

**Estimated Impacts of Mexican Transportation Infrastructure
Improvements on the U.S. Meat Complex
CNAS Report 2016-02**

August 2016

David Anderson, Texas A&M AgriLife Extension Service
Flynn J. Adcock, Texas A&M AgriLife Research
C. Parr Rosson, III, Texas A&M University
Hannah Ahn, Texas A&M University



Author Contact: Flynn J. Adcock, fjadcock@tamu.edu, 979-845-8694.

USDA Contact: Delmy L. Salin, delmy.salin@usda.gov, 202-720-0833.

Recommended Citation: Anderson, David, Flynn J. Adcock, C. Parr Rosson, III, and Hannah Ahn. Estimated Impacts of Mexican Transportation Infrastructure Improvements on the U.S. Meat Complex. Publication Number CNAS Report 2016-02. August 2016. Posted at <http://cnas.tamu.edu>.

Acknowledgements: This work was supported by Cooperative Agreement Number 14-TMXXX-TX-0021 with the Agricultural Marketing Service of the U.S. Department of Agriculture.

Disclaimer: The opinions and conclusions expressed do not necessarily represent the views of the U.S. Department of Agriculture or the Agricultural Marketing Service.

TABLE OF CONTENTS

Table of Contents

Executive Summary	ii
Introduction.....	1
Trade Trends in U.S.-Mexico Meat and Animal Products	2
Case Study on Cattle Trade Disruption: Violence along the Border	6
Geographic Flows of U.S.-Mexico Meat Complex Trade	7
Truck Flows of U.S.-Mexico Meat Complex Trade	12
Recent and Ongoing Improvements to Mexican Infrastructure.....	14
Mexican Cold Storage Capacity.....	17
U.S. Cold Storage Capacity.....	18
Other Issues Impacting U.S.-Mexico Meat and Livestock Trade.....	21
Summary and Conclusions	23
References.....	25

Estimated Impacts of Mexican Transportation Infrastructure Improvements on the U.S. Meat Complex

Executive Summary

What Is the Issue?

The United States and Mexico have a long and strong trading relationship in most product sectors, including agricultural and food products. Within the agricultural sector, there is significant trade between the two countries in the meat and animal complex. Exports of beef, pork, poultry meat and edible offal to Mexico have grown significantly, while imports of beef from Mexico are at all-time highs and cattle imports remain high.

These exports and imports cross into and out of Mexico almost entirely over land borders. Texas is the most important state for meat and live cattle exports to Mexico, Texas and California for meat imports from Mexico, and New Mexico and Arizona for live cattle imports from Mexico. Most of these meat and livestock products cross via truck. As a result, recent improvements to certain Mexican highways and related infrastructure may greatly impact U.S.-Mexico meat and livestock trade and help to alleviate bottlenecks at the border as this trade grows.

Analysis of these recent and ongoing Mexican infrastructure improvements examined the impacts of these improvements. Efforts were made to determine the volume and value of U.S. meat and livestock exports to Mexico, port of entry into Mexico, and how they enter and proceed to their final Mexican destination. The modes of transportation and entry points at the U.S. border for Mexican beef and cattle were identified.

Further, this project documented and analyzed the transportation systems currently serving the U.S. beef, poultry, and pork shipments into Mexico to determine which of the recent improvements may have the most impact on U.S. exports, imports, and port operations. Finally, there are other issues that impact livestock and meat trade infrastructure that are analyzed, which include: (1) meats competing with fresh produce during certain times of the year, and (2) the cold chain capacity and utilization within Mexico. This project identifies the impacts of these issues in conjunction with recent Mexican transportation infrastructure improvements.

What Did the Study Find?

The study found that U.S.-Mexico trade in the meat complex has grown significantly over the last two decades. Total U.S.-Mexico meat trade reached a high of 4.3 billion pounds in 2014 and dropped slightly in 2015. This compares to 792 million pounds in 1994, the first year of the North American Free Trade Agreement (NAFTA). While U.S. beef exports to Mexico have

fallen, U.S. poultry meat and pork exports have consistently grown. At the same time, U.S. beef imports from Mexico have grown from negligible levels to 319 million pounds in 2015.

About 75 percent of U.S. meat exports to Mexico are shipped through the south Texas ports of the Laredo customs district. The analysis shows these exports are becoming more concentrated through south Texas over time, as compared to other border customs districts. For example, beef imports from Mexico rely on the Laredo district for more than 80 percent of the shipments with the San Diego customs district accounting for most of the rest. Cattle imports from Mexico enter mostly through Santa Teresa in the El Paso district, but the Nogales district and the Laredo district also have significant shares depending on the year. All of this trade in the U.S.-Mexico meat complex results in approximately 90,000 trucks crossing into Mexico and 20,000 trucks entering the United States each year.

Mexico consistently is improving its highway system to facilitate trade growth. Currently, Mexican highways serving major U.S.-Mexico border crossings have more lanes and more urban center by-passes. New East-West Mexican oriented highways have expanded avoiding the use of the old, dangerous “Devil’s Backbone” highway between Mazatlan and Durango. Highway improvements in Mexico have created increased competition for U.S. meat exporters in both Mexico and at home.

The Mexican government and industry successfully increased exports by investing in packing and inspection capacity at meat packing plants that are eligible to export to the United States and the European Union. This effort resulted in the growth of value-added meat production, and increased domestic demand for beef due to rising incomes, and growth in grain fed cattle feeding infrastructure. The growth in cattle feeding and meat packing has allowed for more exports of middle meats¹ and trimmings to the United States. The growth in immigration to the United States over the same period allowed for the establishment of exports of beef products that are like products “at home” destined for the immigrant population.

One of the most interesting events in U.S. beef trade has been the rise of Mexico as a supplier of beef to the United States. As recently as 1987 the United States imported no beef from Mexico. The rapid growth began over the last decade. Since 2006, imports of Mexican beef have increased from 40.8 million pounds (Mlb) to 392 Mlb. By 2015, Mexican beef totaled 11.6 percent of total U.S. beef imports. Historically high beef prices in the United States have encouraged more imports from many sources, including Mexico.

While illustrating the growth in U.S.-Mexico meat complex trade and improvements to the Mexican highway system, this study also highlights several important infrastructure improvements that have facilitated that growth. Interviews with market participants highlighted

¹ Middle meats include all cuts from the loin, sirloin, and rib.

the classic “chicken or egg” question, but were put in the context of expansion and growth in meat transportation infrastructure for international trade. In the trade context, the question became, “What came first: (1) U.S. company expansion then infrastructure growth and investment, or (2) did infrastructure investment precede company expansion? The answer is that the entrance of U.S. companies into the Mexico market forced Mexican companies and their government to invest in order to compete. Company investment and expansion included U.S. companies expanding into Mexico and Mexican companies expanding into the U.S. market.

Interviews also highlighted that the competition from U.S. companies expanding into Mexico forced domestic companies in Mexico to invest in order to survive and compete. The competition applies to U.S. companies also as system improvements have allowed Mexican companies to successfully compete in the United States.

A third highlighted area is food quality. Interviewees noted that the improvements in infrastructure have dramatically improved food quality in Mexico. Attempting to measure food quality improvements is beyond the scope of this work, but it seems to be an overlooked area of research in quantifying the impacts of trade growth.

Interviewees noted dramatic improvements in border crossing procedures. These mechanisms to facilitate the import and export process through government cooperation and border infrastructure investment greatly improved the timeliness and ability to trade. This improvement and streamlining of the process might be placed in a research category of reducing transactions costs. But these discussions with meat trade participants highlighted the continued need for ongoing work to further harmonize trade between the United States and Mexico.

Cold storage capacity has grown on both sides of the border. The refrigerated capacity in cubic feet in U.S. border-states has grown in each state. Over the last decade the percent of total U.S. cold storage capacity in the states bordering Mexico has grown to just over 20 percent of the nation’s capacity. During roughly the same time period, Mexican cold storage capacity grew at an average annual compound rate of more than 26 percent from 2008 to 2014.

Lastly, border conflicts can continue to disrupt trade. This paper highlights a recent study of the effects of border closures on U.S. live cattle imports from Mexico. Port of entry closures due to border violence shifted cattle to different ports of entry. The opening of temporary import facilities did allow cattle to be imported through those ports, but the numbers imported were much smaller.

How Was the Study Conducted?

This project has three main objectives that provide valuable information on the estimated impacts of Mexican infrastructural improvements on the U.S. meat complex:

1. Identify recent trade trends in U.S. meat and animal trade with Mexico.
2. Identify recent and ongoing improvements to the Mexican truck transportation systems serving U.S. meat exports to Mexico.
3. Investigate other trade infrastructure issues which may impact U.S.-Mexico meat and livestock trade.

