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Rail Tariff Rates for Grain by Shipment Size and Distance Shipped

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Summary

For most commodities examined in this paper, (grain and oilseeds, fertilizer, food products, grain mill products, and soymeal), inflation-adjusted rail rates (in 2011 dollars) increased from 2004 through 2011, although to different extents, depending on shipment characteristics. Shipments of some commodities had consistently higher rail rates, measured in cents per ton-mile, throughout the period. While rail rates for the various shipment sizes fluctuated differently over the period, rates for many of the shipment distances began rising between 2002 and 2004. In general, smaller shipments have noticeably higher rates than large shipments. Likewise, shipments moving longer distances normally have lower rates per ton-mile than shipments moving over shorter distances. However, agricultural commodity movements vary by shipment size and distance traveled. For instance, most grain mill products move in smaller shipments (less than 50 cars), with occasional large shipments. Grain and oilseeds, on the other hand, consistently move in shipments of all sizes and travel a large variety of distances.

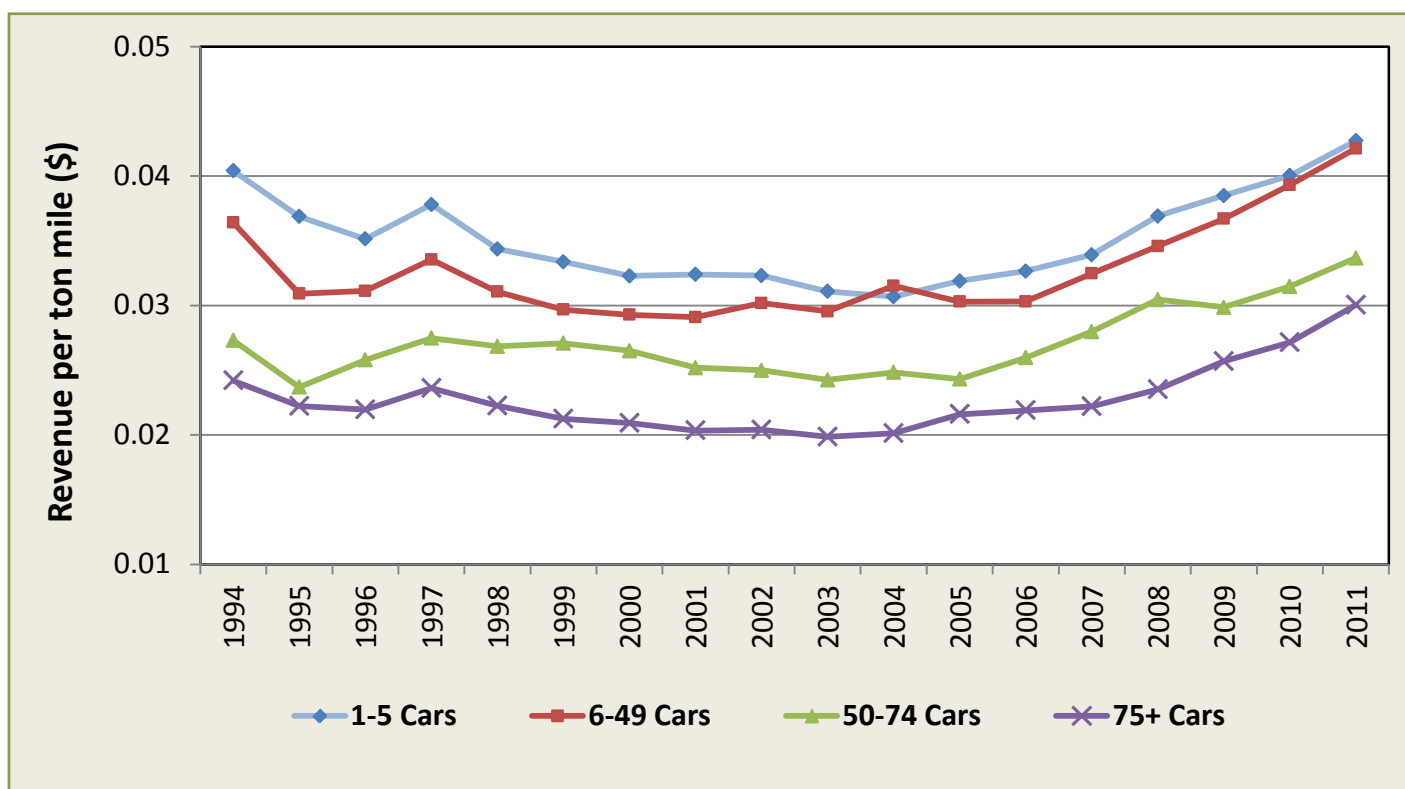
Introduction

This paper examines differences in per ton-mile inflation-adjusted (2011 dollars) rail tariff rates for a variety of agricultural commodities. The two characteristics examined and compared across commodities are shipment size and shipment distance. These characteristics may cause differences in rail tariff rates for commodities, as longer and/or larger shipments may benefit from decreases in per ton-mile rail rates. These benefits are related to the fixed costs associated with rail shipping, such as cost of rail lines, loading, unloading, and switching rail cars, among other factors. As producers and shippers look to rail as an efficient and cost-effective method of transportation, consideration must be given to the characteristics of the shipment: commodity type, shipment size, and distance shipped. A number of questions arise that may impact the choices made by shippers, including:

- Are there significant differences across commodities?
- Do shipments moving over longer distances receive lower rates?
- Does it cost more to ship a small number of carloads of a particular commodity rather than a larger number of carloads?

The following analysis examines shipment size and distance of haul in rail tariff rates to learn how these shipment characteristics differ among rail rates.

