Estimating the Competitive Effects of Larger Trucks on Rail Freight Traffic

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Abstract

This is a study of the potential for larger trucks to divert traffic from the short line railroads. The study uses a methodology developed at MIT and applied previously in various studies, including a recent study conducted for the International Railway Congress (UIC). The UIC methodology has been updated and applied in two analyses, each of which examines rail mode share for a set of generic origins and destinations under various assumptions concerning trucking capabilities.

Increases in truck size weights can be expected to have a large effect on rail traffic, with diversions of 10-15% possible even under the most modest proposals. Under the most aggressive scenarios for increasing truck size/weights, the great majority of general merchandise traffic would be subject to diversion. While efficient unit trains and multi-car shipments will continue to be the most effective means of transport for bulk commodities, the largest trucks will be able to provide very effective competition against rail moves that involve very circuitous routes or very short trains, even for distances in excess of 200 miles.

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1. Introduction

Short line and regional railroads play an important role in handling rail freight. For commodities other than coal and intermodal, the short lines handle 41.5% of all rail shipments in North America (Table 1). For many important commodity groups, short lines are involved in more than half of the shipments. The short lines and the Class I railroads work together to provide service to their customers, with the Class I railroads typically handling more of the line haul over major freight routes and the short lines handling more of the pickup and delivery operations. The commodities, length of haul, shipment size and other characteristics of the freight handled by short lines will therefore be similar to the characteristics of the freight handled by the entire industry.

Table 1 Short Line Participation in Rail Freight
July 1, 2005 to June 30, 2006

Commodity	Handled by Short Lines	Short Line Origin or Destination
All commodities	23.3%	21.0%
Other than Coal and Intermodal	41.5%	36.9%
Leading Commodities:		
Pulp, Paper and Allied Products	57.0%	52.4%
Lumber and Wood Products	58.8%	52.0%
Waste and Scrap	51.1%	48.9%
Metals and Products	52.0%	47.4%
Food and Kindred Products	50.4%	44.8%

Source: Martland & Alpert, 2006 (data from Railinc)

This study assesses the competitive impact of increases in truck size/weight limits on the freight traffic that is handled by short line railroads. Two of the three major categories of rail freight are considered: bulk traffic and general merchandise traffic. These two categories contain the vast majority of the freight handled by short line railroads. The third major category of freight is intermodal traffic, which is an increasingly important category for the Class I railroads, but of much lower importance for most of the short line and regional railroads.

The basic conclusion is that increases in truck size/weight limits could potentially have a very large impact on short line traffic. If motor carriers were allowed to use the largest trucks that have been proposed, most general merchandise traffic currently handled by the railroads would be at risk of diversion. Trucks already enjoy considerable advantages in terms of trip times and reliability, and the use of larger vehicles would allow them to compete more effectively with respect to cost. Two- and three-trailer combinations would even be able to compete with short- and medium distance rail unit train movements, which could result in the restructuring of distribution systems for grain, coal, ores, and other bulk commodities.

These conclusions are based upon analysis of the competitive balance between rail and truck for sets of hypothetical origin-to-destination (OD) movements. The OD movements were structured to represent a typical mix of commodity and customer characteristics. For each OD movement, the estimated mode share was based upon a comparison of the total logistics costs for using rail, intermodal, and truck transportation. In addition to direct transportation costs, the total logistics costs included inventory costs, loading and unloading costs, and loss & damage. Transportation and logistics costs were estimated using models developed in prior studies. The cost and capacity characteristics of larger trucks were provided by Roger Mingo. The methodology used was based upon studies of rail/truck competition conducted recently by MIT for the International Railway Congress (Union International de Chemins-de-fer or UIC) (Martland 2001, 2003).

The purpose of the UIC study was to identify the most promising technologies for the international rail industry. To do this, MIT developed and applied a methodology known as "performance-based technology scanning". Basically, this methodology provided a means of comparing various technologies by first estimating their impact on performance and then estimating how improvements in performance would affect market share. In the UIC study, the focus was on technologies that would improve rail market share, but the same methodology can be used to investigate the effect of technologies – such as increases in truck size/weight limits – that would reduce rail market share.

This paper adapts two of the UIC analyses so as to provide an estimate of the effects of increases in truck size/weights on the rail market share for traffic handled by short lines. The first study concerns the rail market share for the entire range of general merchandise and bulk freight handled by short lines, while the second focuses on the relative costs of moving bulk traffic short distances by rail and by truck.

