most U.S.-assembled cars include at least 25% foreign content. U.S. auto makers assemble smaller cars in their Mexican plants, and import parts from Mexico for larger cars assembled in the U.S. For example, the Chevrolet Silverado, assembled in the U.S., includes more than half imported parts, including a Mexican-built engine. Mexico has 44 free-trade agreements, making it easier to import auto parts into Mexico from many countries than into the U.S

The U.S. has proposed raising the NAFTA car-content requirement to 85%, including 50% made in the U.S. Critics of this U.S. demand say that, if adopted, auto firms may move auto parts and auto assembly plants to China and pay the 2.5% tariff the U.S. levies on imported cars. After President Trump criticized Ford for a plan to move production of its small Focus car to Mexico in January 2017, Ford announced that the Focus would be built in China.

Mexican auto and auto parts plants pay employees more than Mexico's minimum wage of $4 a day in 2017, often $2 an hour or $1,200 a month plus overtime and benefits that range from free meals to transportation and bonuses. Most Mexican auto plants are unionized, and most auto firms sign so-called protection agreements with unions before new plants are built so that newly hired workers become union members and have dues deducted from their wages. Some U.S. unions want to promote independent unions to raise Mexican auto wages.

Supply chains for fruit and vegetables and automobiles have become integrated over the past two decades, with U.S. farms and firms investing in Mexico to produce for U.S. consumers. NAFTA renegotiations have slowed U.S. and other foreign investments in Mexico. Changes to NAFTA aimed at helping U.S. farms and firms may shrink U.S. investments in Mexico, which could slow Mexican economic and job growth.

Mexico–U.S. Migration

The freer trade associated with NAFTA accelerated change in all three countries. In Mexico, economic integration speeded up the movement of labor out of agriculture. In Canada and the U.S., freer trade hastened de-industrialization. Workers displaced from factory jobs in Canada and the U.S. did not move to Mexico, but some rural Mexican youth realized that, with NAFTA's freer trade in corn and grains, they could get ahead only by leaving rural Mexico. Many migrated to the United States.

The result was a Mexico-U.S. migration hump that peaked in 2000. Rural Mexican youth were often unable to get jobs in the auto and other factories that were created in response to NAFTA since they lacked secondary school diplomas and lived far away from new auto factories and parts plants. Many rural Mexicans had better connections to U.S. labor markets than to jobs in booming areas of Mexico, prompting an upsurge in Mexico-U.S. migration.

Over 4,000 Mexicans a day were apprehended just inside the U.S. border in 2000, when the Mexican labor force increased by a million but only 350,000 formal sector jobs were created. The U.S., by contrast, was adding over 10,000 jobs each work day or 2.5 million a year. Many U.S. farm, food, construction, and service employers were eager to hire rural Mexicans with relatively little education. For example, Mexican-born workers have been at least two-thirds of U.S. crop workers for the past quarter century.

Mexico-U.S. migration slowed during the 2000–01 recession, but surged again during the U.S. economic boom of 2002–07, when Mexican-born workers were very prominent in home-building and many service sectors. By 2007, over 10% of the 120 million people born in Mexico were living in the U.S., and 60% of the estimated 12 million unauthorized foreigners in the U.S. were Mexicans.

The 2008–09 recession and stepped up enforcement on the Mexico-U.S. border slowed northward migration, making the upsurge in Mexico-U.S. migration between the early 1990s and the 2008-09 recession appear as a 15-year hump. Mexico-U.S. migration rose with the changes accelerated by NAFTA and is now below the level that might have occurred without NAFTA. As Mexico-U.S. migration continues to fall, Figure 3 illustrates the migration that is saved or avoided by freer trade and investment.

