Modal Choices in the Transportation of U.S.-Mexico Agricultural Trade

Delays Accompany Growth in U.S.-Mexico Trade

Between 1995 and 2000, U.S.-Mexico trade of all types more than doubled to $247 billion, with over 4.2 million truck border crossings in 1999. In 2000, Mexico was the fourth largest market for U.S. agricultural exports ($6.5 billion) and the third largest source of agricultural imports ($5.1 billion). However, greatly increased volumes have been accompanied by significant border congestion, especially for trucks at principal ports of entry. Delays can range from several hours to a full day or more.

Congestion is exacerbated by the way in which truck cargoes now move across the U.S.-Mexico border. NAFTA's architects envisioned a transportation system in which trucks from each NAFTA country would be able to move freely within the three-country region. Canadian and U.S. trucks are allowed to move anywhere within Canada and the United States. In contrast, the United States delayed implementation of NAFTA's motor carrier provisions that provide Mexican trucking firms with greater access to the United States. The reasons cited for the delay included concerns about overweight equipment, truck and trailer condition, driver safety, language difficulties, and a lack of regulations defining the maximum hours in which a driver may work in a given period. On May 3, 2001, the United States issued proposed rules to implement those provisions, following a unanimous decision against the United States by a NAFTA Arbitration Panel. At this point in time, however, Mexican trucks are still limited to a "commercial zone" about 30 kilometers beyond the point of entry.

U.S.-Mexico trade also must comply with other requirements. Exports from the United States must be cleared by a U.S.-based Mexican customs broker. Agricultural commodities moving northbound must be inspected first by Mexican and then U.S. authorities, while agricultural commodities moving southbound must be inspected by Mexican agricultural authorities on the U.S. side of the border.

The inability of Mexican trucks to continue beyond the commercial zone to final destinations within the United States, coupled with the complexities of paperwork and inspections, has resulted in the development of a peculiar cross-border transportation system. Long-haul trucks drop their trailers at holding lots on the Mexican side of the border, where the load waits for paperwork and inspections to be completed. The trailer is then taken across the border by a special "drayage tractor," normally authorized to circulate only within the commercial zone. Finally, the trailer is dropped in a U.S. holding lot, where a U.S. long-haul tractor takes the trailer to its final destination.

Several studies have attempted to quantify the total delay costs along the entire U.S.-Mexico border. The most recent comprehensive study, completed in late 2000 by the Mexican Secretariat of Communications and Transport (Secretaría de Comunicaciones y Transport—SCT), placed this cost at $77.4 million in 1999.[1] Although these studies differ in terms of their methodologies, they all yield the same general conclusion: delays at the U.S.-Mexico border result in significant economic costs. Are these delays instrumental in diverting cargoes from truck to other modes of transportation, such as rail or coastal shipping? And how do these modes compete?

Nearly 70 percent of northbound and 20 percent of southbound agricultural products moving across the U.S.-Mexico border are perishable goods with high unit values. Northbound traffic of agricultural products consists mainly of fresh and frozen fruits and vegetables, while southbound perishables consist primarily of chilled and frozen meats, poultry, and dairy products moving to large food processors and distributors. As they do within the United States, these commodities move largely by truck and are very resistant to diversion to other modes, such as ocean shipping or rail, despite the numerous difficulties described above.

[1] Secretaria de Communicaciones y Transport (SCT), *Impacto del Incremento del Trafico de Carga generado por el Comercio Exterior sobre la infraestructura de la Frontera Norte, Inorme Final*, 2000, p. 76.

There are several reasons for this. First, transit times by truck are generally much shorter than transit times using more complex modal chains. A 4,000-kilometer truck haul from central Mexico to Atlanta, Georgia, takes about 4-5 days, even with possible border delays of up to 24 hours or more. Rail movements over the same route are not common, and it is difficult to estimate theoretical transit times for large volumes. Probably, these would take a minimum of 6-8 days, and possibly much longer. Truck-ship-truck movements may take 10 days, including waiting in port for vessels. Second, inventory costs are usually much lower when using truck, and there are fewer possibilities for damage, compared with using a combination of transportation modes. Third, the flexibility inherent in trucking allows for quickly targeted shipments to many destinations and rapid adaptation to changing demand patterns, something that is more difficult for other modes.