2. General Freight Traffic

Structure of the UIC Study

The UIC study of the effects of technology on modal competition (Martland, 2001) considered 24 OD movements that were suitable for movement by rail, intermodal, or truck. The movements were structured as follows:

- Trip distances: 400, 800, and 1200 miles
- Value/pound: $1.00, $0.50, and $0.25
- Annual use rate: 500 to 2000 tons/year

A base case used typical unit costs and operating parameters for each mode. Logistics costs were estimated as a function of commodity characteristics, trip times and reliability, and modal factors related to loading, unloading and loss and damage. Mode share was estimated based upon a comparison of total logistics costs for each mode.[1] If two modes had the same total costs, then the model predicted that they would share equally in the traffic. If one mode had substantially lower costs, then the model predicted that it would capture all of the traffic. The UIC study was aimed at identifying the technologies and operating strategies that would have the greatest potential for improving railroad market share and financial performance. Toward that end, the study considered the effects of various changes in rail performance on market share, including various combinations of the following:

- Larger freight cars
- Double stack intermodal service
- Better service (faster or more reliable)
- Cheaper service

Using the Methodology To Estimate Impact of Larger Trucks on Rail Traffic

The methodology was adapted to investigate the impacts of changes in truck technology or operations on rail market share. A base case was established based upon the traffic handled by the short line industry. A hypothetical set of 100 OD movements was created as follows:

- Trip distances: 50, 200, 400, 600, 800, and 1200 miles
- Value/pound:
    - General traffic: $1.00, $0.50, and $0.25 ($2000, $1000, and $500 per ton)
    - Bulk traffic: $0.10, $0.05 and $0.01/pound ($200, $100, and $20 per ton)
- Density: 15 pounds/cu.ft. for high value, 20 pounds/cu.ft. for medium value and 30 pounds/cu.ft. for low value merchandise and all bulk commodities
- Annual use rate:
    - General traffic: 2, 8, and 25 thousand tons/year
    - Bulk traffic: 8, 25, 50 and 100 thousand tons/year

These factors were selected so that it would be possible to consider the range of OD movements that are actually handled by short lines. The number of shipments in each category was selected so that the predicted rail traffic had characteristics of short line traffic. The percentage of short line shipments by commodity group was based upon a recent study of short line shipments for the period July 2005 to June 2006. During that period, 45% of short line shipments (other than intermodal) were general freight and 55% were bulk.

The percentage of shipments in each distance and annual use rate category were based upon the results of a recent study sponsored by the American Short Line and Regional Railroad Association that analyzed trip times and reliability for a representative sample of 39 OD movements originating or terminating on short lines during a three-month period

[1] In technical terminals, a logit model was used to predict mode split based upon a comparison of the total logistics costs of shipping by rail, intermodal or truck. Given the total logistics costs of shipping by rail (LR), intermodal (LI) and truck (LT), the rail share is estimated as $e^{-LR}/(e^{-LR} + e^{-LI} + e^{-LT})$.

in the first half of 2006 (Martland and Alpert, 2006). Table 2 shows the highway distance for these movements and the number of shipments observed in the three-month study period.

Table 2 Characteristics of Short Line Rail Movements
(based upon a sample of 39 OD movements)

Distance (Miles)	**Shipments (total for 3 months)**					
	<11	**11-40**	**41-100**	**101-200**	**>200**	**Total**
< 100	0	0	0	0	4	4 (10%)
100-300	1	0	0	1	3	5 (13%)
300-500	0	4	1	1	1	7 (18%)
500-700	2	3	2	1	1	9 (23%)
700-900	1	1	1	2	2	7 (18%)
> 900	0	5	1	1	0	7 (18%)
Total	4 (10%)	13 (33%)	5 (13%)	6 (15%)	11 (28%)	39 (100%)

Source: Martland and Alpert, 2006

Commodity characteristics were based upon the actual traffic handled by short lines in the 12-month period from July 2005 to June 2006 (Martland and Alpert, 2006). The commodities were aggregated into six groups based upon estimated value, as shown in Table 3. The percentages shown are the percentages of traffic for which the waybill included a valid STCC (standard transportation commodity code). The tons/car are typical numbers for each category based upon tons and shipments handled by the Class I railroads in 2003 (as reported in "Railroad Facts"). The value of the commodity is a critical factor in estimating inventory costs, so each category was assigned a value per pound between \$0.01 and \$1, a range that was intended to be representative of the commodities shipped by rail.

Each of the 100 generic OD movements can be used to represent multiple customers. Weights were assigned to each of the 100 movements so that the predicted rail share of the traffic would approximately match the above distribution of commodities. Each weight was calculated as the product of three factors representing the type of commodity, distance, and the annual use rate plus a fourth factor needed to translate predictions of mode share of OD movements into predictions of mode share of tonnage (because the predicted mode share for one generic low volume movement will represent many more actual movements that the predicted mode share for one generic high volume movement).