The data were gathered from several sources, including government agencies databases and reports, trade organizations, and private sector firms. Data were collected from: (1) Global Agricultural Trading System (GATS), USDA/Foreign Agricultural Service (FAS); (2) U.S. Cold Storage reports, USDA/National Agricultural Statistics Service (NASS) (3) Capacity of Refrigerated Warehouses reports, USDA/NASS; and (4) WISERTrade. These data were used to validate trade volumes and entry points for exports from the United States into Mexico. In addition to the data from the above sources, information from various FAS Global Agricultural Information Network (GAIN) reports was reviewed to determine uses for U.S. products included by this research. Further, data from the Global Cold Storage Alliance were analyzed to provide the fullest picture possible of the Mexican meat infrastructure. Information was also gathered from some of the main U.S. meat private sector exporters to Mexico, including: Agri-West, Cargill, and JBS. All the information collected and analyzed revealed how U.S. meat was moving within Mexico, and how that movement has changed over time due to infrastructure and related changes in Mexico.

Estimated Impacts of Mexican Transportation Infrastructure Improvements on the U.S. Meat Complex

Introduction

With the implementation of the North American Free Trade Agreement (NAFTA) in 1994, trade between the United States and Mexico has increased substantially. Overall merchandise trade between the two countries increased 430 percent from the first year of NAFTA to 2015. U.S. exports to Mexico reached \$240.2 billion in 2014, before dropping to \$236.4 billion in 2015. U.S. imports from Mexico reached a high of \$294.7 billion in 2015.

Agricultural trade between the two countries has also greatly increased since the beginning of NAFTA, growing slightly more than 400 percent. U.S. agricultural exports to Mexico grew from \$4.6 billion in 1994, to a high of \$19.4 billion in 2014. As with total exports, U.S. agricultural exports declined to \$17.7 billion in 2015. U.S. agricultural imports from Mexico grew from \$2.9 billion in 1994 to \$21.0 billion in 2015, an increase of 624 percent.

Within the agricultural sector, there is significant trade between the two countries in the meat and animal complex. U.S. beef, pork, poultry meat, and edible offal exports to Mexico averaged 3.48 billion pounds (Blb) per year from 2011-2015, with an average annual value of \$3.01 billion. Both volumes and value grew most years during this five-year span, although both dropped in 2015. Additionally, U.S. exports of live animals – mostly cattle and poultry – have averaged about \$64 million over the past five years.

The United States also imports animals and meat from Mexico, mostly beef and cattle. From 2011-2015, U.S. imports of live cattle from Mexico averaged 1.2 million head valued at \$692.6 million. At the same time, meat imports from Mexico averaged 261.8 million pounds (Mlb) valued at \$705.2 million. About 90 percent of the value of these meat imports is beef. Further, while live cattle imported from Mexico may increase or decrease from year to year, meat imports have grown during all but one of the past five years in both volume and value.

As U.S.-Mexico trade in the meat and live animal complex has grown, improvements in infrastructure on both sides of the border have been undertaken. In Mexico, there have been improvements to the highway system, the cold storage network, and the border entry process.

The purpose of this research is to determine how these improvements and other issues have impacted the U.S. meat complex in terms of both market opportunities and new competition. Specific objectives are to: (1) identify recent trade trends in U.S. meat and live animal trade with Mexico; (2) identify recent and ongoing improvements to Mexican truck transportation systems serving U.S. meat exports to Mexico; and (3) examine other issues which may impact U.S.-Mexico meat and livestock trade. Other issues analyzed, include competing

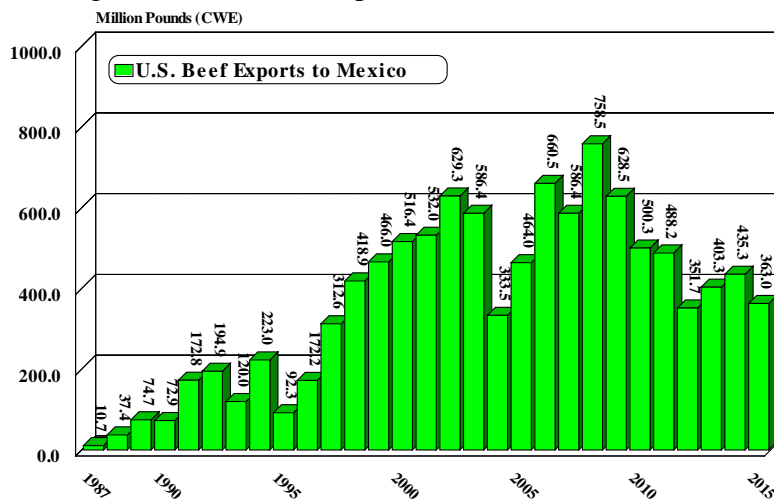
with fresh produce during certain times of the year, and the cold chain capacity and utilization within Mexico.

Trade Trends in U.S.-Mexico Meat and Animal Products

U.S.-Mexico beef and cattle trade has a long productive history, certainly predating NAFTA. In fact, Canada-U.S.-Mexico beef and cattle trade has long been thought of as the North American cattle industry. Import and export trade flows of cattle and beef between the three NAFTA countries has highlighted a dynamic trade partnership. This research report focuses on the U.S.-Mexico portion of meat trade, which has exhibited dramatic changes over the last decade.

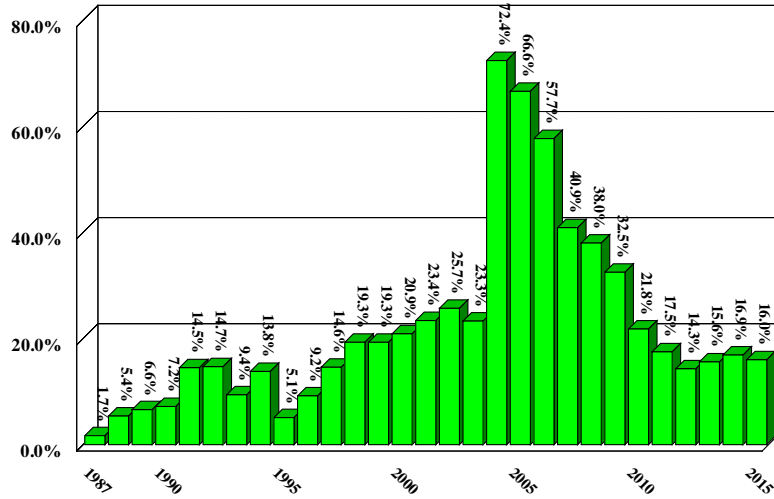
Mexico has long been part of the traditional big four customers for beef U.S.'s exports, the others being Japan, South Korea, and Canada. U.S. beef exports to Mexico peaked in 2008 at 759 Mlb (carcass weight), accounting for 38 percent of total beef exports in that year (figures 1 and 2). During the Bovine Spongiform Encephalopathy (BSE) impacted year of 2004, U.S. beef exports to Mexico were 334 Mlb, but accounted for 72 percent of total beef exports as most other export destinations sharply curtailed or discontinued their purchases of U.S. beef after a U.S. cow with BSE had been found in December 2003. Since 2012, U.S. beef exports to Mexico have been about 15 to 16 percent of total U.S. beef exports.

Figure 1. U.S. Beef Exports to Mexico



Source: <http://www.ers.usda.gov/data-products/livestock-meat-international-trade-data.aspx>

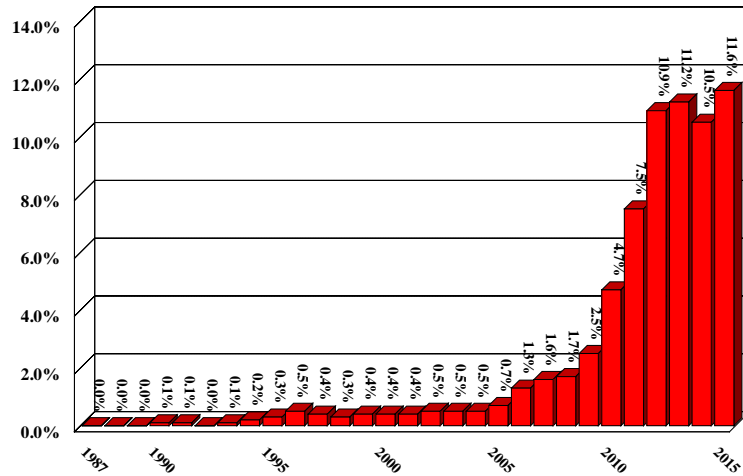
Figure 2. Mexico Share of U.S. Beef Exports



Source: <http://www.ers.usda.gov/data-products/livestock-meat-international-trade-data.aspx>

One of the most interesting events in U.S. beef trade has been the rise of Mexico as a supplier of beef to the U.S. As recently as 1987 the U.S. imported no beef from Mexico. The rapid growth began over the last decade. Since 2006, imports of Mexican beef have increased from 40.8 Milb to 392 Milb. By 2015, Mexican beef totaled 11.6 percent of total U.S. beef imports (figure 3).