Figure 1. Grain and oilseeds inflation-adjusted tariff revenue per ton-mile by shipment size (2011 \$)



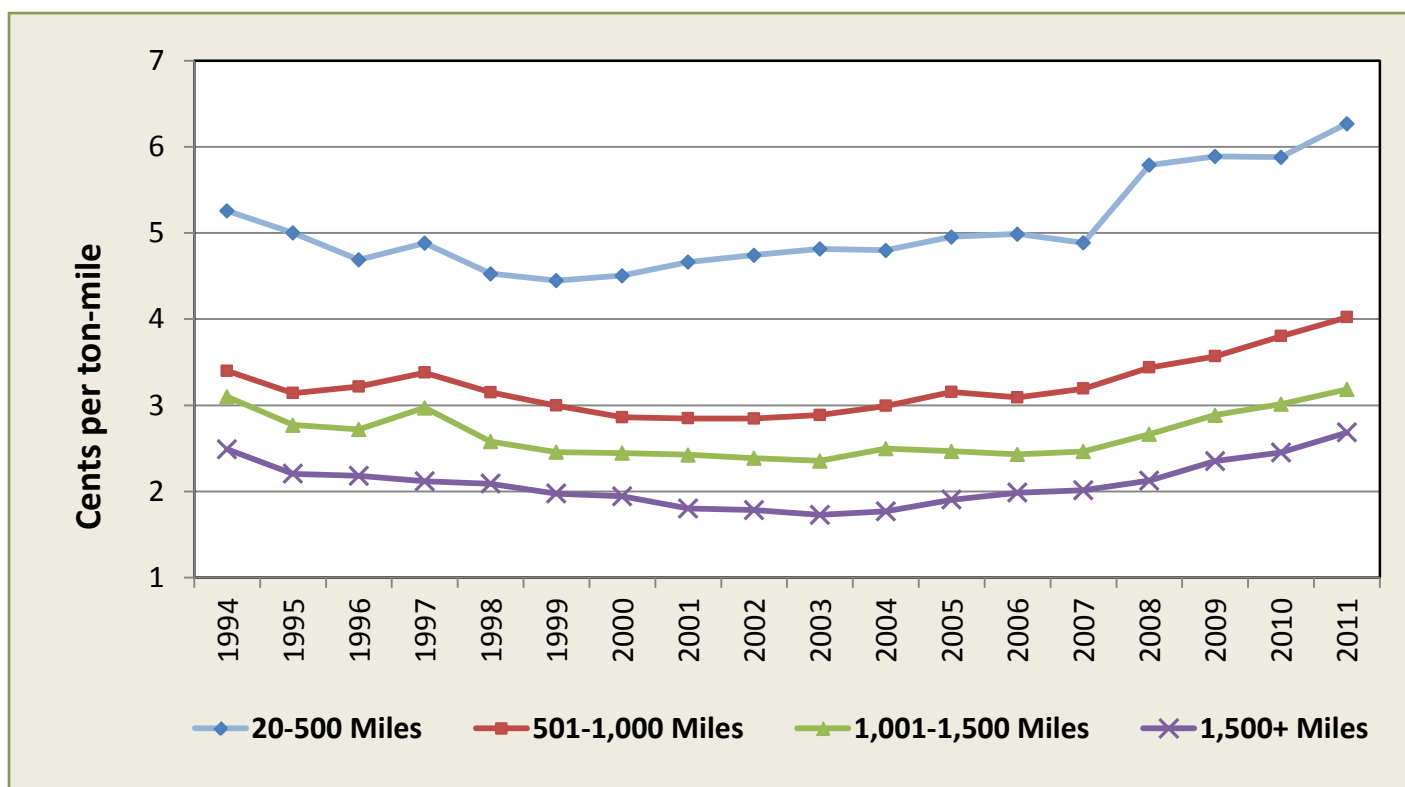
Source: USDA analysis of Surface Transportation Board Confidential Waybill Samples

Comparison of Grain and Oilseed Rail Tariff Rates

The rail rates for grain and oilseed transportation reflect a significant advantage for larger trainload shipments. As seen in figure 1, rates for all shipment sizes have risen since 2003, after trending down since 1994. The inflation-adjusted rates for the smallest shipment size (1–5 cars) have increased 37 percent since 2003. This compares to 43, 39, and 51 percent increases, respectively, for 6–49 car, 50–74 car, and 75+ car shipments. Since 1994, the inflation-adjusted rates for the smallest shipment sizes have only increased 6 percent, while rates for 6–49 car shipments have increased 16 percent. Further, rates for 50–75 car shipments and 75+ car shipments have increased by 23 and 24 percent, respectively. This demonstrates that rates for larger shipments have increased relatively more than those of smaller shipments over the period.

In 2011, rates for the largest shipment size were 3.0 cents per ton-mile, in contrast to 4.3 cents for the smallest movements. Rates for large shipments were 30 percent lower (equivalent to just over 1.3 cents less) than those for the smallest shipment size. In 1994, though, nominal rates for large shipments were 40 percent less than those of small shipments. Furthermore, in 2004, 2010, and 2011, rates for the two smallest movements (1–5 carloads and 6–49 carloads) converged.

Figure 2. Grains and oilseeds inflation-adjusted revenue per ton-mile by shipment distance (2011 \$)



Source: USDA analysis of Surface Transportation Board Confidential Waybill Samples

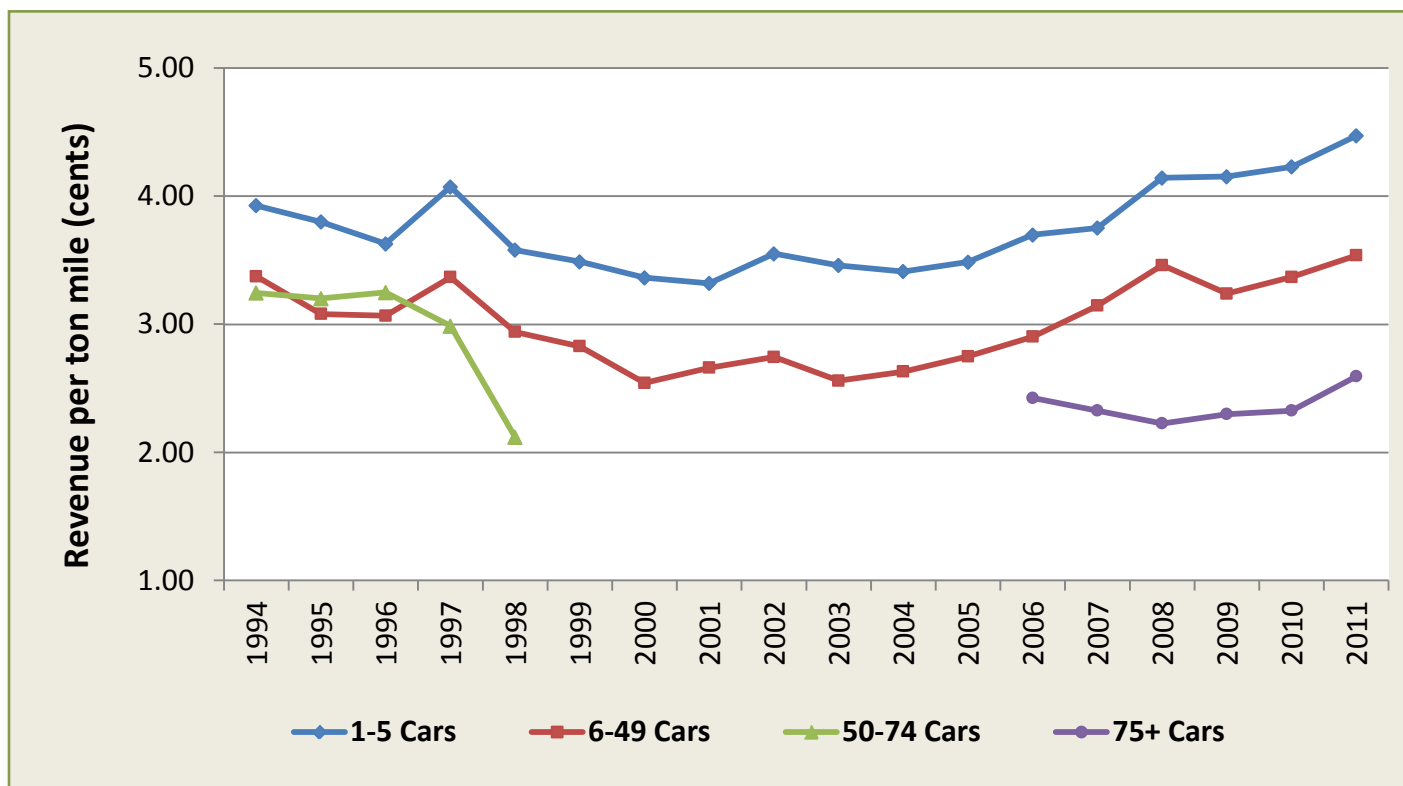
The inflation-adjusted rate disparity between shipments moving different distances is similar to that of rate differences due to shipment size. In 2011, rates per ton-mile for shorter shipments (20–500 miles) were consistently more than 1.5 times the rates for movements over 501 miles in length: 6.3 versus 4.0 cents per ton-mile, respectively. While rates for short hauls started increasing around the year 2000, longer hauls did not see regular increases until around 2004 (see figure 2).