The factors used were as follows:

- Type of commodity:
  - 0.45 for merchandise
  - 0.55 for bulk

- Distance category(% of OD movements with distance of 50, 200, 400, 600, 800 or 1200 miles)
  - Merchandise (1%, 4%, 25%, 30%, 15%, 25%)
  - Bulk (25%, 25%, 10%, 10%, 25%, 5%)

Table 3 Aggregating Short Line Traffic into Six Generic Categories

Commodity Type	Commodities Included	Tons/car	% of short line shipments	Assumed Value/Pound
High value merchandise	Motor vehicles & equipment Food & kindred products Grain mill products	70 (other than motor vehicles)	16%	$1.00
Medium value merchandise	Pulp & paper products Stone, clay & glass Farm products except grain	80	13%	$0.50
Low value merchandise	Metals & products Lumber & wood Primary forest products	80	15%	$0.25
Liquid bulk	Chemicals Petroleum Products	85	12%	$0.10
High value dry bulk	Grain Sand & gravel Waste & scrap Coke	100	26%	$0.05
Low value dry bulk	Coal Ores	110	18%	$0.01

- Annual Use Rate Category (% of OD movements with 4, 16, 50, 100, and 200 million pounds per year)
  - Merchandise (30%, 50%, 20%, 0%, 0%)
  - Bulk (3%, 7%, 10%, 30%, 50%)
- Weight for annual use rate (a factor proportional to 1/annual use rate)

The percentages used are round numbers, which is consistent with the generic nature and limited scope of this study. The weights are quite different for merchandise and bulk traffic because a) rail is competitive for merchandise traffic only for long distances and b) annual use rates are much higher for bulk customers.

The base case used the same rail cost and service parameters that were used in the UIC study, except that the cost of fuel was increased from $1.20/gallon to $2.68 per gallon. The other rail costs, which were typical of the period 2000-2002, were assumed to be reasonable for use today. The rail parameters were the same in all of the scenarios considered in this study. To reflect the recent increase in rail rates, rail rates were increased by 10% over the rates used in the prior study (i.e. 10% above the long-run average costs used in the model).

The truck parameters used in this study were based in part upon the prior study and in part upon estimates of current and proposed trucking capabilities. Fuel economy, fuel costs, equipment costs, driver costs, maintenance costs, and overhead costs were all updated using estimates provided by Roger Mingo. Truck size and weight limits were also based upon information provided by Roger Mingo. Other operating parameters were left unchanged from the UIC study, including various parameters related to trip times and reliability, loss & damage, and loading/unloading costs. Truck rates were assumed to be equal to the average long-run truck costs used in the model.

Results

The mode shares were estimated for a base case in which truck competition was provided by a tractor-trailer combination with an 80,000 pound gross vehicle weight (GVW). For the 100 OD sample, the predicted mode shares were as shown in Table 4. The predicted distribution of traffic was found to be similar to the actual distribution of traffic in terms of distance and commodity group. Rail clearly has the advantage for the bulk movements, even for the 50- and 200-miles moves. The detailed results indicate that the rail market share increased for higher value and longer distance movements; for example, Table 5 shows market share for hypothetical movements of 16 million pounds/year (8,000 tons/year) for various distances and commodity values. As would be expected, the rail share generally increases with distance, but declines with the value of the commodity.

Table 4 Base Case Mode Split

(Mode share of ton-miles for 100 hypothetical OD movements)

Mode	Merchandise	Bulk	Total
Rail	33.8%	100%	57.3%
Intermodal	7.9%	0%	3.8%
Truck	58.3%	0%	38.9%

Table 5 Market Share for General Merchandise Movements (hypothetical shipments, 8,000 tons/year)

	400 miles	600 miles	800 miles	1200 miles
High Value	5%	6%	3%	7%
Medium Value	20%	30%	18%	38%
Low Value	63%	89%	90%	99%

The absolute value of the percentages in these tables are not intended to reflect the overall mode share for all freight, because the sample OD movements only include moves where rail is a viable option. Many other moves would be needed to represent the very common situations where intermodal is dominant (e.g. long-distance moves of international containers) or where truck captures essentially all of the traffic (e.g. short distance non-bulk moves and low-volume general merchandise moves). The sample of 100 OD moves is intended to reflect the types of shipments that are routinely carried by the rail industry and handled at either the origin or the destination by a short line railroad.

