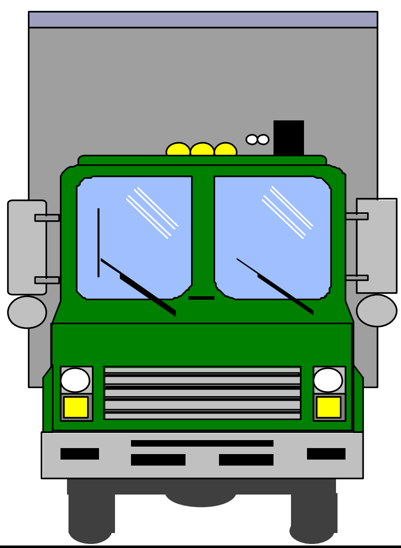
CHAPTER XI

Rail



Introduction

Motor carriers, railroads, barges, and pipelines are the principal transportation modes for the movement of intercity freight, with motor carriers and rail possessing the greatest market share in both revenues and tonnage. While railroads handle more bulk traffic than trucks, *e.g.*, coal and chemicals, they nonetheless compete with trucks for certain commodities and, of course, for intermodal traffic.

The passage of the Staggers Rail Act in 1980 provided the railroads the opportunity to restructure their systems and operations and to price their services competitively with other modes of transportation. Since Staggers, the loss in market share to trucks that railroads experienced reversed and began to increase, led by the growth in intermodal traffic.

Increases in truck sizes and weights would change the economics of truck-rail competition for freight by providing new opportunities for truck productivity improvements. Allowing heavier payloads would lower truck transportation and other logistics costs facing a shipper. To the extent that the trucking industry would be able to offer shippers lower total logistics costs, shippers would shift freight that currently moves by rail to the larger, heavier trucks. Because rail is a decreasing cost industry, railroads would be required to spread the relatively unchanged fixed costs of operating their system over a smaller traffic base, *i.e.*, railroads would face higher costs on their remaining traffic. Figure XI-1 describes characteristics of decreasing cost industries.

Four of the six scenarios analyzed in this study evaluate the effects of larger and heavier trucks. To the extent shippers remaining on the railroad face higher costs as a consequence of lost traffic, the net national cost saving attributable to productivity improvements associated with larger trucks will be reduced.

This chapter examines the extent to which changes in truck size and weight (TS&W) could have financial effects on the railroad industry. The chapter also examines how the impact of a change in truck size and weight regulations varies by

Figure XI-1. What is a Decreasing Cost Industry?

Railroads are a decreasing cost industry because they face high fixed and common costs to maintain an extensive network, including the costs of right-of-way acquisition, roadbed preparation, installation of track and signals, etc. This network must be in place before any freight can move.

Once an initial investment has been made to provide a given level of capacity, per-unit-costs decline as production increases up to capacity. As output increases to that point, per unit fixed costs and common costs decrease because they are spread over more and more units. Conversely, as railroad traffic shrinks, fixed and common costs are spread over a smaller traffic base, resulting in higher costs per unit.

Figure XI-2. The Class I Railroad Industry

In 1994, there were 12 Class I rail systems as defined by the Surface Transportation Board. The impact of changes in truck size and weight (TS&W) regulations are analyzed for these railroads. The Class I railroads are the Atchison Topeka and Santa Fe Railway, Burlington Northern Railroad, Chicago and Northwestern Railroad, Conrail, CSX, Grand Trunk Western, Illinois Central Railroad, Kansas City Southern Railway, Norfolk Southern Railroad, Soo Line, Southern Pacific Railroad, and Union Pacific Railroad.

selected railroads. Individual railroads will be affected differently depending on whether the freight they carry can be efficiently diverted to larger trucks.

Basic Principles

Overview of Class I Rail Industry

As 1994 is the base data year for the Comprehensive Truck Size and Weight Study, a review of conditions in the Class I railroad industry for that year provides a useful basis for comparison with the effects of the truck size and weight scenarios on the industry in the study Year 2000. Figure XI-2 identifies the 12 Class 1 railroads in operation in 1994. Considerable restructuring of the railroad industry has occurred since 1994. Figure XI-3 discusses that restructuring and why the current study was unable to consider potential implications of that restructuring.

Overall, in 1994, the rail industry did well. Railroad business significantly outpaced growth projections while providing high levels of service to customers. The railroads continued to increase market share, with records being set in 1994 for total volume and intermodal freight, in particular. Class I railroads handled

Figure XI-3. Restructuring of the Railroad Industry

Since 1994, there have been four significant Class I railroad mergers. In 1995, the Burlington Northern Railroad and the Atchison Topeka and Santa Fe Railway merged their systems. In 1995, the Union Pacific Railroad and the Chicago and Northwestern Railroad were merged, which was followed by the 1996 Union Pacific/Southern Pacific consolidation. Finally, in 1998, Norfolk Southern Railroad and CSX Railroad acquired and are now in the process of integrating Conrail assets into their respective systems. The study does not take these recent mergers into account. It is difficult to speculate today what the study outcome would be as a result of these consolidations since, for example, traffic flows on the merged systems have not been established for waybill analysis. However, because these mergers are not considered, portraying the distinctions between railroads resulting from their different traffic bases and operating characteristics can be demonstrated as originally planned.