The data used in this paper begins in 1994 and ends in 2011. The shipment distance and size data comes from the Surface Transportation Board's Confidential Waybill Samples. The analysis includes all rail car types; otherwise, some valid data would have been negated by errors in the reporting of rail car type. Only shipments originating in the contiguous United States were considered. For each commodity examined, the annual number of rail shipments was organized into four shipment distance categories and four shipment size categories. The four shipment distance categories are shipments moving: (1) 20–500 miles (referred to as short shipments), (2) 501–1,000 miles, (3) 1,001–1,500 miles, and (4) more than 1,500 miles. Shipments of less than 20 miles were disregarded; many of these are switching movements rather than line hauls. The shipment size groups are shipments of 1–5 cars, 6–49 cars, 50–74 cars, and 75+ cars. Inflation-adjusted per-ton-mile rates for these shipment categories were calculated for all commodities for each year using the Gross Domestic Product Implicit Deflator. The highest and lowest 2.5 percent of rail rates were dropped from this analysis in order to eliminate possible outliers. Contract shipments were eliminated because the true market rates are not reported. Rail rates for data points with fewer than 30 observations are not reported.

Comparison of Food Products Rail Tariff Rates

Food products include meat; dairy products; canned and preserved fruits, vegetables, and seafood; sugar; and beverages. Most rail shipments of food products in the United States from 1994 to 2011 were small (1–50 cars). Larger shipments (50+ cars) were not regularly used over the period, as seen in figure 3. The smallest shipments (1–5 cars) had higher rates than the second smallest shipments (6–49 cars) every year from 1994 to 2011. Inflation-adjusted rates for 1–5 car shipments were 3.4 cents per ton-mile and 2.6 cents for shipments of 6–49 cars in 2004. By 2011, they had increased to 4.5 and 3.5 cents per ton-mile, respectively. Rates for small shipments of 1–5 cars fell slightly until around 2001, at which point they began to steadily increase. Rates for the smaller shipment categories (1–5 cars and 6–49 cars) spiked slightly in 1997 before beginning to increase regularly beginning in 2001, after which they rose for most of the rest of the period. This resulted in increases in per-ton-mile rates for 1–5 car and 6–49 car shipments of 32 and 33 percent, respectively, since 2004.

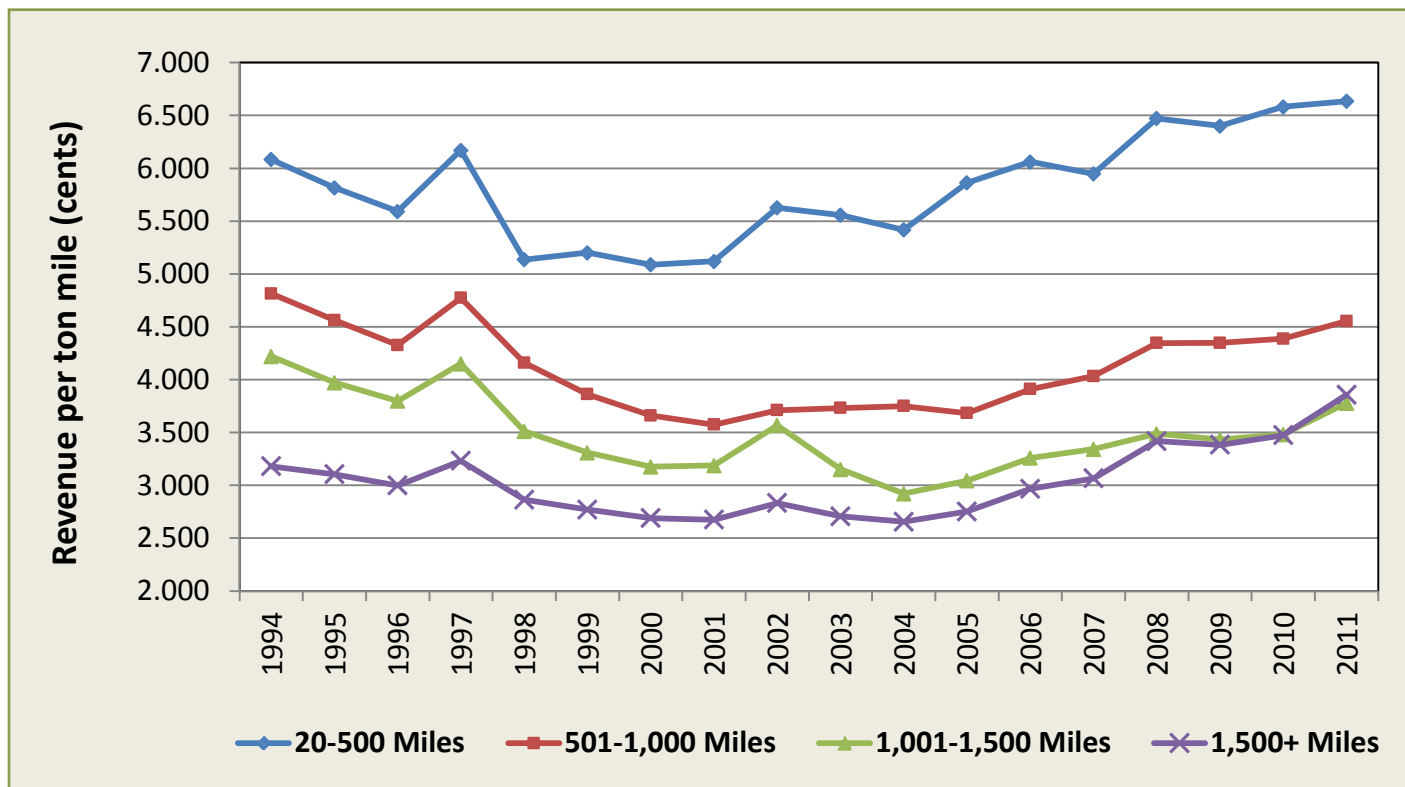
Figure 3. Food products inflation-adjusted tariff revenue per ton-mile by shipment size (2011 \$)