What is of interest in this study is the change in market share for rail (not including intermodal) as a result of changes in truck capabilities. If everything stays the same except truck size/weights, then how much will the rail market share decline? Since the sample of 100 OD movements is intended to represent all of the traffic handled by short lines, the decline in the rail market share will in fact represent the expected decline in the traffic handled by short lines (even though the percentage changes in the intermodal or truck shares will not represent the percentage changes in intermodal or truck volume).

Various competitive scenarios were considered, with truck size and weights getting progressively larger. In some cases, it was assumed that relay drivers would be used, which would reduce the travel time for the long-distance shipments. A total of nine scenarios were analyzed:

- Increases in load limits for existing trucks to 90,000 lb (3-S2 with 90,000 GVW)
- Increases in GVW to 97,000 lb for trucks with an additional axle (3-S3)
- Rocky mountain doubles with 110,000 lb GVW
- Rocky mountain doubles with 129,000 lb GVW
- Turnpike doubles with 129,000 GVW
- Turnpike doubles with 129,000 GVW with relay drivers
- Triple trailers with 110,000 GVW
- Triple trailers with 110,000 GVW with relay drivers
- Turnpike doubles with 148,000 GVW

The results for the base case and three representative cases are shown in Table 6. The base case is the same as in Table 4 above. The next column shows the effect of the smallest proposed change, namely allowing existing tractor/trailer combinations to carry additional weight up to a GVW limit of 90,000 lbs. This option increases the maximum payload from 26.6 to 31.6 tons, with the cubic capacity remaining at 3,984 cubic feet. With only a minimal increase in cost, the higher weight limit allows trucks to capture a third of the merchandise traffic. The next-to-last column show a jump to long-combination vehicles (Rocky Mountain Doubles) with a GVW of 110,000 pounds and a maximum payload of 36.2 tons or 6,089 cubic feet. The last column allows Turnpike Doubles (TPD), with a further increase in payload to 53.65 tons or 7,216 cubic feet. As trucks get larger, the rail market share is clearly predicted to decline. The loss of market share is predicted to affect only the general merchandise traffic, as bulk traffic moving in unit trains or multi-car shipments remains competitive with truck. However, this analysis assumes very good rail service; as will be shown in the next section, the larger trucks could actually be competitive with many rail services for distances up to 300 miles.

Table 6 Estimated Impact of Larger Trucks on Mode Shares of Ton-Miles (Analysis of 100 hypothetical rail/truck competitive movements)

Market	Mode	Base	90,000 GVW	110,000 GVW RMD	148,000 GVW TPD
Merchandise	Rail	33.8%	22.6%	18.4%	5.0%
	Intermodal	7.9%	7.4%	5.2%	5.0%
	Truck	58.3%	70.0%	76.4%	90.0%
Bulk	Rail	100%	100%	100%	100%
	Intermodal	0%	0%	0%	0%
	Truck	0%	0%	0%	0%
Total	Rail	56.2%	48.9%	46.1%	37.2%
	Intermodal	5.2%	4.9%	3.4%	3.3%
	Truck	38.5%	46.2%	50.5%	59.5%%
Decline in Rail Traffic	Merchandise		34%	46%	85%
	Total		13%	18.4%	34%

As noted above, this analysis is keyed to traffic that could be handled by short lines; no attempt is made to model shipments that currently are handled exclusively by intermodal or truck. The most relevant number is therefore the predicted decline in rail share as larger trucks are allowed. In other words, the rail share in the base case (56.2%) is assumed to represent all of the traffic handled by the short line railroads. The decline in this number – which is shown in the last two rows of the table - represents the potential loss of traffic on short lines if larger trucks were available and the rail industry made no response in terms of service, equipment, or rates. For example, an increase from 80,000 to 90,000 GVW for existing tractor-trailer combinations would potentially reduce short line merchandise traffic by about 34% and overall short line traffic by 13%. The most drastic option, allowing large long-combination vehicles with 148,000 GVW would eliminate 85% of the general merchandise traffic and reduce overall short line traffic by 22%. To the extent that some long-combination vehicles are already allowed on highways, these results may somewhat overstate the impact on short line railroads (because the traffic may already have diverted to the longer trucks). The impact of larger trucks will be the greatest in regions where current limits are the lowest.

Table 7 shows the same kind of results for the other six options for changes in truck/size weights. These options all have impacts that are within the range spanned by Table 6. Two of the cases allow relay drivers for the longer distance shipments; relays increase the cost of drivers, but allow quicker, more reliable deliveries and better equipment utilization. The difference between Rocky Mountain Doubles and Turnpike Doubles is that the latter option allows a larger second trailer, thereby increasing the cubic capacity even when the GVW is the same. The extra cubic capacity is important for the many lower density commodities that reach the maximum cubic capacity limit before they reach the weight limit.