Per-mile operating costs for truck can be 2-3 times that of rail systems. Despite this, total logistics costs - that is, transport plus inventory costs - as well as costs of lost quality, can be much higher for rail than for truck. The SCT has studied total logistics costs for a variety of agricultural commodities moving between Nuevo Laredo and Mexico City, including fresh vegetables, dressed poultry, and chilled meat. Theoretical rail logistics costs for these commodities are between 2 and 3 times as high by rail than by truck.[2]

The Improved Efficiency of Mexican Rail Carriers

Despite the strong position of trucking in the perishables market, Mexican rail carriers have become markedly more efficient since privatization and have been successful in attracting bulk commodities such as grain. Trains have become longer, crewing practices more cost-effective, and locomotives and rail cars are often the most modern U.S. models. Transit times on major traffic lanes have improved dramatically over the past decade. Also important is the high degree of coordination with U.S. railroads and the formation of important north-south corridors between central Mexico and the U.S. Midwest and other destinations. Together, these improvements spurred a near doubling of trans-border rail volumes between the early and late 1990's.[3]

As Mexican rail carriers become increasingly similar to their U.S. counterparts, it is expected that they will share a common strength—the efficient movement of "unit trains" of bulk agricultural commodities. Unit trains usually contain 50 cars or more, often dedicated to a single commodity and shipper. These trains are normally loaded at large facilities and are destined to major customers capable of handling large volumes at their own unloading installations. Rail cars in such service may be controlled by the railway, the shipper, or both. The rail carrier normally handles line-haul transportation only, which serves to decrease its costs. Unit trains move through the rail network with a minimum of switching, which serves to decrease costs further and to make transit times lower and more reliable.

These new efficiencies have led to greater market penetration by rail in the movement of grains and oilseeds from the United States. Traditionally, these commodities have moved down the Mississippi Valley, mainly by barge, to Gulf Coast ports and then by ship to Mexican ports like Veracruz. From there, grains have traveled inland to Mexico City and other major destinations by rail. The low unit costs of Mississippi barging and ocean shipping, combined with very efficient terminal transfer processes within the United States, have made this somewhat complex modal chain attractive. Confidential interviews with Mexican transport firms revealed that combined ocean-rail rates may be as much as 10 percent lower than direct rail rates. While ocean transport is still the dominant mode, rail from the U.S. Midwest (largely unit trains) has been gaining steadily. Accurate statistics on the shares of total grain traffic corresponding to ship and to rail are difficult to obtain. It is generally accepted that rail's share was only about 10 percent prior to privatization. Current estimates of rail's share range from 20 percent nationally to higher percentages for grains bound to destinations in northern Mexico.

Challenges Facing Intermodal Rail

Since their privatization, Mexican railways also increased development of intermodal services. Rail

[2] Felipe Ochoa y Asociados, S.C., *Eficiencia de la Infraestructura en Corredores de Transporte, Caso: Mexico-Nuevo Laredo* (Secretaria Comunicaciones y Transporte, December 1998).

[3] See Prentice et al. *Rail Harmonization in Mexico and North America: Implications for Agriculture* for an overview of changes in Mexican rail service.

intermodal transport involves a container or trailer moved by truck to a terminal where it is loaded on a specialized rail car, moved by rail to another terminal where it is unloaded from the rail car, and then moved by truck to the final destination. Railways have promoted intermodal transport as a more efficient alternative to conventional rail service and as a way to compete with trucking. The principle is that the economic gains of long-haul rail transport are sufficient to offset the trucking and terminal costs on both ends, producing total costs that are lower than a direct truck movement between origin and final destination. However, transit times are usually longer and less consistent than by direct truck. Intermodal transport works best when rail distances are long and trucking legs are short, such as from a Mexican auto engine factory to a U.S. vehicle assembly plant, or from a container terminal in Southern California to a distant inland city such as Chicago.