Source: USDA analysis of Surface Transportation Board Confidential Waybill Samples

Over the same period, food products were shipped a variety of distances by rail. In general, the longer the shipment distance, the lower the per ton-mile rate, as can be seen in figure 4. The shipments traveling the shortest distances (20–500 miles) saw rates grow more than rates for other shipment distances, resulting in substantially higher rates. At 6.6 cents per ton-mile in 2011, short shipment rates were 46 percent higher than the next highest rates of 4.5 cents per ton-mile for shipments traveling 501–1,000 miles. Short shipment rates were 6.1 cents per ton-mile in 1994, compared to 4.8 cents for 501–1,000 mile shipments, 4.2 cents for 1,001–1,500 mile shipments, and 3.2 cents per ton-mile for 1,500+ mile shipments. Between 2004 and 2011, short shipment rates had grown 22 percent to 6.6 cents per ton-mile. Over the same period, rates for the other three shipment categories grew 21 percent (501–1,000 miles), 29 percent (1,001–1,500 miles), and 45 percent (1,500+ miles) to 4.6, 3.8, and 3.9 cents per ton-mile, respectively. From 2008–2011, rates for shipment distances of 1,001–1,500 miles converged with shipments exceeding 1,500 miles.

Figure 4. Food products inflation-adjusted tariff revenue per ton-mile by shipment distance (2011 \$)



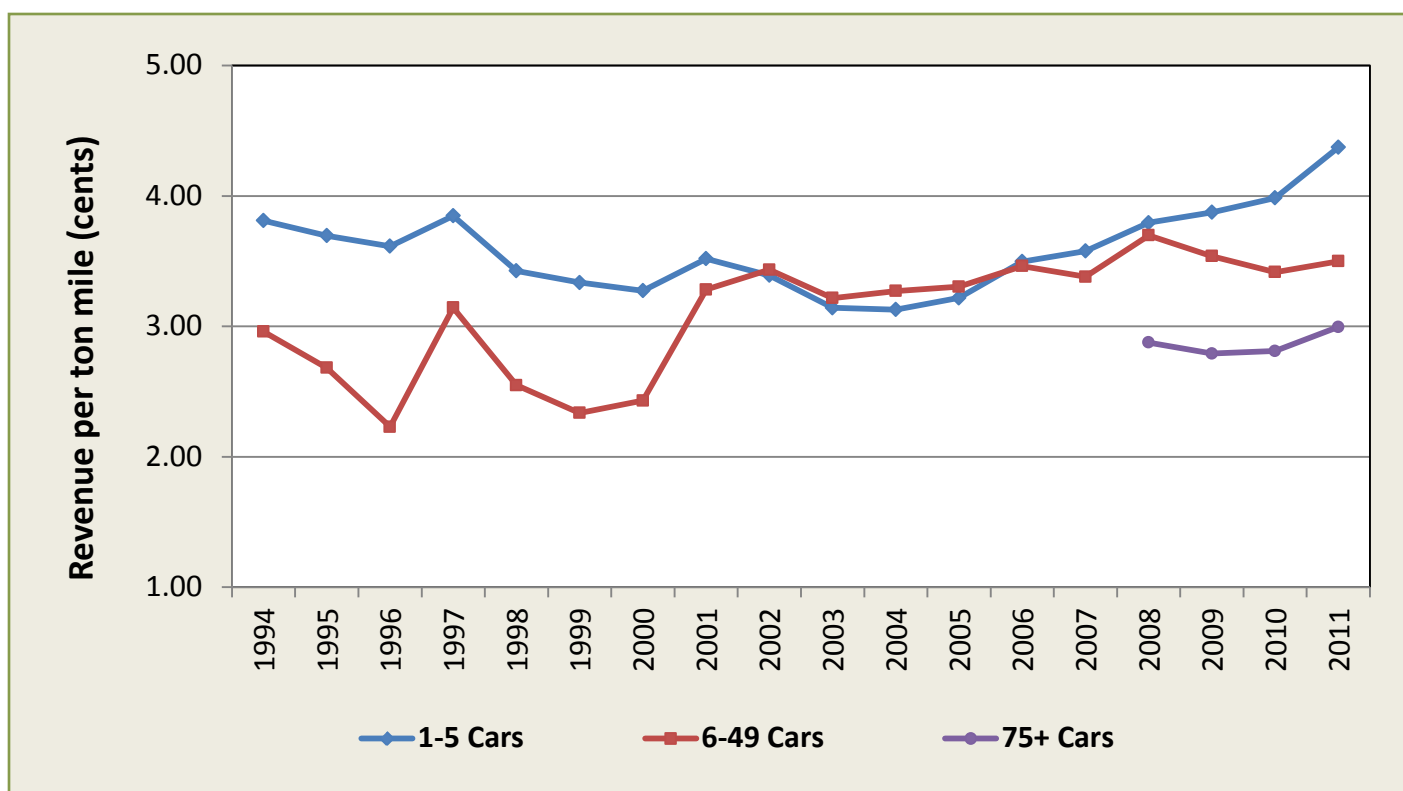
Source: USDA analysis of Surface Transportation Board Confidential Waybill Samples

Comparison of Grain Mill Products Rail Tariff Rates

Grain mill products include distillers dried grains with solubles (DDGS), a byproduct of ethanol production often used as a protein source for livestock. In addition, the category includes flours and corn syrup.