Table 7 Estimated Impact of Larger Trucks on Mode Shares of Ton-Miles (Analysis of 100 hypothetical rail/truck competitive movements)

Market	Mode	97,000 3-S3	110,000 Triples	110,000 Triples Relays	129,000 RMD	129,000 TPD	129,000 TPD Relays
Merchandise	Rail	18.9%	24.3%	19.0%	4.8%	9.8	7.0%
	Intermodal	8.0	5.9	4.3	4.1	4.9	3.8
	Truck	73.2	69.8%	76.7	91.1	85.3	89.2
Total	Rail	46.4	50.0	46.5	37.1	40.4	38.5
	Intermodal	5.3	3.9	2.9	2.7	3.2	2.5
	Truck	48.3	46.1	50.7	60.2	56.3	58.9
Decline in Rail Traffic	Merchandise	44%	28%	44%	86%	71%	79%
	Total	17%	11%	17%	34%	28%	31%

The results can be summarized as follows:

- If GVW were increased from 80,000 to 90,000, the potential loss of rail traffic is estimated to be on the order of 10-15% of overall tons or ton-miles, with essentially all diversions coming from general merchandise freight.
- If GVW were increased to 97,000 or 110,000 pounds, then the potential diversion increases to approximately 10-20% of all tons or ton-miles, depending upon the exact configurations of equipment that are allowed.
- If GVW were increased to 129,000 or 148,000 pounds, then the potential diversion would be more than a third of all traffic and more than two thirds of merchandise traffic.

In short, increases in truck size and weight limits pose an extremely serious threat to the general merchandise traffic handled by short lines. Diversions of freight will be limited by the ability of the trucking industry to handle additional growth. Recent trends with respect to driver shortages, high fuel costs, and congestion suggest that it may be difficult for motor carriers to absorb tremendous amounts of additional traffic. On the other hand, other factors suggest that the situation could be even worse than depicted in this section, because the largest trucks may in fact be able to compete with many rail moves of bulk commodities, as discussed in the next section.

3. Bulk Traffic

The same basic methodology was used to analyze the effects of larger size/weight limits on the ability of trucks to compete for bulk freight in situations where railroads may not be able to use modern rail technology effectively. The analysis in the prior section assumed efficient train operations and heavy cars. In actual fact, there are many rail movements where efficient operations are difficult or impossible to achieve. The main factors that would lead to inefficient operations are as follows:

- Circuity: the rail route may be much longer than the truck route
- Old equipment: older rail equipment will have smaller payloads than modern heavy-haul equipment
- Low volume: few customers have the volume necessary to support full unit train operations, and it may be necessary (especially on short lines) to operate short trains for bulk customers.

The UIC study of bulk freight (Martland, 2003) considered 30 OD movements chosen to represent short- to medium-distance movements of a commodity with a value of $0.10 per pound ($200/ton), e.g. grain. The study focused on shorter lengths of haul because rail easily dominates the longer-haul markets. Prior studies have shown that this type of traffic can be handled by rail, by truck, by water, and by various intermodal combinations, depending upon the costs for using each mode and the structure of the rail network, and the location of waterways (see studies by Baumol; Babcock and Bunch; Casavant, Dooley, and Hays; and Maze, Allen and Smadi).

In the UIC study, the 30 OD moves were structured as follows:

- Ten Distance Categories: 10, 25, 50, 75, 100, 150, 200, 300, 400, and 500 miles

- Three Categories for truck service:
    - Poor - inefficient tractor-trailer combinations
    - Base - efficient tractor-trailer combinations
    - Good - efficient double-bottom service

- Three categories for rail service
    - Poor – cars with 60-ton payloads moving in 20-car unit trains; cycle times 2.6 to 8.7 days (increasing with distance);$400 per shipment (i.e. per car) for loading and unloading
    - Base – cars with 80-ton payloads moving in 50-car unit trains; cycle times of 2 to 5.4 days; $200 per shipment for loading and unloading

- Good – cars with 100-ton payloads moving in 100-car unit trains; cycle times of 1.65 to 5.1 days; $100 per shipment for loading and unloading

Table 8 shows the parameters used for each level of rail and truck service. The UIC study used truck, rail and logistics costs typical of the 2000-2002 period. The results of that study were presented in a bar chart that showed the cost per ton-mile for each mileage category (Figure 1).