Figure 3. Mexico Share of U.S. Beef Imports



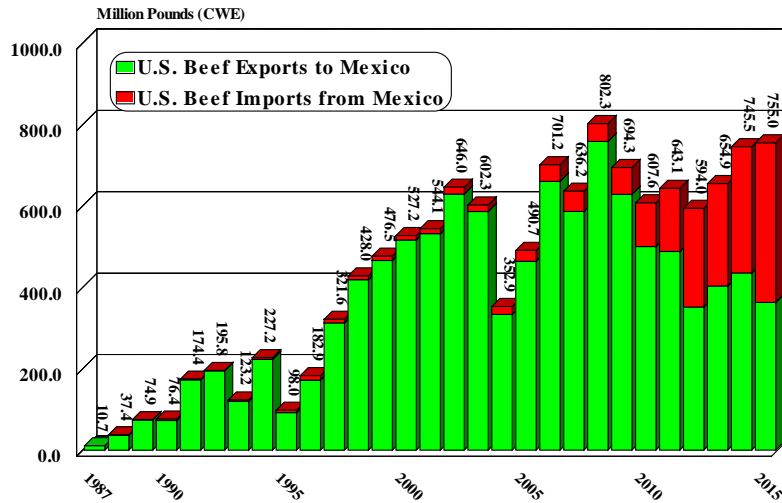
Source: <http://www.ers.usda.gov/data-products/livestock-meat-international-trade-data.aspx>

A number of reasons for this growth have been cited, including rapid investment in packing capacity, investment in inspected meat packing plants eligible to export to the United States and the European Union, growth in value added meat production, a dedicated government and industry effort to increase exports, increasing demand in Mexico for beef due to rising incomes, and growth in grain fed cattle feeding infrastructure. The growth in cattle feeding and meat packing has allowed for exports of middle meats and trimmings to the U.S. The growth in

immigration to the U.S. over the same period allowed for the establishment of exports of beef products that are like products “at home” destined for the immigrant population. Historically high beef prices in the U.S. have encouraged more imports from many sources, including Mexico.

Total beef trade with Mexico (imports plus exports) has climbed as U.S. beef imports from Mexico have grown. Total U.S.-Mexico beef trade hit a record in 2008 of 802 MLb when exports peaked. After dipping from 2009-2011, U.S.-Mexico beef trade has generally grown since 2012 and reached 755 MLb in 2015 (figure 4).

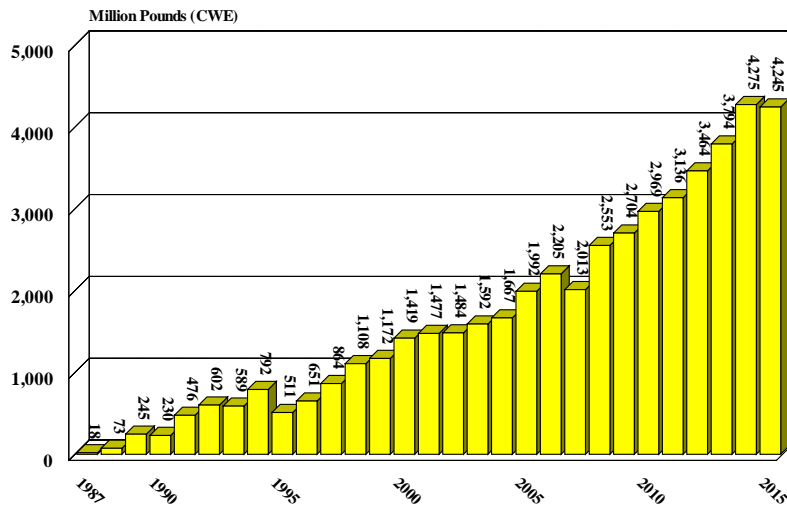
Figure 4. U.S. Beef Trade with Mexico



Source: <http://www.ers.usda.gov/data-products/livestock-meat-international-trade-data.aspx>

Mexico has been a major trading partner for all meats – not just beef. While the focus of this study is on beef, other meats such as pork, chicken and turkey trade are important also. A cold chain is required for all of those fresh and frozen meats. Growth in total trade in meat with Mexico has been remarkable, almost doubling in the last 10 years, from 2.2 Blb to over 4.2 Blb in 2015 (figure 5). All meat trade with Mexico was only 18 MLb in 1987. Where growth occurs in the shipment of perishable commodities like beef, then the transportation and storage infrastructure has to grow along with it in both countries.

Figure 5. U.S. Meat Trade with Mexico



Source: <http://www.ers.usda.gov/data-products/livestock-meat-international-trade-data.aspx>

Mexico has long been a supplier of feeder cattle and calves to the U.S. For many years the U.S. has been thought of as having a comparative advantage in cattle feeding and meat packing while Mexico had an advantage in calf production, supplying calves and feeders to the U.S. For the last 30 years, cattle imports from Mexico have averaged 1.07 million head annually. Over the last decade, average imports have been slightly larger at 1.11 million head. For the most part these cattle are lighter weight calves bound for grazing pastures in the U.S. and then feedlots. Because of U.S. animal disease regulations, no intact animals capable of breeding can be imported, only steers and spayed heifers.

Live animal trade has experienced several important trade challenges in recent years including disruptions due to violence along the border. Historically, Mexico has a comparative advantage in the production of feeder cattle and the United States has a comparative advantage in the production of beef. Since NAFTA, the United States exported more beef to Mexico and imported more feeder cattle from Mexico.

Based on the data from USDA/AMS Market News Service, U.S. cattle imports from Mexico have fluctuated over time while the shares of imports by port have only slightly changed. A highest percentage of exports occur through the port at Santa Teresa in New Mexico, followed by Nogales and Douglas in Arizona and Laredo and Eagle Pass in Texas. Exports through Hidalgo, Texas have grown, while Del Rio, Texas grew then decrease, Presidio, Texas showed a significant decrease in the number of feeder cattle crossings, and the San Luis, Arizona became relatively inactive.

There are multiple factors influencing changes in cattle crossings. U.S. cattle imports exhibit a seasonal pattern of higher numbers of cattle crossing into the United States between

October and May and fewer imports from June to September. The combined result of 2010/2011 drought and high feed costs in Mexico are among factors impacting the flow of Mexican cattle into the United States. The inspection process that all cattle have to follow the U.S. health regulations before crossing also impacts movement. A policy change in Mexico to increase the slaughter and packing at Federally Inspected Type (TIF) meat and poultry processing facilities and to expand market access into Russia, China, and Singapore has been well documented. Further, the policy change has had the effect of enhancing the health and quality of the cattle and breed characteristics of Mexican cattle exported to the United States.

Case Study on Cattle Trade Disruption: Violence along the Border

An important infrastructure chokepoint involves live animal importation at the border. All cattle imported into the U.S. from Mexico are inspected prior to crossing the border, meaning the inspection is done on the Mexican side of the border. Recently, several disruptions occurred due to violence involving U.S. livestock inspectors. The result was the closing of some border crossings and the implementation of temporary facilities on the U.S. side of the border. The following section describes an analysis of the effects of the closures on cattle imports at other ports of entry.

In March 2012, gang violence caused the closing of U.S. cattle inspection stations in Reynosa, Tamaulipas across from Hidalgo and Nuevo Laredo, Tamaulipas across from Laredo for six weeks. Based on historical import data this closure was estimated to affect 11 percent of cattle crossing into the United States. Furthermore, the facility in Ojinaga, Chihuahua, across Presidio was closed during August 2012, and it was not reopened until June 23, 2014. During the closure, a temporary USDA facility in Presidio was opened on October 2, 2012, until the actual port was reopened. Since 2010, cattle ports of entry across from the Del Rio and Eagle Pass facilities were also closed due to violence. These events forced Mexican ranchers to transport their animals to the other ports of entry potentially decreasing exports of feeder cattle to the United States.

To examine the impact of port closure on Mexican feeder cattle imports an econometric model was developed to estimate the effects of the border closure on the cattle crossings through each port of entry along the U.S.-Mexican border: Santa Teresa, Nogales, Laredo, Eagle Pass, Hidalgo, Douglas, Columbus, Del Rio, Presidio, and San Luis (Ahn, et al 2016).

Results and Discussion

The model results indicated that closing the Presidio port of entry had a statistically positive effect on exports through the Santa Teresa port of entry. The Santa Teresa port experienced increased flows of live cattle imports with about 24,000 more cattle per month

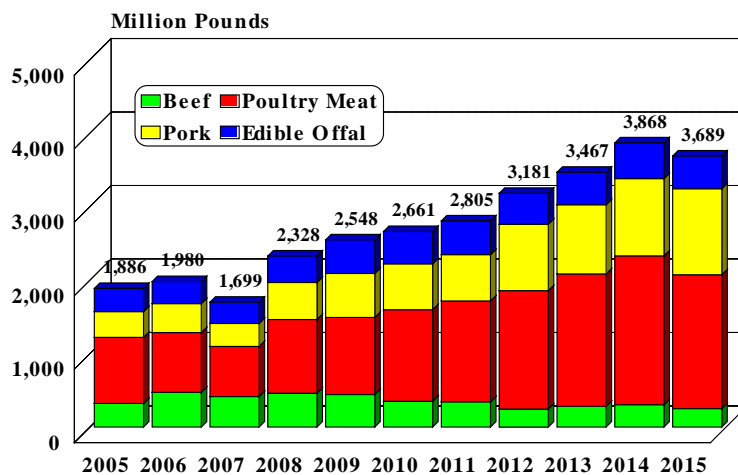
imported. The number of cattle imported through Santa Teresa declined by about 15,000 head per month when a temporary facility was opened in Presidio. The opening of the temporary facility did not recapture the previous level of cattle imports handled before the closure.