From 1994 to 2011, rail shipments of grain mill products were almost all 50 or fewer cars. Large shipments (75+ cars) were used more often towards the end of the period, as seen in figure 5. Small shipment (1–5 cars) rates were 3.1 cents per ton-mile in 2004, compared to 3.3 cents for the second smallest shipment size (6–49 cars). Rates grew 40 percent (1–5 cars) and 7 percent (6–49 cars) to 4.4 and 3.5 cents per ton-mile in 2011, respectively. Rates for both sizes fluctuated from 1994 until about 2004, at which point rates for both sizes began to rise. While the beginning and end of period rates for small shipments (1–5 cars) were noticeably higher than shipments of 6–49 cars, from about 2001 to 2008, rates for both shipment sizes were nearly identical.

Figure 5. Grain mill products inflation-adjusted tariff revenue per ton-mile by shipment size (2011 \$)*

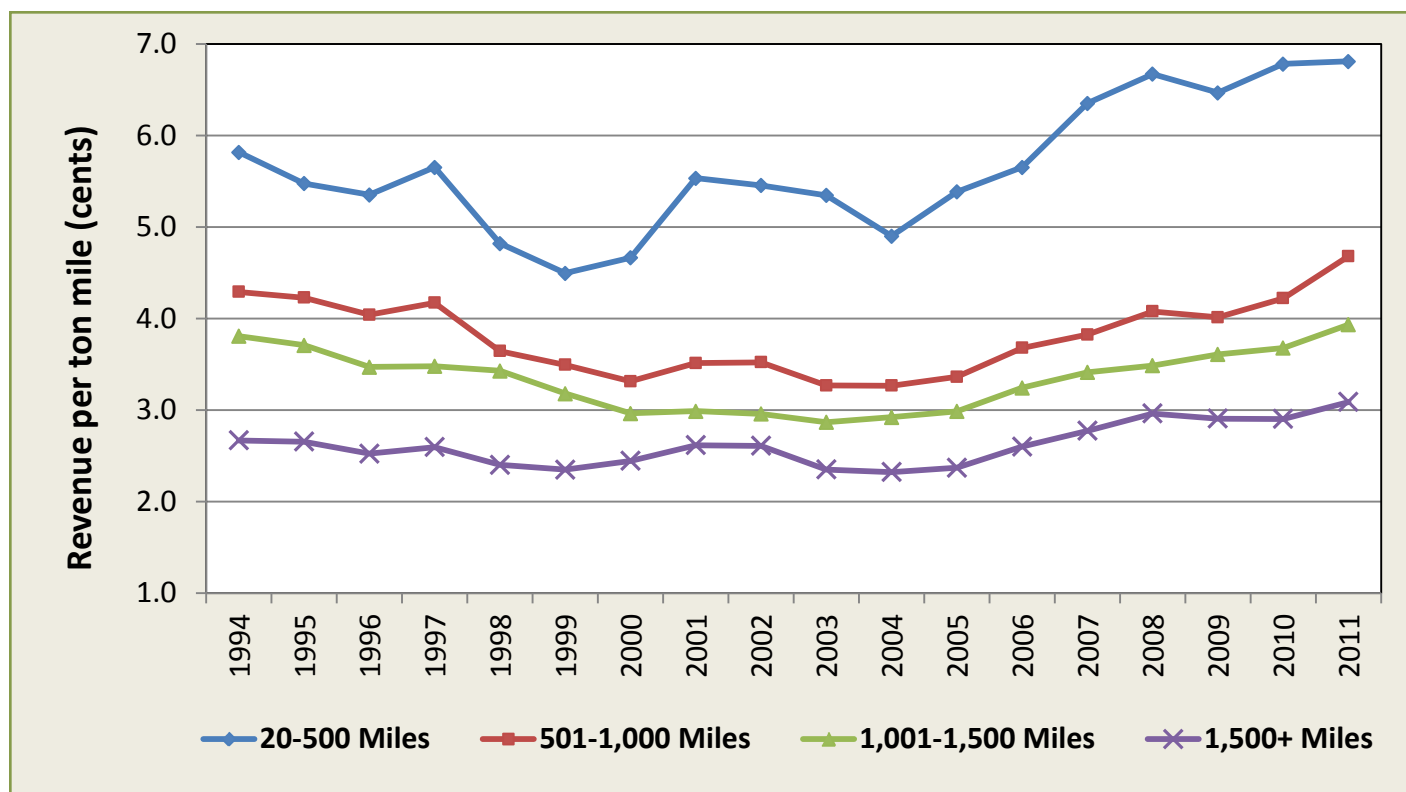


* Insufficient data was available to report the 50-74 car size.

Source: USDA analysis of Surface Transportation Board Confidential Waybill Samples

Grain mill products are shipped by rail over the range of distances reported. However, the rates per ton-mile for the shortest shipments are noticeably higher than those of all other shipment distances, as seen in figure 6. In 2004, short shipments were subject to a rate of 4.9 cents per ton-mile, which grew 39 percent to 6.8 cents per ton-mile in 2011. This was 45 percent greater than the second highest rates, those for shipments moving 501–1,000 miles. This is slightly less than the 48-percent difference between rates for these two shipment distances in 2004. In 2004, rates for shipments moving 501–1,000 miles, 1,001–1,500 miles, and 1,500+ miles were 3.3, 2.9, and 2.3 cents per ton-mile, respectively. These rates grew 43, 35, and 33 percent, respectively, and in 2011 were 4.7, 3.9, and 3.1 cents per ton-mile, respectively.

Figure 6. Grain mill products inflation-adjusted tariff revenue per ton-mile by shipment distance (2011 \$)