Table 8
Distinguishing Parameters for Different Levels of Rail and Truck Service
(parameters used in the UIC study)

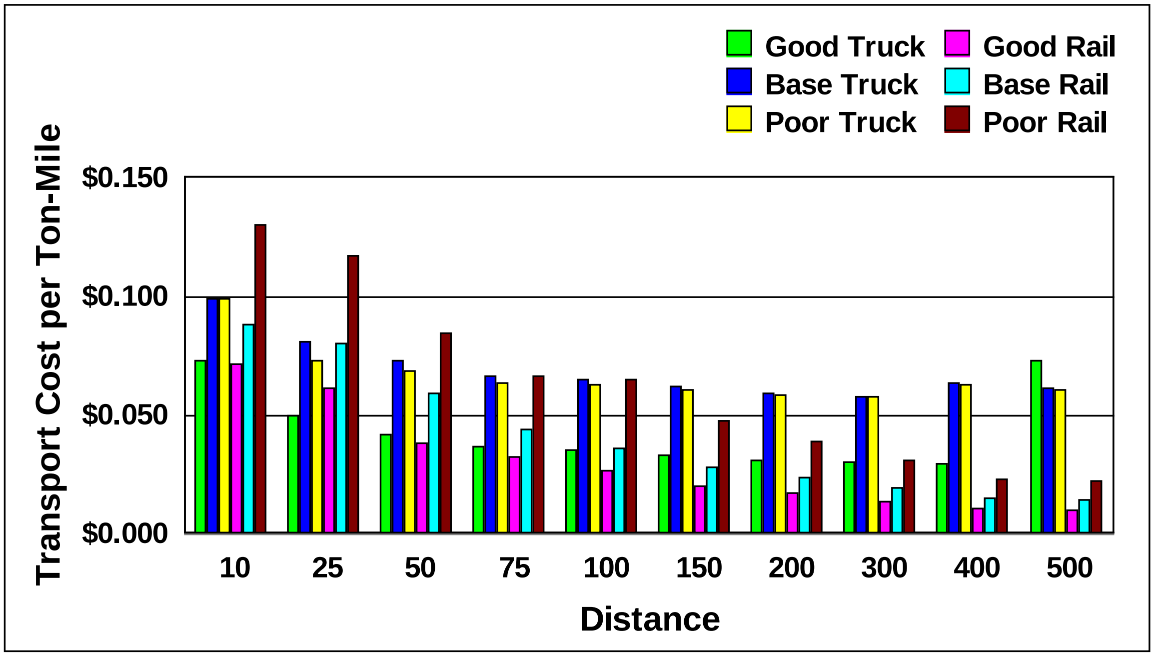
Parameter	Poor Rail	Base Rail	Good Rail	Poor Truck	Base Truck	Good Truck
Loading/Unloading $/shipment	$400	$200	$100	$150	$200	$250
Tons/shipment	60	80	100	20	20	40
Access distance	10	5	1	15	10	5
Cars/train	20/80	50	100			
Track cost index	100	80	60			

In Figure 1, there are six bars for each distance category. The x-axis shows the direct distance between origin and destination, not including the initial branch line distance or the access to the highway. The y-axis shows the cost per ton-mile. For each distance group, there is a cluster of six bars; the first three bars show the costs for trucks while the last three bars show the costs for rail. For both rail and truck, the bars show costs for the good, base, and poor service. The rail costs decline with distance; truck costs decline so long as the trip can be completed in one day, then rise.

At the right-hand side of Figure 1, we see the expected result. For a 500-mile haul, even the lowest level or rail service was predicted to be far cheaper than the best truck service. At the extreme left, however, we see something quite different. Here the best truck service is equivalent to or cheaper than the best rail service. In the middle range, the best rail service is the cheapest, but good truck is cheaper than poor rail.

In this example, we see truck costs can drop to about $0.03 per ton-mile (at 2000-2002 cost levels) by using twin trailers (one tractor pulling two trailers), even without increasing the loading per trailer. This is a low enough cost to make trucks a formidable cost competitor over distances of several hundred miles or more.

Figure 1
Comparative Transportation Costs for Various Levels of Truck and Rail Service
(Results of the UIC Study)



If we add in logistics costs, the advantage will shift to the mode with the best loading/unloading capabilities. Loading/unloading costs relate to the customers' facilities and the type of equipment. Where volumes are high and labor is expensive, customers can afford highly efficient conveyor systems; where volumes are low or labor is cheap, customers will favor less capital intensive systems. Inventory costs are not nearly as important for bulk as they are for higher value merchandise movements. Even for the higher-valued bulk commodities, like soybeans, inventory costs will only be a few percent of the transport costs. For lower-valued bulk commodities, like coal, the inventory costs will be negligible. Speed and reliability are therefore important only as they affect equipment utilization and cost, not as a serious factor in either customer costs or mode share.