This study of port closures highlights the impact of port closures on changing trade patterns. The work quantifies the ability of temporary facilities to partially offset the effect of the closure of permanent facilities. Closures may also contribute to changing meat flows between the U.S. and Mexico. Difficulties in moving live animals may provide an incentive to keep those animals in Mexico to be fed and processed there. That may mean small increases in beef exports to the U.S. and decline in U.S. beef exports to Mexico in the future.

Geographic Flows of U.S.-Mexico Meat Complex Trade

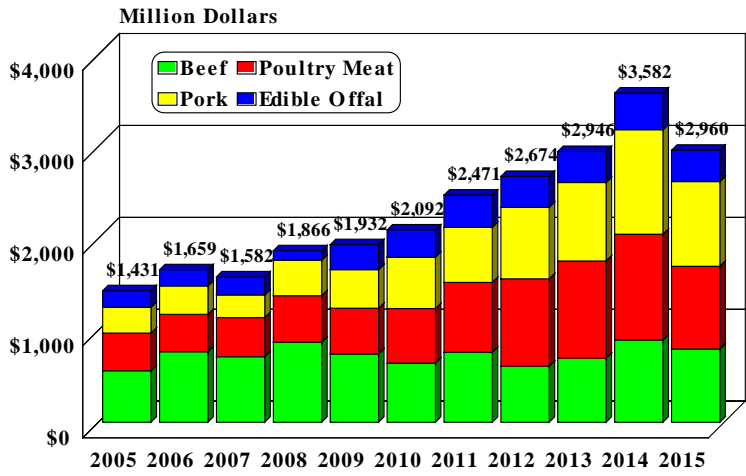
When considering the geographic flows of U.S.-Mexico meat complex trade, it is clear that nearly all of this trade occurs over the vast land border between countries. For U.S. beef, pork, edible offal, and poultry meat exports to Mexico during 2015 totaled 3.69 Blb of product weight, and 99.9 percent enter Mexico via truck over land borders. These meat exports are valued at \$2.96 billion. Figures 6 and 7 illustrate that, while important, beef has the lowest volume of the four types of meat exports to Mexico and is third in value. Poultry meat has generally been highest in terms of volume with pork and edible offal overtaking beef in 2008 and 2009, respectively. In terms of value, poultry meat and pork both surpassed beef in 2012.

Figure 6. Volume of U.S. Exports of Beef, Pork, Poultry Meat, and Edible Offal to Mexico via Land Border



Source: USDA/FAS Global Agricultural Trading System

Figure 7. Value of U.S. Exports of Beef, Pork, Poultry Meat, and Edible Offal to Mexico via Land Border



Source: USDA/FAS Global Agricultural Trading System

The Laredo customs district, which includes ports both north and south of Laredo, leads the way for all U.S. meat exports to Mexico. Since 2005, 73.6 percent of U.S. beef exports to Mexico enter through the Laredo district, while 79.2 percent of pork, 71.4 percent of poultry meat, and 79.0 percent of edible offal enter Mexico through the Laredo district. The vast majority of this meat enters Mexico through ports located in Laredo: over 99 percent in the case of beef, 91 percent of poultry meat, 86 percent of edible offal, and 75 percent of pork. The Pharr and Brownsville crossings are the other important Laredo district ports with some product also moving through Eagle Pass.

The other land border customs districts are El Paso, Nogales, and San Diego. For beef exports, 12.4 percent has moved through the San Diego district since 2005, namely the ports of Otay Mesa, Calexico, and Calexico East. About seven percent moved through both El Paso and Nogales. About 11.4 percent of pork was shipped through El Paso, six percent through the San Diego district, and three percent through Nogales. For poultry meat, about thirteen percent moved through El Paso while nearly 12.5 percent moved through the San Diego district ports and 3.4 percent through the Nogales district, which includes some movement through San Luis in the case of poultry meat. Finally, about eight percent of edible offal used Nogales and El Paso from 2005-2015 while the San Diego district ports of Otay Mesa and Calexico accounted for the remaining five percent.

The share of U.S. meat exports to Mexico using the various customs districts has changed over time. Whether U.S. exports have increased as in pork, poultry meat, and edible offal, or decreased as with beef, the dependence on the Laredo district in general and Laredo's ports of entry in particular has grown. For instance, Table 1 illustrates that from 2005-2015, 73.6 percent of beef exports to Mexico used the Laredo district. However, that rate was only 70.5 percent from 2005-2010 before jumping to 77.3 percent for the 2011-2015 time period.

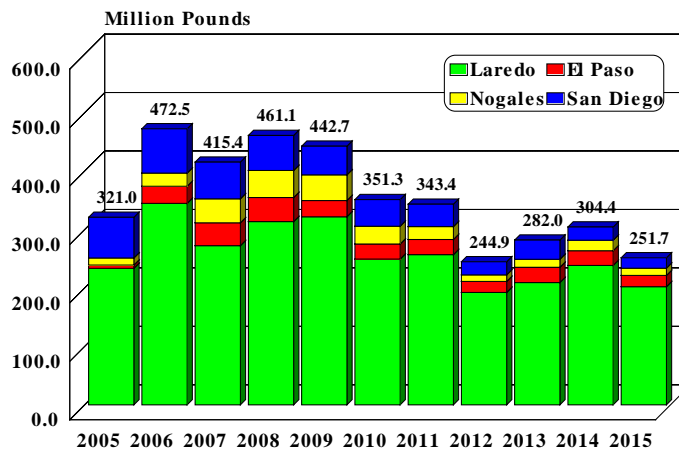
Table 1. Customs District Shares of U.S. Meat Exports to Mexico

		2005-2015	2005-2010	2011-2015
<i>Beef</i>	Laredo	73.6%	70.5%	77.3%
	San Diego	12.4%	15.0%	9.3%
	El Paso	7.3%	6.7%	8.1%
	Nogales	6.7%	7.8%	5.3%
<i>Pork</i>	Laredo	79.2%	77.5%	81.3%
	El Paso	11.4%	12.5%	10.2%
	San Diego	6.4%	6.4%	6.4%
	Nogales	2.9%	3.6%	2.0%
<i>Poultry</i>	Laredo	71.4%	69.7%	73.4%
	El Paso	12.9%	13.0%	12.7%
	San Diego	12.4%	14.2%	10.3%
	Nogales	3.4%	3.1%	3.7%
<i>Edible Offal</i>	Laredo	79.0%	76.8%	81.7%
	Nogales	8.1%	9.7%	6.2%
	El Paso	7.8%	7.3%	8.5%
	San Diego	5.0%	6.3%	3.6%

Source: Global Agricultural Trade System, Foreign Agricultural Service, USDA

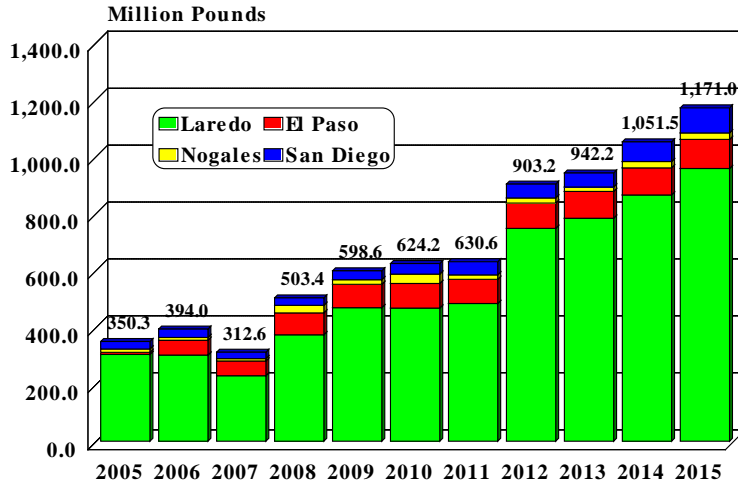
Similar trends hold for the other major meat categories, and figures 8-11 further illustrate these trends. The El Paso district has become more important for beef exports while San Diego, though still ranked second for the entire time period, and Nogales have become less so. For pork, El Paso and Nogales have seen their shares drop while the San Diego district has held steady. Further, El Paso and Nogales have held relatively stable in poultry meat while San Diego has dropped while the El Paso district saw its share of edible offal exports increase while San Diego and Nogales each fell.