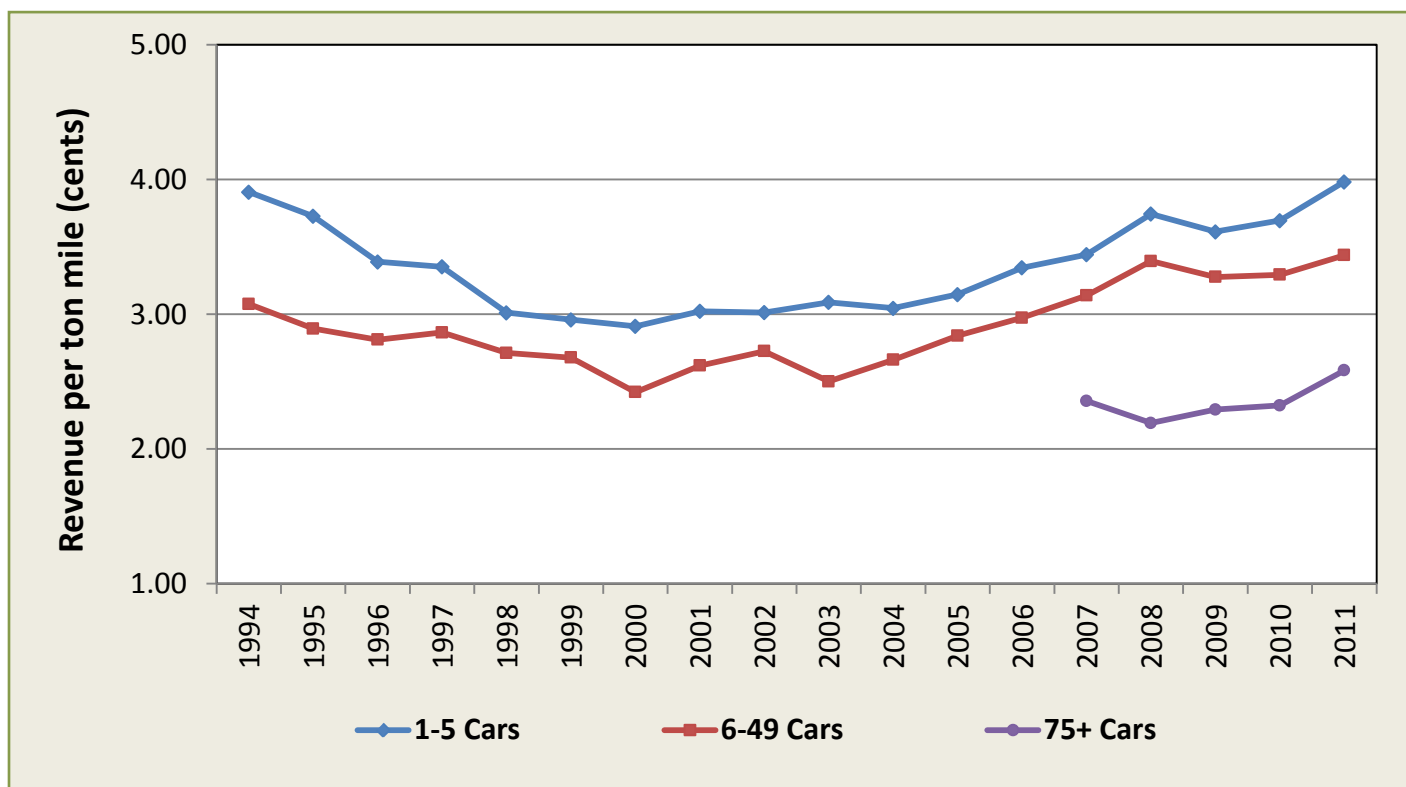


Source: USDA analysis of Surface Transportation Board Confidential Waybill Samples

Comparison of Soymeal Rail Tariff Rates

The majority of soymeal shipments by rail between 1994 and 2011 were 1–5 cars or 6–49 cars in size. The largest shipment sizes were not regularly used until 2007, at which point 75+ cars shipments became more prevalent, as can be seen in figure 7. Rates for the smaller shipment sizes moved in similar patterns over the entire period, falling gradually from 1994 until 2000, at which point both began to rise. After 2008, the rates dropped slightly before again beginning to climb. From 1994 to 2011, rates for the smallest shipments (1–5 cars) rose 2.5 percent from 3.9 to 4 cents per ton-mile. Rates for the second smallest shipment size, which were 2.7 cents in 2004, increased 29 percent to 3.4 cents per ton-mile by 2011.

Figure 7. Soymeal inflation-adjusted tariff revenue per ton-mile by shipment size (2011 \$)*

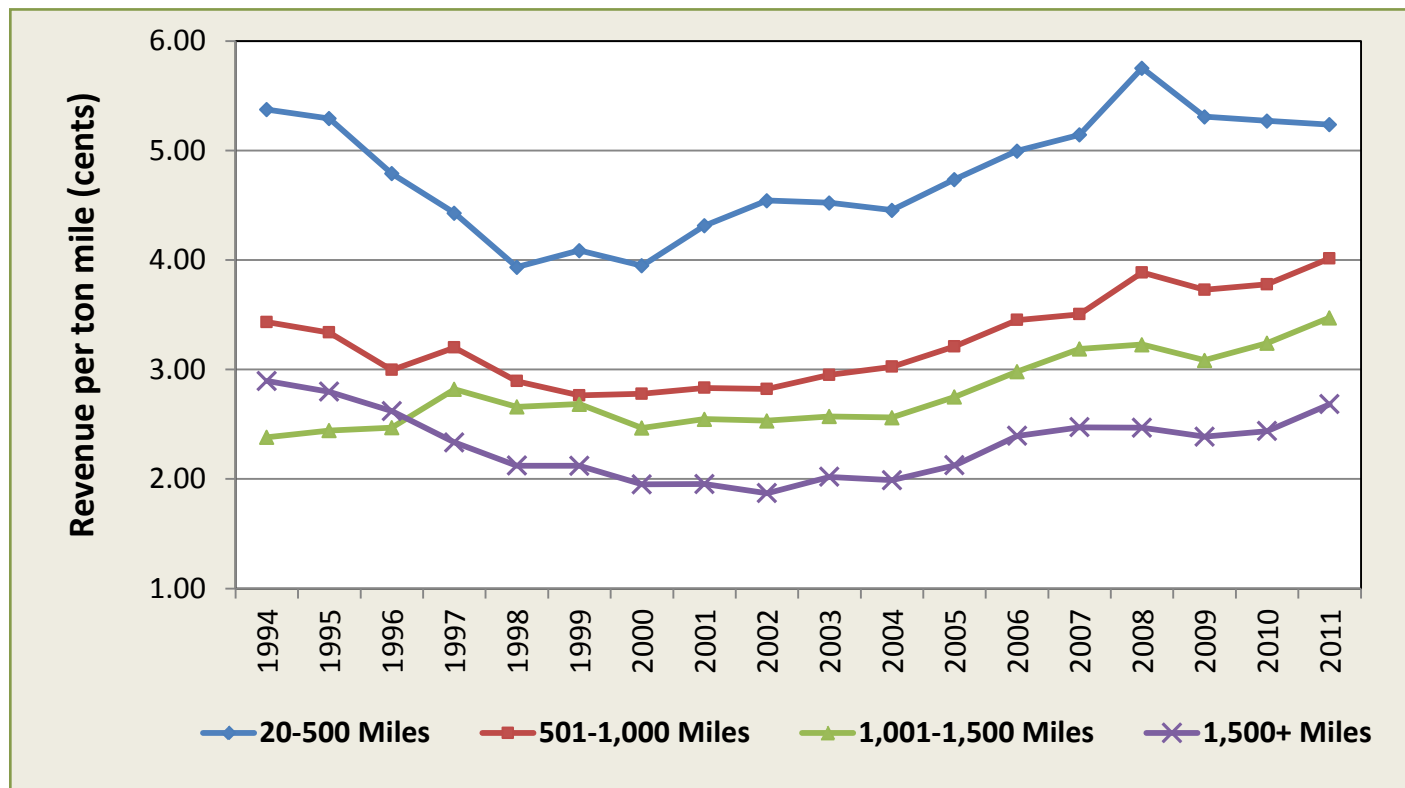


* Insufficient data was available to report the 50-74 car size.