Updating the Bulk Study

The UIC study was updated using the same distance categories, but with truck categories defined to represent the range of size/weight limits currently under consideration:

- Base case: standard tractor-trailer combination with 80,000 pound GVW (gross vehicle weight) (referred to as 3-S2 in studies conducted for CABT by Roger Mingo)
- Larger, single-trailer combination: enhanced tractor-trailer combination with 97,000 pound GVW (3-S3)

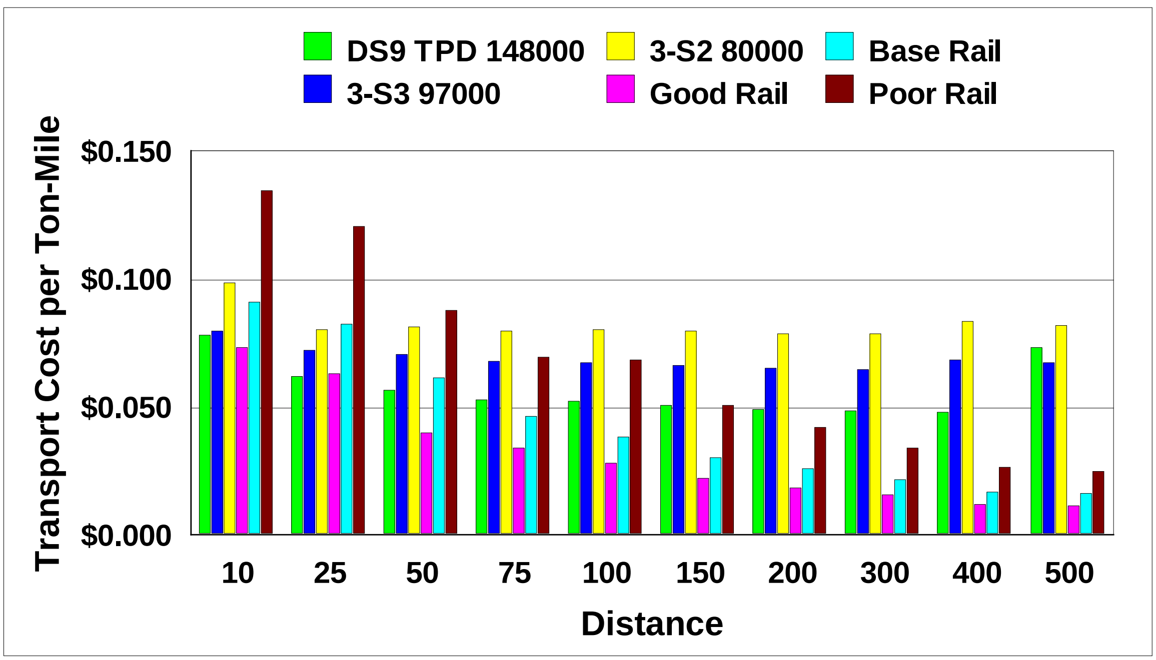
- Very heavy, double-bottom combination: turnpike doubles with 148,000 GVW (DS9 TPD)

Operating parameters and unit costs for each type of truck were the same as in the previous study, i.e. they were the current trucking costs provided by Roger Mingo. Since 2002, there have been two major changes in truck costs. Driver shortages have caused the industry to increase average driver wages, while fuel costs have more than doubled from $1.20 to $2.68 per gallon.

The same three rail scenarios were used, the only change being the increase in diesel fuel costs from $1.20 to $2.68 per gallon.

The results are shown in Figure 2. Since this is very similar to Exhibit 3, the conclusions are the same: larger trucks would become a more serious competitive threat for bulk rail freight for distances up to 150 miles or more. The threat is greatest where rail freight service is least efficient, whether because of high circuity, short trains, expensive track structure, or inefficient facilities for loading and unloading - problems which are generally more serious for the short lines than for the Class I railroads.