Coordination difficulties, a greater possibility of damage, and longer transit times in comparison to direct trucking usually make intermodal rail a poor choice for high-value perishables. Although the United States has a much more developed intermodal infrastructure than Mexico, intermodal rail and conventional rail each accounted for only 2 percent of domestic perishable movements within the United States in 1999, compared with 96 percent for trucking.[4] Intermodal and conventional rail traffic within the United States usually involves damage-resistant commodities that are relatively insensitive to time, such as potatoes and lettuce. This traffic generally originates in small areas of concentrated production, such as California's Imperial Valley, and serves large shippers with sophisticated distribution systems.

Since the Mexican case typically features smaller shippers and geographically dispersed sites of production, the chances of success for intermodal rail in Mexico are much lower than in the United States. While some intermodal rail shipments from Sinaloa to the United States began in the 1980's, ground has been lost to trucking due to rail service difficulties and the greater efficiencies associated with Mexican trucking. Thefts of copper generator cables and fuel from refrigerated containers also have been a concern. Intermodal shipment of perishables generates little interest among Mexican shippers or railroads, and the immediate prospects for significantly increased transborder shipments of perishables by this mode appear poor.

In contrast, other commodities may eventually see greater use of intermodal rail. Likely candidates include identity-preserved grains and other commodities that are insensitive to time. Such shipments would be largely long-distance movements in which intermodal rail would have cost advantages over trucking and where consistency of service is less critical, compared with perishables. Success will depend on the construction of intermodal terminals in large Mexican population centers and the development of well-integrated trucking services. Smaller grain shippers in particular may find intermodal rail service more attractive than infrequent, larger shipments in conventional rail cars. Newer Mexican food processors lacking rail access may also find this option attractive.

Recent Developments in Maritime Systems

Despite gains by railroads in shipping U.S. grains, Mexican ports and marine terminal companies are not standing still. In 1998, the Port of Veracruz was dredged from 31 to 36 feet. By 2003, the Port plans to dredge to a depth of about 40 feet from the harbor entrance to the grain terminals, possibly to be financed half by the Port and half by the private grain terminal operator, Terminales de Cargas Especializadas (TCE). The ultimate effects of this investment are likely to be subtle and complex. If the improvements materialize, Veracruz could easily accommodate Panamax grain ships, which should lower ocean shipping rates from U.S. Gulf ports by 15-20 percent, making these ports more competitive with the direct rail alternative. But dredging the Port of Veracruz will also lower ocean shipping costs for U.S. competitors in the world grain market, such as Canada and the European Union (EU).[5] Thus, while the market share of rail may erode as a consequence and marine trade may grow, it is not clear if U.S. grain and oilseed exports would gain overall.

In addition, associated transport costs at Veracruz may rise. Over 90 percent of grain imports are distributed

[4] USDA Agricultural Marketing Service, *Fresh Fruit and Vegetable Shipments by Commodities, States and Months, FVAS-4 Calendar Year 1999.*

[5] These findings are the result of vessel cost modeling by Seaport Consultants.

inland by rail. Rail and truck access to the port area is currently constrained by antiquated layouts of the rail yard and marine terminal, as well as by conflicts with truck traffic, which will become more problematic as grain ship and consignment sizes increase and as overall port volumes continue to grow. It is not clear how a landside modernization of road and rail access within Veracruz would be conducted now that the port is split among many private entities and since the port administration today lacks some of the authority of its state predecessor. At this point, the ultimate impact of dredging the Port of Veracruz is unclear. While ocean transport from all grain exporters should become more competitive with the direct rail alternative from the U.S. Midwest, port congestion and poor landside access may cause inland costs to rise.

Other maritime systems, such as the barging of grain cars, have had only mixed success. Rail cars from the U.S. Midwest are loaded onto barges at Gulf Coast ports and sent to Mexico. Lengthy transit times, the large weight of empty equipment (tare weight), and difficulties in providing backhaul cargoes have made these systems only intermittently profitable. Such barge systems seem best suited to areas with limited port facilities for handling ocean vessels and storing grain, or where direct rail service is erratic. In such instances, shipments can be delivered to a final destination much more quickly than through a small or inefficient deepwater port. Several barge services have been launched and discontinued in the past decade. Thus, it is not clear if eventually there will be a niche market for these services as overall trade volumes grow.