Figure 8. U.S. Beef Exports to Mexico by Port District



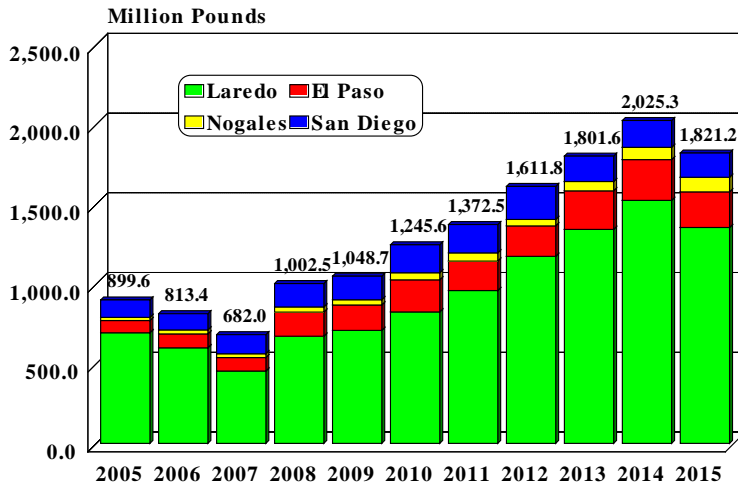
Source: USDA/FAS Global Agricultural Trading System

Figure 9. U.S. Pork Exports to Mexico by Port District



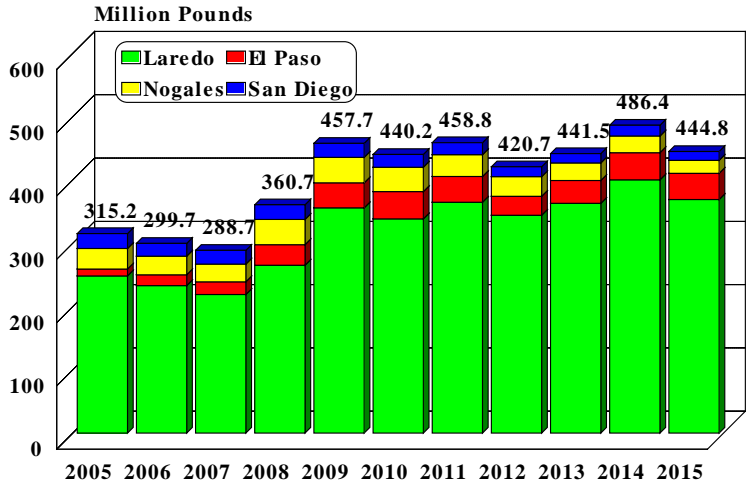
Source: USDA/FAS Global Agricultural Trading System

Figure 10. U.S. Poultry Meat Exports to Mexico by Port District



Source: USDA/FAS Global Agricultural Trading System

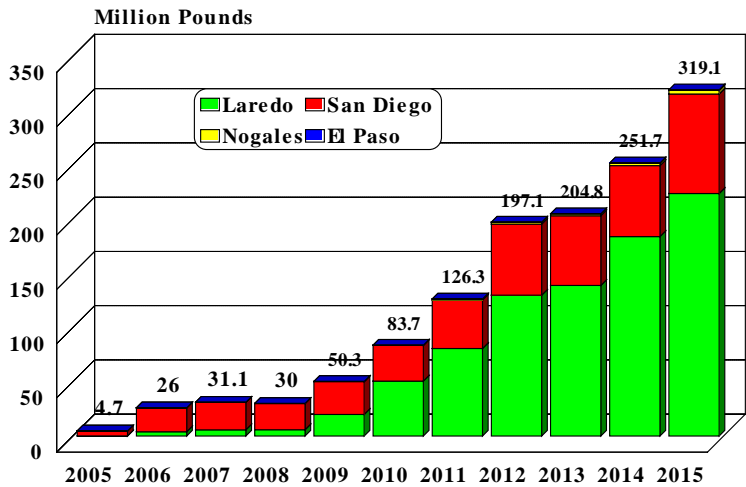
Figure 11. U.S. Edible Offal Exports to Mexico by Port District



Source: USDA/FAS Global Agricultural Trading System

The discussion of meat imports from Mexico by customs district is much more direct as the United States imports only beef in significant quantities. Of the 356.8 Mlb of Mexican meats (product weight) entering the United States, 319.0 Mlb or 89.4 percent is beef (figure 12). Just over seventy percent of the beef imported from Mexico, or 223.5 Mlb, enters through the Laredo district, and nearly all of that through ports located in Laredo. The other important district for U.S. beef imports from Mexico is San Diego as the ports of Otay Mesa, Calexico, and Calexico East typically combine to handle the remaining beef imports. There is no Mexican beef entering through the El Paso and Nogales districts. For the 205,300 pounds of U.S. pork imports from Mexico, about three-quarters enters through the Nogales district while most of the remainder enters through Laredo. For the 172,800 pounds of U.S. edible offal imports from Mexico, about 60 percent enter the Laredo district while the remainder enters via the San Diego district.

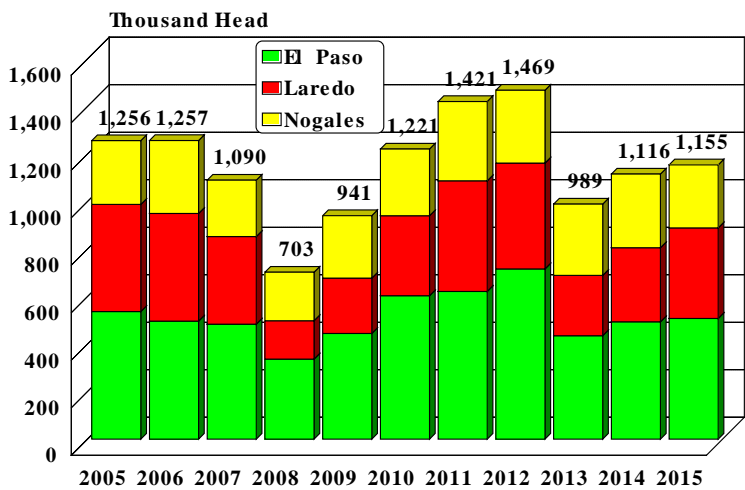
Figure 12. U.S. Beef Imports from Mexico by Port District



Source: USDA/FAS Global Agricultural Trading System

The other major meat complex import from Mexico is that of live cattle. Through previously discussed, it is important to highlight them again. Mexican exports of live cattle to the United States typically total over one million head each year, with a recent high of 1.47 million head in 2012 and a low of 703,000 head during 2008 (figure 13). Most of these cattle are lighter, under 700 pounds, and require finishing at U.S. feedlots or even put on wheat or other pasture before being finished. Most of these cattle enter the United States through the El Paso customs district, namely Santa Teresa, NM, but many flow through the ports of both the Laredo district and the Nogales district.

Figure 13. U.S. Live Cattle Imports from Mexico by Port District



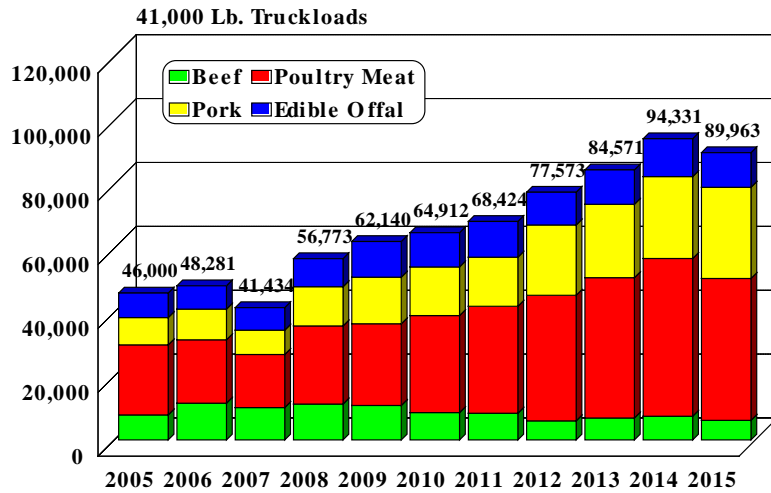
Source: USDA/FAS Global Agricultural Trading System

Truck Flows of U.S.-Mexico Meat Complex Trade

Another way to analyze the growth in meat complex trade between the United States and Mexico is by the trend in truck traffic. Industry has indicated that while they typically try and load a container to the 42,000 pound maximum, they sometimes ship as little as 40,000 pounds in a container. Therefore, an average of 41,000 pounds was used to approximate the number of trucks required to transport U.S. meat exports to Mexico and U.S. beef and cattle imports from Mexico.

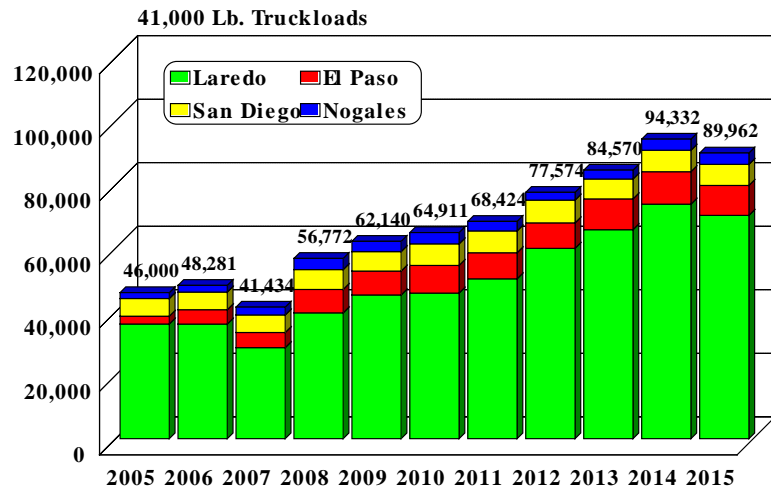
Figure 14 illustrates that the number of trucks required to transport U.S. meat exports to and throughout Mexico grew from 46,000 truckloads in 2005 to 94,331 truckloads in 2014 before dipping slightly in 2015. Further, most of these exports use the Laredo customs district to facilitate the shipments, accounting for more than 70,000 truckloads for both 2014 and 2015 (figure 15). This increased number of truckloads using the Laredo port district emphasizes the importance of infrastructure improvements, particularly in eastern Mexico. Most of the shipments through Laredo and surrounding ports continue south to Monterrey, Mexico City, and population centers along the way.