Source: USDA analysis of Surface Transportation Board Confidential Waybill Samples

Although most soymeal shipments moved in smaller shipment sizes (less than 50 cars), the shipments moved a variety of distances. The shipments moving the shortest distances had noticeably higher per-ton-mile rates over the period than shipments moving over longer distances, as figure 8 shows. While rates for the shipments moving greater distances (500+ miles) decreased until the early 2000s, rates for the shipments moving the shortest distances decreased from 1994 until 1998 before beginning to rise around 2000. Rates for shipments traveling over the shortest distances rose 18 percent from 4.5 cents in 2004 to 5.2 cents per ton-mile in 2011. Rates for the other shipments rose 33 percent (501–1,000 miles), 36 percent (1,001–1,500 miles), and 35 percent (1,500+ miles) from 2004 to 2011. In 2004, rates for shipments of 500–1,000, 1,001–1,500, and 1,500+ miles were 3.0, 2.6, and 2.0 cents per ton-mile, respectively. In 2011, these rates were 4, 3.5, and 2.7 cents per ton-mile, respectively.

Figure 8. Soymeal inflation-adjusted tariff revenue per ton-mile by shipment distance (2011 \$)

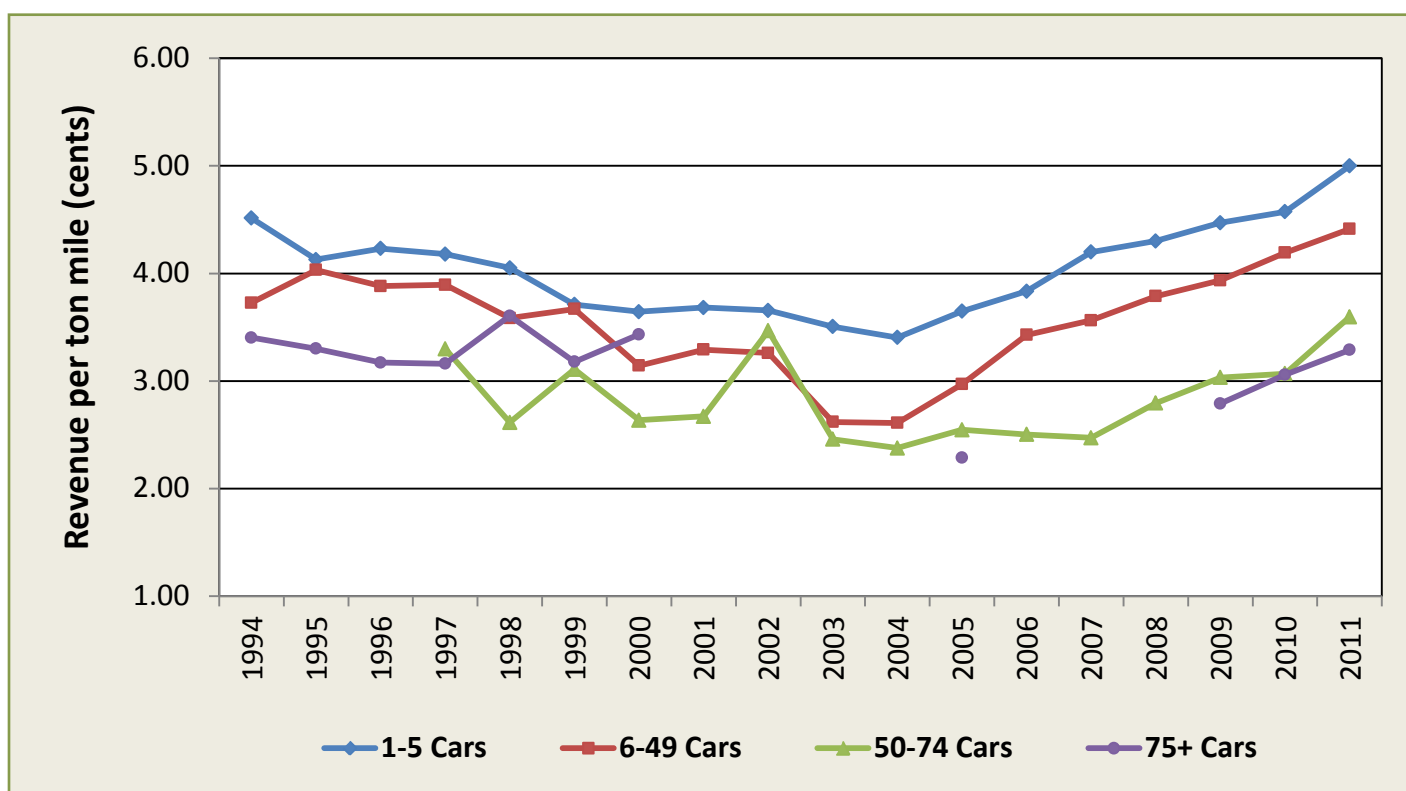


Source: USDA analysis of Surface Transportation Board Confidential Waybill Samples

Comparison of Fertilizer Rail Tariff Rates

Fertilizer includes bulk ingredients as well as manufactured dry, liquid, and gaseous fertilizers ready for application. Fertilizer uses smaller shipment sizes (1–49 cars) more than it does larger shipments (50+ cars). However, larger fertilizer shipments became more common towards the end of the period between 1994 and 2011, as shown in figure 9. The smallest shipments (1–5 cars) and second smallest shipments (6–49 cars) had similar rates and growth throughout the period. Rates trended down until 2004, at which point they began to rise. Small shipment rates (1–5 cars) rose 47 percent between 2004 and 2011, and rates for the second smallest shipments (6–49 cars) rose 69 percent. In 2004, 1–5 car shipment rates were 3.4 cents per ton-mile, while 6–49 car shipment rates were 2.6 cents per ton-mile. In 2011, 1–5 car and 6–49 car shipment rates were 5.0 and 4.4 cents per ton-mile, respectively. Rates for 50–74 car shipments were erratic until 2003 and increased 51 percent, from 2.4 cents to 3.6 cents, between 2004 and 2011. Rates for 75+ car shipments did not have enough shipments for most of the years between 1994 and 2011, but ended at 3.3 cents.