High-value Mexican exports have proven difficult to divert from direct trucking to ocean shipping, largely due to the need for lengthy truck hauls from Mexican production areas to Atlantic ports and then from U.S. Gulf Coast ports to major U.S. population centers in the East and upper Midwest. Total transport costs may be similar, but transit times by truck-marine-truck modal combinations are often double those for direct trucking, even given border congestion. These factors have combined to make maritime services for high-value goods moving across the Gulf of Mexico only intermittently successful. Thus, Veracruz is a principal export point for Mexican fruits and vegetables destined for Europe, but not for Mexican fruit and vegetable exports to the United States.

But other ports and maritime services could theoretically serve as alternatives to an increasingly congested U.S. border on certain trade lanes. One such port is Manzanillo, located on Mexico's southwest Pacific coast. Manzanillo is fairly close to the Bajio, an important agricultural region in south-central Mexico that produces mangos, avocados, and other high-value crops. Thus, there may be some long-term potential for north-south trade between Manzanillo and ports on the U.S. West Coast. Manzanillo was a small fishing and general cargo port until recently, when investors from Chile and other countries modernized the port. The aim of these investors is to make Manzanillo an important site for importing Chilean fruits during the Mexican off-season, as well as a modern container port for automotive and other manufactured goods from Asia. Manzanillo is also an important export point for Mexican melons and other fruits bound for Japan and other Asian markets.

Combined truck-ocean rates between the Bajio and California ports via Manzanillo were modeled by Seaport Consulting using vessel, terminal, and other costs. These rates were found to be about 25-35 percent less than the rates charged for direct truck service. However, transit times may be up to 3 times longer by sea than by direct trucking, and currently there is virtually no movement of perishables on this route. Should frequency improve and rates remain low, there may be opportunities to divert northbound and possibly southbound traffic, such as U.S. apples and stone fruit, from direct truck service.

This may especially be true in the case of California apples, which currently are not approved for importation into Mexico. Apples from San Joaquin County moving through the Port of Oakland and apples from Kern County moving through the Port of Long Beach to Mexico City should be very competitive with direct truck service. Both apple-growing areas are relatively close to major seaports, which minimizes trucking distances. Truck-ocean shipping of other products, such as stone fruit grown in the same areas, may also prove competitive with direct truck service.

In addition, there may be opportunities for products from the Bajio, such as mangos and melons, to move north via truck-ocean shipping to California. Containerized shipping, with regular schedules and the ability to handle small consignments, will probably have the edge over conventional refrigerated shipping, which requires a full vessel and in-port storage. It is

known that several shipping lanes are actively investigating this option.

In addition to transportation costs and transit times, there are other factors that contribute to the resiliency of existing routes and modes. Our interviews reveal that agricultural shippers in both Mexico and the United States strongly prefer dealing with established commercial and government contacts with whom they have good working relationships. They are hesitant to try more complex modal chains and new routes, even if costs may be somewhat lower.

Conclusion

Regardless of border congestion, it seems likely that perishables will continue to move by truck and will not be easily diverted to other modes. Rail service will probably continue to improve, as Mexican carriers become more modernized and better integrated with U.S. railroads. Intermodal rail is not likely to gain much high-value agricultural traffic, but it could eventually attract some containerized grains, but only if service levels improve dramatically. As in the United States, rail carriers will probably focus on larger shippers moving unit trains of bulk agricultural commodities. Improvements at the Port of Veracruz should increase the competitiveness of ocean grain shipping from U.S. Gulf Coast ports, and these trade lanes and associated inland links from the Midwest should remain strong. But improvements in Mexican grain ports will also lower costs for U.S. competitors, such as Canada and the EU. Elsewhere, some alternatives to trucking may appear, such as coastwise Pacific services, if frequency becomes sufficient to be competitive.

William J. Hall, Seaport Consultants, Inc.

Note: This chapter was completed in conjunction with activities funded by the USDA Foreign Agricultural Service's Emerging Markets Program. For more information about this chapter, contact William Coyle (202-694-5216, wcoyle@ers.usda.gov).