Figure 14. U.S. Meat Exports to Mexico via Truck by Type



Source: USDA/FAS Global Agricultural Trading System

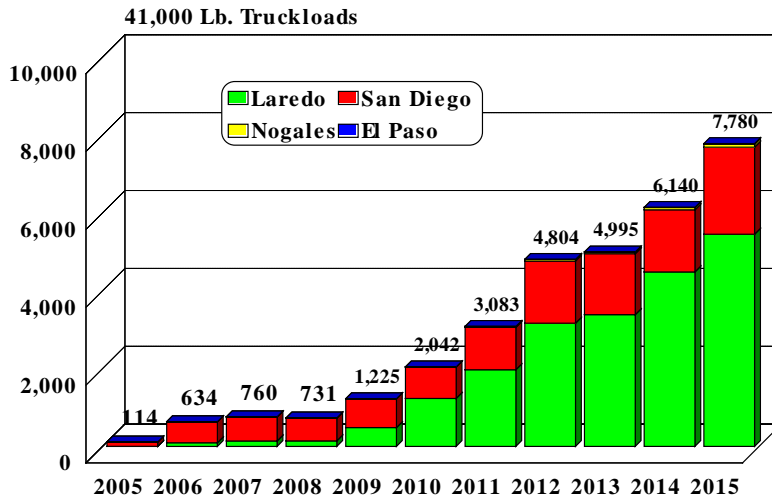
Figure 15. U.S. Meat Exports to Mexico via Truck by Customs District



Source: USDA/FAS Global Agricultural Trading System

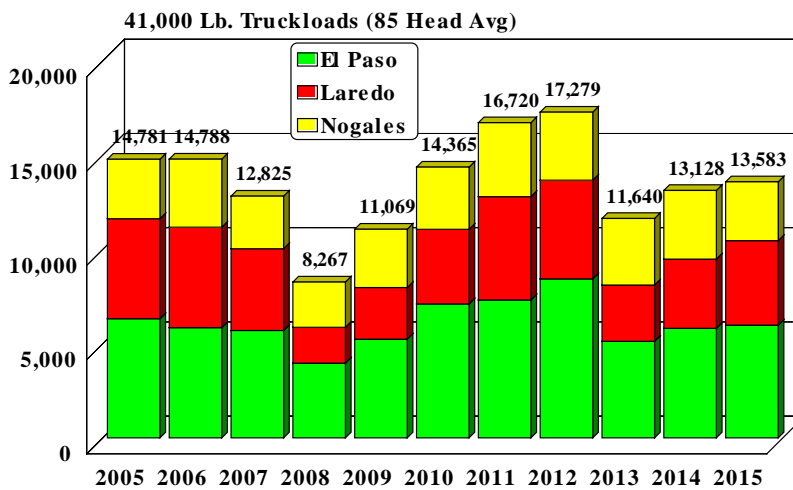
For imports, figure 16 shows that U.S. beef imports grew from 114 truckloads in 2005 to an estimated 7,780 truckloads in 2015, and the vast majority of that entered through the South Texas ports of the Laredo district while most of the remainder entered through California. For cattle imports from Mexico, the situation is a little different as there has been a more varied trend in that trade. Using an average of 85 head per truckload, about 13,583 truckloads were required to ship the 1.15 million head of Mexican cattle into the United States (figure 17). The largest port of entry for Mexican cattle is Santa Teresa, NM, which is part of the El Paso customs district. However, the Laredo and Nogales districts are also important.

Figure 16. U.S. Beef Imports from Mexico via Truck by Customs District



Source: USDA/FAS Global Agricultural Trading System

Figure 17. U.S. Cattle Imports from Mexico via Truck by Customs District



Source: USDA/FAS Global Agricultural Trading System

Please note that fewer larger animals and a greater number of smaller animals can fit on a trailer while maintaining the maximum weight limit. As the majority of animals entering through the El Paso and Nogales districts are larger, those data may be underestimated while Laredo may be overestimated due to their higher proportion of small cattle imports.

Recent and Ongoing Improvements to Mexican Infrastructure

As nearly all U.S.-Mexico meat and livestock trade is transported by truck, it is extremely important that truck transportation be as efficient as possible, allowing U.S. shippers to reach customers throughout Mexico in a timely manner. To that end, Mexico has been consistently improving their highway system.

In 2006, twelve years after the implementation of NAFTA, the Mexican highway network served much of the country and facilitated trade with the United States (figure 18). There was major highway access for border crossings at Brownsville/Matamoros, McAllen/Reynosa, Laredo/Nuevo Laredo, Eagle Pass/Piedras Negras, El Paso/Ciudad Juarez, Nogales/Nogales, Calexico/Mexicali, and Otay Mesa/Tijuana. Of course, other U.S.-Mexico border crossings such as Del Rio/Ciudad Acuña and San Luis/San Luis Rio Colorado had access to lesser highways that eventually connected to the major Mexican highways.

Once in Mexico, traveling on to Monterrey and Mexico City was fairly direct although the roads were crowded and the roadway itself was in need of both expansion and maintenance. Further, it was becoming necessary to circumvent the growing cities on the route as trucks would encounter a good deal of congestion. Each city represented a bottleneck. Further, some highways, such as those headed towards Guadalajara, Manzanillo, Mazatlan, and Guanajuato, would become smaller highways and more dangerous roads.

Figure 18. Mexico Main Highway Network, 2006



Source: Secretaría de Comunicaciones y Transportes, Programa Nacional de Infraestructura 2007-2012

By 2012 and following a concerted effort by the Government of Mexico, the highway network had been greatly improved (figure 19). The U.S.-Mexico border crossings which were

Figure 19. Mexico Main Highway Network, 2012



Source: Secretaría de Comunicaciones y Transportes, Programa Nacional de Infraestructura 2007-2012

already served by a major highway continue to be served, but those highways now have more lanes, and there are numerous cities in route which now have by-passes. Other border crossings now have either direct major highway access or improved access to major highways. This includes Del Rio/Ciudad Acuña, San Luis/San Luis Rio Colorado, Rio Grande City/Ciudad Camargo, and the Colombia Bridge outside of Laredo.

Further, highways which ended short of major and growing markets such as Guadalajara, Manzanillo, Mazatlan, and Guanajuato were extended and expanded. In fact, product can now be shipped all the way from Laredo and the Lower Rio Grande Valley to Mazatlan without using the dangerous “Devil’s Backbone” set of winding, steep roads between Mazatlan and Durango. The construction of the Baluarte Bridge, 114 additional bridges, and 61 tunnels in the Mazatlan to Durango on Mexican Federal Highway 40 are finished (figure 19). This new portion of the highway covers more than 140 miles and is expected to reduce transportation time by six or more hours between South Texas ports and Mazatlan.

When the construction of the Highway 40 improvements commenced, the belief was that it would make the west coast of Mexico more accessible to U.S. exporters while at the same time

making Texas, southeast U.S. and Midwest markets more accessible to western Mexico exporters. However, according to U.S. meat exporters, the improvements made to the north-south highways, mainly Federal Highway 85 (figure 19), are more important as Monterrey and Mexico City and the two cities' surrounding markets are destinations for most U.S. meat exports to Mexico. Therefore, the increased maintenance, increased number of lanes, including tolled alternatives (Federal Highway 85B), and the ability to bypass some cities as needed has helped to make the transport of U.S. meats to Mexican markets more efficient.

What the improvements to the east-west Highway 40 and other east-west corridors did provide was the more efficient transport of Mexican products within Mexico and to the U.S. border, including meat (figure 19). Among other changes within Mexico which will be discussed later, the improved east-west Mexican highways allowed companies like SuKarne, a meat processor based in Culiacán, Sinaloa in the west but with plants located also in Durango, Michoacan, Nuevo Leon, and Baja California, better transportation routes. This enabled these companies to reach the north-south corridors more easily, including markets in both the Mexico and the United States. Thus, the improvements to Highway 40 and other east-west highways created increased competition for U.S. meat exporters in both Mexico and at home.

Mexican Cold Storage Capacity

Another improvement to Mexican infrastructure is the increased amount of cold storage that was constructed to service the growing chain retail, food service, and Mexican meat packing industries. While the cold storage capacity is privately held, the expansion of this capacity is crucial to the efficient movement of meats within Mexico, whether it is U.S. or Mexican produced meat.

According to the International Federation of Refrigerated Warehouses, Mexico increased their warehouse capacity at an average compound annual rate of 26.5 percent from 2008 to 2014, reaching 172.0 million cubic feet (mcf). Further, Mexico boasts 31 members of the Global Cold Chain Alliance (GCCA), accounting for 70.8 mcf of storage space. While not all Mexican cold storage operators are a part of GCCA, Mexican members do account for about 41 percent of cold storage capacity in Mexico. Therefore, the dispersion of the Mexican GCCA membership is illustrative of the demand for cold storage in Mexico – near the border, near large markets, and near transportation corridors (figure 20). Finally, not all of this storage space is solely for meat because Mexico also has a vibrant fruit and vegetable industry. This is indicative of the increased amount of U.S., Mexican and meat from other countries being shipped and stored within Mexico.