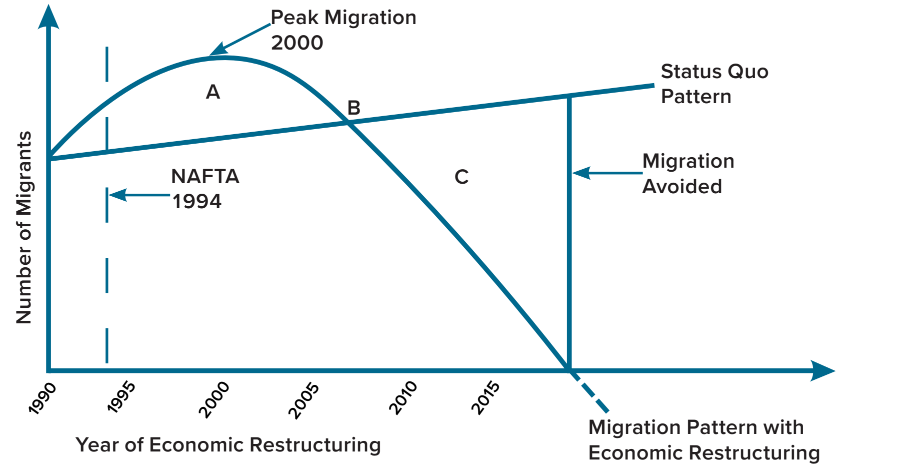

Figure 3: NAFTA and Mexico–U.S. Migration

The migration hump was not anticipated by the architects of NAFTA, who believed that freer trade would smoothly reduce Mexico-U.S. migration. Mexican President Carlos Salinas predicted in 1992 that NAFTA would create enough new jobs in Mexico to absorb the rural Mexicans who were leaving agriculture. Salinas said the U.S. faced a choice of "accepting Mexican tomatoes or Mexican migrants that will harvest them in the United States."

Salinas failed to realize that the small Mexican corn farmers did not have the capital, technical knowledge, or marketing expertise to switch from producing corn to tomatoes and other vegetables. Since most rural Mexicans lacked the education needed to find nonfarm jobs in Mexico, they faced the choice of working for wages in Mexican or U.S. agriculture. Wages in U.S. agriculture were up to 10 times higher than in Mexican agriculture, explaining why many rural Mexicans moved to the U.S.

Unauthorized Mexico-U.S. migration is poised to remain on a downward trajectory due to the much smaller share of Mexicans in agriculture today, slower labor force and faster job growth in Mexico, and better education systems that prepare rural youth for jobs in Mexico. There are still many rural Mexicans eager to work in U.S. agriculture, but they mostly travel and work legally. The number of legal Mexican guest workers employed in U.S. agriculture topped 150,000 in 2017, and another 30,000 were employed on Canadian farms. The Bracero program peaked at 455,000 admissions of Mexican farm workers in 1956. If legal guest worker programs continue to expand, there could be more Mexican guest workers in U.S. agriculture in the 21st century than there were Braceros in the 20th.

Conclusions

Freer trade can be a substitute for large-scale migration in the long term, but the NAFTA experience shows that freer trade can also be associated with a migration hump, as when trade and migration rise together. The first 15 years of NAFTA were marked by one of the largest migration movements in history, bringing 10% of persons born in Mexico to the U.S., some 12 million by 2007, up from less than three million in 1990.

NAFTA promoted the integration of supply chains producing fruits, vegetables, and autos. U.S. growers and shippers partnered with Mexicans to produce tomatoes, berries, and other labor-intensive commodities in Mexico for export to the U.S., and U.S. auto firms built plants in Mexico to take advantage of lower labor costs and fast transport to the United States. Re-negotiating NAFTA is not likely to lead to a resumption of large-scale Mexico-U.S. migration, but could slow the expansion of cross-border supply chains.

Suggested Citation:

Martin, Philip L. "Whither NAFTA? Agriculture, Autos, and Migration." *ARE Update* 21(2) (2017): 9–11. University of California Giannini Foundation of Agricultural Economics.

AUTHOR'S BIO

Philip L. Martin is an emeritus professor in the ARE department at UC Davis and a member of the Giannini Foundation of Agricultural Economics. He can be reached by email at martin@primal.ucdavis.edu.

Agricultural and Resource Economics
ARE UPDATE
Giannini Foundation of Agricultural Economics, University of California

Department of Agricultural and Resource Economics
UC Davis
One Shields Avenue
Davis CA 95616
GPBS

ARE UPDATE is published six times per year by the Giannini Foundation of Agricultural Economics, University of California.

Domestic subscriptions are available free of charge to interested parties. To subscribe to **ARE UPDATE** by mail contact:

Julie McNamara, Communications Director
Giannini Foundation of Agricultural Economics
Department of Agricultural and Resource Economics
University of California
One Shields Avenue, Davis, CA 95616
E-mail: julie@primal.ucdavis.edu
Phone: 530-752-5346

To receive notification when new issues of the **ARE UPDATE** are available online, submit an e-mail request to join our list to julie@primal.ucdavis.edu.

ARE UPDATE is available online at:
http://giannini.ucop.edu/publications/are-update/