Figure 2 Estimated Costs/ton-mile for Various Bulk Movements



A second analysis estimated the mode share for trucks if they were competing against the "poor rail" service under conditions that were more favorable to trucks.   To reflect the possibility that customer would invest in their facilities in order to capture the benefits of larger trucks, lower loading and unloading costs were used in this study than in the UIC study ($100 rather than $150 to $250 for unloading a single trailer and $150 for unloading two twin-trailers). The distance from the customer to the major highway system was also reduced (which has the effect of increasing the circuity of rail relative to truck). Figure 3 and Table 9 show the results. In Figure 3, the truck options are somewhat less expensive while the three rail scenarios all represent the same "poor" level of service shown in Figure 2. In the base case, rail captured essentially all of the traffic for the three trucking scenarios for distances of 50 miles or longer; truck captured only a small portion of the shortest moves. However, as larger trucks were allowed, the short distance traffic shifted entirely to truck and trucks became competitive even for the 300-mile movements. Unlike the analysis in the previous section, this analysis indicates that larger size/weight limits are likely to be a very serious competitive problem for short- to medium-length bulk movements.

Figure 3 Estimated Costs/ton-mile for Various Bulk Movements (With lower loading/unloading costs for large trucks)

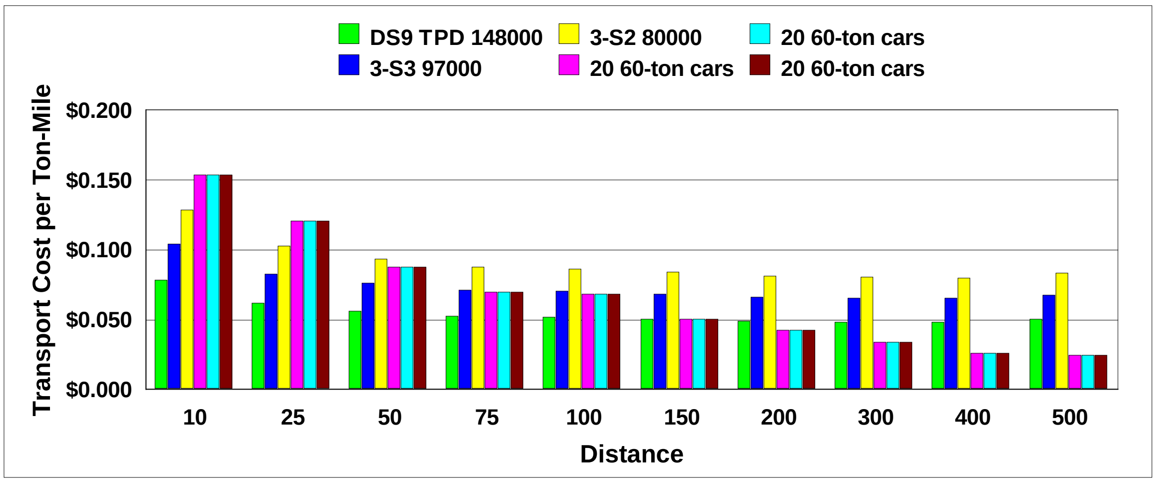


Table 9
Predicted Truck Market Share for Short- and Medium-Length Markets, (in competition with unit trains of twenty 60-ton rail cars)

Distance	Base Case (80,000 GVW 3-S2)	Heavy Tractor/Trailer (97,000 3-S3)	Turnpike Doubles (149,000 GVW)
10	6%	99%	100%
25	9	100	100
50	1	98	100
75	0	84	100
100	0	86	100
150	0	3	100
200	0	0	100
300	0	0	63
400	0	0	0
500	0	0	0

4. Conclusions

This study indicates that an increase in truck/size weights would have a potentially very serious impact on general freight traffic. An increase in gross vehicle weight (GVW) from 80,000 to 90,000 pounds could potentially result in diversion of 10-15% of the type of rail freight that is handled by short line and regional railroads. Long-combination vehicles with GVW of 129,000 to 149,000 pounds would have a much greater impact, and more than two-thirds of general freight (i.e. other than high-volume bulk freight and intermodal freight) would be potentially divertable, assuming that truck drivers and equipment (and highways) are available to handle the increase in truck traffic. Larger vehicles would even be very competitive with bulk rail, not just for the shortest hauls, but for hauls of 100-300 miles where rail efficiency is constrained by circuity, rail infrastructure, or customer loading and unloading capabilities. The competitive effects would be less noticeable in regions where railroads are already competing with long-combination vehicles.

Railroads would be able to respond to the larger trucks by reducing their rates, improving their service, introducing better equipment, or improving productivity. Each of these options, however, would tend to reduce rail profitability.

As in the past, increases in truck size/weights pose a serious threat to the rail industry. The threat is more serious for the short line and regional railroads than for the Class I railroads because the smaller railroads have higher proportions of their traffic in the categories most subject to diversion. The short lines are also more apt to be serving short-haul markets and employing circuitous routings, which makes them more susceptible to competition from heavier trucks operating over direct routes.

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