Among the important impacts of expanded cold storage in Mexico has been the ability for Mexican buyers of pork to “buy right,” that is, they can now purchase larger quantities of beef

and pork when prices are lower as they now have more capacity for the storage of the product until they need to sell it in the marketing chain. This allows for a more centralized distribution system for Mexican retailers and further processors, and provides a more efficient method of buying from both U.S. and Mexican meat packers. Hence, U.S. meat exporters are facing increased competition from the Mexican meat industry.

Figure 20. Global Cold Chain Alliance Members in Mexico, 2016



Source: Secretaría de Comunicaciones y Transportes, Programa Nacional de Infraestructura 2007-2012 and Global Cold Chain Alliance

U.S. Cold Storage Capacity

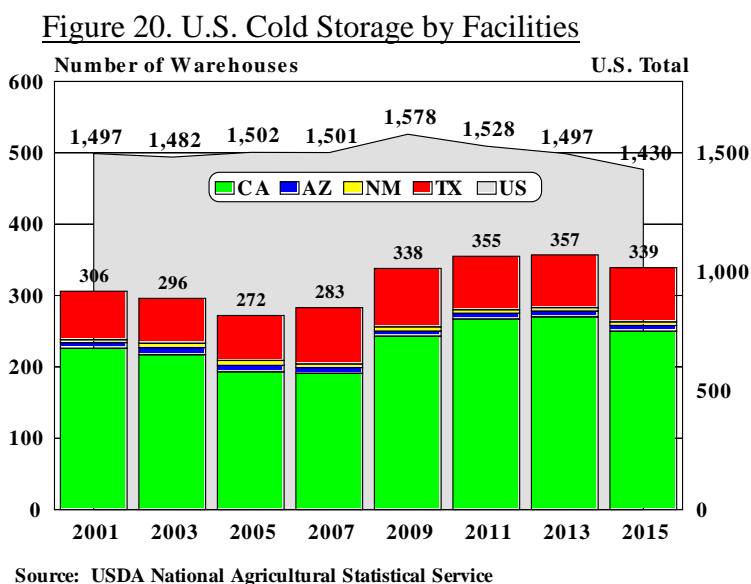
Livestock products typically move through trade as fresh or frozen or already cooked or processed. These products require refrigeration or freezers to remain in good condition. The growth in refrigerated capacity has to occur to support meat and other livestock product trade growth.

The National Agricultural Statistics Service (NASS) does a biannual survey of the capacity of refrigerated warehouses. The latest report was published in January 2016 for 2015’s capacity. The refrigerated capacity report goes back to the 1930s with some aspects of it reaching back to the 1920s. Data back to 2001 is used for this research to highlight industry

changes over that period. This report is a useful supplement to the monthly Cold Storage report also released by NASS.

State level data on the number of warehouses, type of ownership, total refrigerated space broken down into cooler and freezer space is reported. Type of ownership is reported for private and public space. Private space refers to warehouse space that is owned by a company for its own products. Public space is that which is owned by a business that warehouses goods for others.

Since 2001 the total number of refrigerated warehouses in the U.S. has declined by about 4.5 percent, from 1,497 to 1,430 (figure 21). It is important to note, as in any survey, changes in numbers from one year to another can vary as more or fewer entities answer the survey. Changes in the number of respondents or in the number of surveys sent out can have an effect on the results.

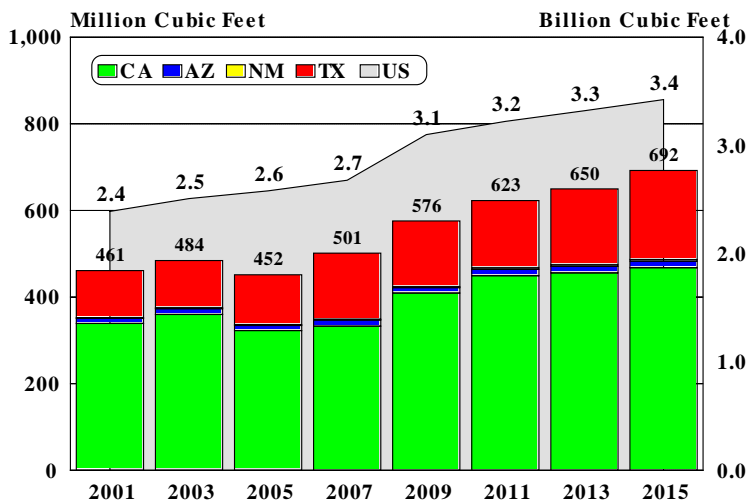


While the number of reported warehouses has declined nationally, the number of refrigerated warehouses has grown in the states bordering Mexico. The number of California warehouses grew by 10.6 percent, from 226 to 250 over the 2001 to 2015 period. Texas warehouses grew from 68 to 76 (almost 12 percent) over the same period. As a share of total U.S. warehouse capacity, the states bordering Mexico grew from about 18 percent in 2005 to 23.7 percent by 2015.

For the purposes of this report warehouse capacity includes public and private and cooler and freezer space are aggregated. While the number of warehouses has declined slightly, the amount of useable refrigerated capacity has grown by 43 percent over the last 15 years. U.S. capacity has increased from 2.4 billion cubic feet (bcf) to 3.4 bcf in 2015 (figure 21). California has the largest capacity of any state and has grown from 339 mcf to 468 mcf of useable space

over the same time period. Storage capacity in Texas grew particularly quickly, by 89 percent over the last 15 years, from 109 mcf to 206 mcf. The other states bordering Mexico, Arizona and New Mexico experienced growth in capacity but from much smaller base area levels than Texas and California.

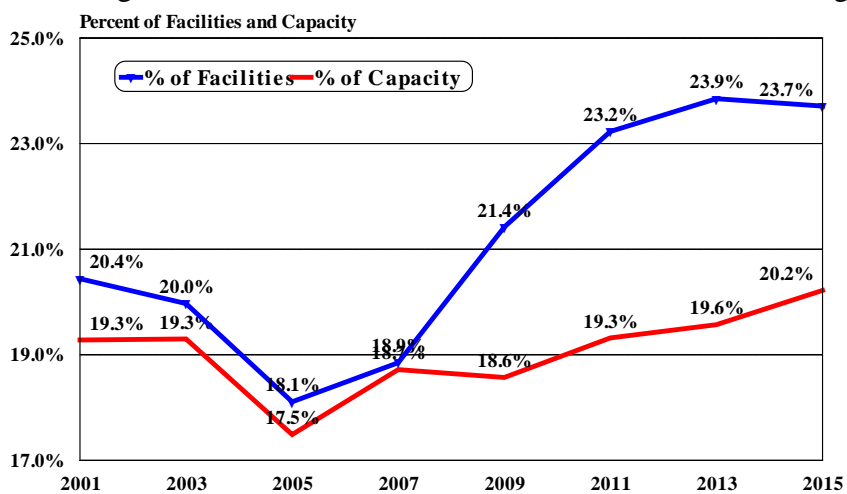
Figure 21. U.S. Cold Storage by Capacity



Source: USDA National Agricultural Statistical Service

The four states that border Mexico have expanded their share of U.S. warehouse capacity since 2001. Border state capacity share has grown from about 18.7 percent to 20.2 percent of U.S. warehouse capacity from 2001 to 2015 (figure 22).

Figure 22. Southern U.S. Border Share of U.S. Cold Storage



Source: USDA National Agricultural Statistical Service

Other Issues Impacting U.S.-Mexico Meat and Livestock Trade

There are other issues which impact U.S.-Mexico meat and livestock trade that were discovered during conversations with U.S. meat industry representatives. One consistent message was that NAFTA was the catalyst for the increased meat and livestock trade and the subsequent infrastructure improvements. The interest generated by NAFTA alone created a greater emphasis on U.S.-Mexico trade as U.S. retailers began to look closer at Mexico for market expansion. Walmart, HEB, and Costco all entered Mexico in the years following NAFTA, bringing their models of warehousing and distribution. This created not only the need for additional cold storage as discussed, but better roads on which to transport product, more refrigerated trailers, better food safety inspection protocols, and more efficient border administration.

As more U.S. meat was exported to Mexico, in part to service the growing number of U.S.-based retail outlets in Mexico, more refrigerated units were needed. In the 1990s, it was standard for U.S. meat in refrigerated trailers to be unloaded at the border and reloaded onto trailers for shipment to their Mexican destination. Part of the reason was the desire to keep control of the refrigerated unit for fear that the U.S. exporter would not get it back or that it could get damaged traveling on Mexican roads. As trade grew and both cold storage availability and quality of highways improved, there was less concern about sending a refrigerated trailer into Mexico.