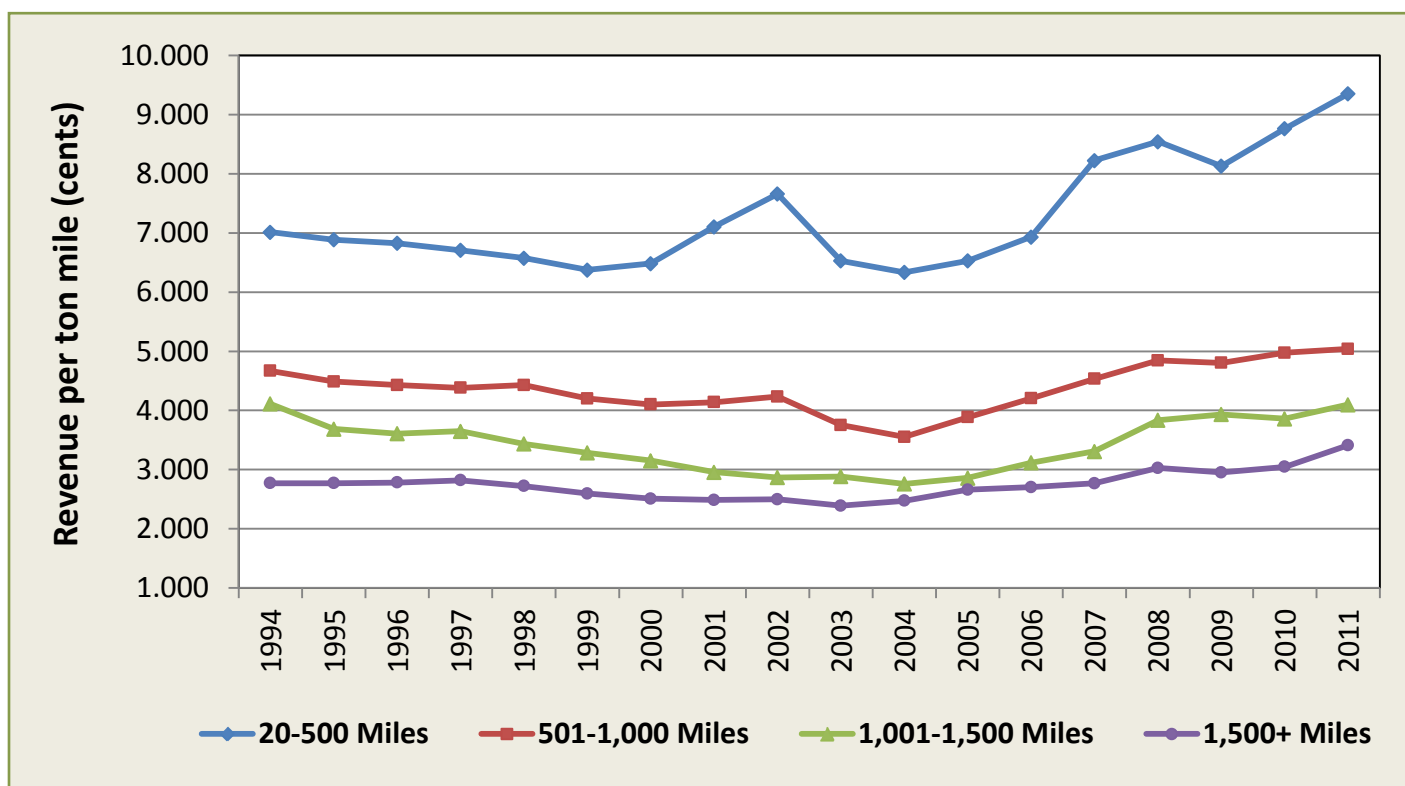
Figure 9. Fertilizer inflation-adjusted tariff revenue per ton-mile by shipment size (2011 \$)



Source: USDA analysis of Surface Transportation Board Confidential Waybill Samples

Fertilizer shipments travel many different distances. Between 1994 and 2011, shipments moving over short distances had consistently higher rates per ton-mile than shipments moving longer distances, as figure 10 illustrates. In 2011, rates for shipments moving 20–500 miles were 75 percent higher than rates for shipments moving more than 501 miles. Except for a spike in 2001 and 2002, rates for shipments moving short distances were between 7.0 cents and 6.3 cents per ton-mile from 1994 until around 2004, at which point they began to rise. Rates for shipments moving 20–500 miles were 6.3 cents per ton-mile in 2004. By 2011, they had grown 48 percent to 9.4 cents per ton-mile. Rates for shipments moving over longer distances trended slightly downward from 1994 to 2004, before rates for all shipment sizes began to increase. In 2004, rates for shipments moving 501–1,000 miles, 1,001–1,500 miles, and 1,500+ miles were 3.6, 2.8, and 2.5 cents per ton-mile, respectively. In 2011, these rates had grown to 5.0, 4.1, and 3.4 cents per ton-mile, respectively.

Figure 10. Fertilizer inflation-adjusted tariff revenue per ton-mile by shipment distance (2011 \$)



Source: USDA analysis of Surface Transportation Board Confidential Waybill Samples

Conclusion

In general, inflation-adjusted rail rates rose for all commodities from 2004 to 2011. Overall, the changes in rates are likely attributable to increases in railroad market power, railroad capacity constraints, and operating costs, including fuel. Further, as rail shipments move over longer distances, they are charged lower per ton-mile rates. Similarly, larger rail commodity shipments are charged lower rates. It is widely acknowledged that railroads use trainload or multiple-car rates to encourage shippers to consolidate shipments, thereby increasing the efficiency of the railroad's capital stock, locomotive power, and labor. These economies of scale are gained through increases in productivity associated with fewer resources spent loading and unloading railcars, less rail switching, and similar costs. While these analyses show that larger shipments and shipments moving over longer distances are charged lower rates, they do not consider the costs that may have been shifted to shippers in order to access these lower rates, nor competition from other transportation modes.

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Preferred citation:

Prater, Marvin E., and Daniel O'Neil, Jr., Rail Tariff Rates for Grain by Shipment Size and Distance Shipped. U.S. Department of Agriculture, June 2014. Web. <<http://dx.doi.org/10.9752/TS152.06-2014>>

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