Industry contacts all mentioned the idea of the “chicken or egg” phenomenon in several areas. For example, did the U.S. companies come to Mexico and then build the infrastructure, or did better infrastructure development in Mexico, in at least some measure, make it possible for those companies to invest and expand into Mexico? It was clear from conversations that the entrance of U.S. companies into the Mexico market forced Mexican companies and the Mexican government to invest in order to compete. The development of U.S. level infrastructure in Mexico allowed Mexican meat companies to begin to compete in the U.S. market. The coming together of a critical mass of investment, infrastructure, companies, and government policy played an important role in Mexico’s economic development, as well as other trade negotiations that increased market access to Mexican exports.

Product quality is probably an area that has been overlooked by many market observers. The interviews indicated that the increased competition in the market in Mexico and investment has drastically improved the quality of food products for consumers in the country. Quality improvement has not been a one-way street. The entrance of Mexican meat companies into the U.S. market has increased the number of choices for consumers both in company and product offerings with a much more consistent quality.

There were also bottlenecks which included border measures. Early in the NAFTA implementation period, paperwork would not be seen by Mexican border personnel until the driver arrived, and there was also a laborious inspection process by SAGARPA wherein product would have to be unloaded for inspection. During this lengthy time at the border, the refrigerated unit would often be unplugged so as to save money during the process. As this took too much time and harmed the quality of the product, solutions such as sending paperwork electronically to Aduanas prior to arrival at the border and an improved Federal Inspection Type system (TIF) were enacted by SAGARPA, shortening the time required at the border. Further, greater trust has been developed so that the standard practice is now to unhitch the refrigerated trailer from the U.S. semi-truck and reattach it to a Mexican semi-truck as opposed to unloading and reloading the product.

As these improvements were enacted and the Mexican consumer became used to a standardized, higher quality set of meat cuts and better availability, Mexican meat packers, further processors and retail chains had to adapt if they wanted to compete. Mexican meat packer SuKarne has numerous plants and is opening a 250,000 head feedlot in Torreon. SuKarne is the main Mexican competition for U.S. meat exporters, Sigma Alimentos, a major Mexican participant in the production of lunch meat and other food products, has been acquiring U.S. franchises in Mexico and expanding their market presence. Processors are continuously expanding and upgrading their plants such as Grupo Bafar in Chihuahua that has a state of the art plant in Chihuahua, and the grocery chain Soriana, which acquired Gigante in 2007, adopted the Walmart style of expansion.

Allowing these improvements in Mexican businesses to provide greater competition to U.S. meat exporters and retailers is the previously mentioned improvements to the east-west highway system in Mexico. While most U.S. product moves north-south, much of the Mexican meat product comes from production regions in Western Mexican states such as Sonora, Chihuahua, and Durango, which must then move east so as to link with the north-south highways. Further, Mexican meat packers and processors have gotten so efficient that they have been acquiring Federally Inspected Type (TIF) certification to export their product to both the United States and other markets. Thus, it is clear that the improvements to the Mexican highway and related infrastructure has generated not only more efficiencies for U.S. exports to Mexico, but has also created greater competition in Mexico, the United States, and elsewhere.

Summary and Conclusions

Meat and livestock trade between the U.S. and Mexico is a dynamic and growing industry. Meat, as a perishable product, requires investment and improvement in transportation and cold storage infrastructure to allow trade to flourish and grow. This study examines the growth in livestock and meat trade between the U.S. and Mexico in the context of the growth in transportation infrastructure.

Over the last decade, Mexican highway infrastructure serving major border crossings has improved to include more lanes and by-passes around numerous cities. Most highways serving U.S. meat exports are north-south oriented highways. Other border crossings have either direct major highway access or improved access to major highways. Further, highways which ended short of major and growing markets such as in central and western Mexico now are extended. East-west Mexican oriented highways are also expanded.

Interviews with market participants highlighted the classic “chicken or egg” question, but in the context of expansion and growth in meat transportation infrastructure. In the trade context, the question became what came first: U.S. company expansion then infrastructure growth and investment, or alternatively did infrastructure investment precede company expansion? The answer is that the entrance of U.S. companies into the Mexico market forced Mexican companies and government to invest to compete. Company investment and expansion included U.S. companies expanding into Mexico and Mexican companies expanding into the U.S. market.

Interviews also highlighted that the competition from U.S. companies expanding into Mexico forced domestic companies to invest in order to survive and compete. The competition applies to U.S. companies also as system improvement has allowed Mexican companies to successfully compete in the U.S.

A third highlighted area is food quality. Interviewees noted that the improvements in infrastructure have dramatically improved food quality in Mexico. Attempting to measure food quality improvements is beyond the scope of this work, but it seems to be an overlooked area of research in quantifying the impacts of trade growth.

Interviewees noted dramatic improvements in border crossing procedures. These mechanisms to facilitate the import and export process through government cooperation and border infrastructure investment greatly improved the timeliness and ability to trade. This improvement and streamlining of the process might be placed in a research category of reducing transactions costs. But these discussions with meat trade participants highlighted the continued need for ongoing work to further harmonize trade between the United States and Mexico.

Cold storage capacity has grown on both sides of the border. Mexican cold storage capacity grew at an average annual compound rate of 26.5 percent from 2008 to 2014, enhancing efficiency for both U.S. exporters and Mexican meat packers. Also over the last decade, the percent of total U.S. cold storage capacity in the states bordering Mexico has grown to just over 20 percent of the nation's capacity and each border state has experienced capacity growth.

Lastly, border conflicts can continue to disrupt trade. This paper highlights a recent study of the effects of border closures on U.S. live cattle imports from Mexico. Port of entry closures due to border violence shifted cattle to different ports of entry. The opening of temporary import facilities did allow cattle to be imported through those ports, but the numbers imported were much smaller.

The growth in investment has set the stage for continued trade growth between these two countries. Expanding meat production and consumer incomes will likely foster increased trade. A number of areas for future research and interest emerged from this work. There is an opportunity to continually improve border processes that will make trade less costly. Quantifying the costs and benefits of process improvement would be useful. Identifying future needs for road improvement would allow for optimum investment choices and government action. Continued growth in Mexican meat exports to the U.S. is a major change in historical trade flow patterns. Further research should estimate the impact of the continued growth in Mexican meat exports on the structure and patterns of the U.S. and North American meat markets.

References

Adcock, Flynn, Luis Ribera and Daniel Hanselka, *Economic Impacts of Increased U.S. Imports of Fresh Produce from Mexico by 2023*. Department of Agricultural Economics, Texas A&M University/Texas A&M AgriLife Extension Service/Texas A&M AgriLife Research. CNAS Report 2016-1, February 2016

Ahn, H., L. Ribera, D.P. Anderson, and D. Riley. *The Effects of Border Violence on US.-Mexican Cattle Trade*. Paper Presented at the Southern Agricultural Economics Association Annual Meeting. February, 2016.

Brezosky, L. 2014. "USDA Reopens Ojinaga Inspection Facility." *San Antonio Express News*, July 27, 2014. Accessed February 9, 2015, Available at: <http://www.expressnews.com/news/us-world/border-mexico/article/USDA-reopens-Ojinaga-inspection-facility-5650364.php>.

GATS, FAS/USDA. <http://apps.fas.usda.gov/gats/default.aspx>

Maras, Elliot. "Useful Insights on Rising Global Cold Storage Capacity." *Food Logistics*, Mar 4, 2015.

Matheis J., J.D. Garcia, and A.T. Halpern. "Dismay, Economic Concern Greet USDA Cattle Inspection Facility Move." *Big Bend Now*, December 20, 2012. Accessed November 3, 2014, Available at: <http://bigbendnow.com/2012/12/dismay-economic-concern-greet-usda-cattle-inspection-facility-move/>.

Salin, Victoria. *2014 IARW Global Cold Storage Capacity Report*. International Association of Refrigerated Warehouses, Alexandria, VA, 2014.

Secretaría de Comunicaciones y Transportes, Government of Mexico. Programa Nacional de Infraestructura. 2007-2012.

<http://es.slideshare.net/jisj20/programa-nacionalinfraestructura2007-2012-integrado>

Texas Department of Agriculture. 2010. *USDA Suspends Imports Livestock Inspection in Reynosa and Nuevo Laredo*. Austin, Texas. Accessed November 12, 2014, Available at: <http://www.texasagriculture.gov/NewsEvents/TDAPublications/TradeActionNetwork/USDASuspendsImportLivestockInspection.aspx>.

U.S. Trade in Goods by Country, U.S. Census Bureau. <http://www.census.gov/foreign-trade/balance/index.html>

U.S. Meat Export Industry Representatives: Agri-West International, Cargill, JBS. Mexican Market Overviews and Related Information Provided by Industry via Personal Phone Calls.

USDA, FAS. Livestock and Products Annual: Outlook for Production and Trade Bright While Consumption Remains Affected by Prices. GAIN Report Number MX3062, August 15, 2013.

USDA, FAS. SAGARPA to Provide USD 50 Million for Abattoirs and Processors. GAIN Report Number MX4011, February 4, 2014.

USDA, NASS. *Cold Storage*. Various Issues. 1980-2016.

USDA, NASS. *Capacity of Refrigerated Warehouses, Annual Summary*. Various Issues, 1980-2016.

World Institute for Strategic Economic Research. WISERTrade. www.wisertrade.org