39.2 percent of the Nation's total freight revenue ton-miles over a privately owned network that totals nearly 110,000 route miles. However, because the railroads handle a larger portion of bulk commodities than truck, this traffic represented only 7.9 percent of intercity freight revenue.

As in previous years, bulk commodities continued to be the mainstay of the U.S. railroad freight transportation market share in 1994. To expand into new markets, most of the Class I carriers had looked at logistics support and services and just-in-time operations as high margin opportunities for growth. All North American railroads had entered into intermodal agreements with major trucking and steamship lines by 1994.

The top seven U.S. railroads accounted for over 90 percent of 1994 Class I railroad business. None of the U.S. railroads spanned the continent—three operated in the Eastern U.S. and four in the West. All seven railroads had lines into Chicago. Nearly one-fourth of all carloads carried in North America are joint line movements—their journeys begin on one railroad and end on another.

Intermodal rail performed extremely well, as in past years, but coal was again the industry*s top commodity. The following statistical profile shows that the rail industry was well integrated with most U.S. major commodity business groups in 1994:

- Coal accounted for 39.1 percent of total rail tonnage, 24.5 percent of rail carloadings, and 21.7 percent of rail revenues. In 1994, rail revenues for carrying coal were $7 billion, or 8.3 percent higher than the previous year.
- Intermodal rail traffic grew by nearly 15 percent or by more than one million containers and/or trailers.
- Chemicals and allied products were 14.1 percent of total rail revenues and increased by 5.7 percent to $4.6 billion.
- Motor vehicles and equipment accounted for 9.8 percent of total rail revenues, up 7.7 percent to $3.2 billion.
- Food and associated products were 7.5 percent of total rail revenues, up 3.9 percent to $2.4 billion.
- Farm products accounted for 7.4 percent of total rail revenues, down 5.0 percent to $2.4 billion.

The Class I railroad traffic in 1994 totaled a record 1.201 trillion revenue ton-miles, 8.2 percent higher than the previous year. The growth in revenue ton-miles was attributable to both higher tons originated and longer hauls. Car miles grew significantly as well, to 28.5 billion, a 6 percent growth rate, with the empty return ratio showing marked improvement. The rail industry's share of total intercity revenue ton-miles reached 39.2 percent in 1994, a 3 percent increase over the previous year. The industry realized significant gains in productivity as revenue ton-miles per employee improved 9.3 percent over 1993 and revenue ton-miles per locomotive improved 6.2 percent even with significant locomotive fleet expansion.

Financial Performance and Implications

In 1994, financial

performance was at its best for any single year in over two decades; net revenues from operations, operating revenues less operating expenses, reached $5.3 billion and net income, a measure of profitability, totaled $3.4 billion. The industry operating ratio, total operating expenses divided by total operating revenue, was 81.5 percent an improvement from 85.1 percent the year before. The ratio shows how well a carrier is managing costs.

The industry*s return on investment (ROI) was a relatively impressive 9.4 percent, up from 7.1 percent the year before and the highest in recent industry history. Rail freight rates continued their long decline both in nominal and real dollar terms. The revenue yield, as measured in cents per revenue ton-mile, fell to 2.49 cents, which is 19.3 percent lower in nominal dollars, and 41.8 percent lower in real dollars than comparable 1984 figures. These improvements experienced by the railroad industry were largely the result of the significant economic regulatory reforms embodied in the Staggers Act.

Methodology

The process for estimating the post-diversion impact on the rail industry that could result from the decreased number of rail shipments and rate reductions for those remaining rail shippers is described in this section. The objective of this analysis is to compute a revised industry balance sheet, for the analysis year 2000 for the illustrative TS&W scenarios. In this way, the scenario impact on revenue, freight service expense (FSE), contribution, and ROI resulting from changes in traffic can be assessed.

The rail impact analysis employs two models, the Department of Transportation's Intermodal Transportation and Inventory Cost (ITIC) Model and an Integrated Financial Model described in Figure XI-4. Both are discussed below. These models required that the data for the analysis be extrapolated to the study Year 2000. This was accomplished by applying rail traffic growth rates developed by DRI/McGraw Hill to the following data sources: (1) Class I railroad financial and operating statistics as compiled by the Association of American Railroads (AAR) in the *Analysis of Class I Railroads—1994*; and (2) the 1994 Surface Transportation Board's (STB's) Carload Waybill Sample. The data used from the *Analysis of Class I Railroads* is compiled from R-1 reports submitted by the railroads to the STB. Figure XI-5 discusses adjustments made by the STB to rail revenues reported in the Waybill that improve the analytical results.

The revenue and traffic diversions used to assess rail impacts are derived from the ITIC Model. The model uses the STB Carload Waybill Sample as the basis for rail freight flows and undertakes to estimate shipper transportation and inventory costs for moving freight by rail and truck under different truck size and weight scenarios.
In this analysis, the ITIC model allows the railroads to

Figure XI-4. Integrated Financial Model

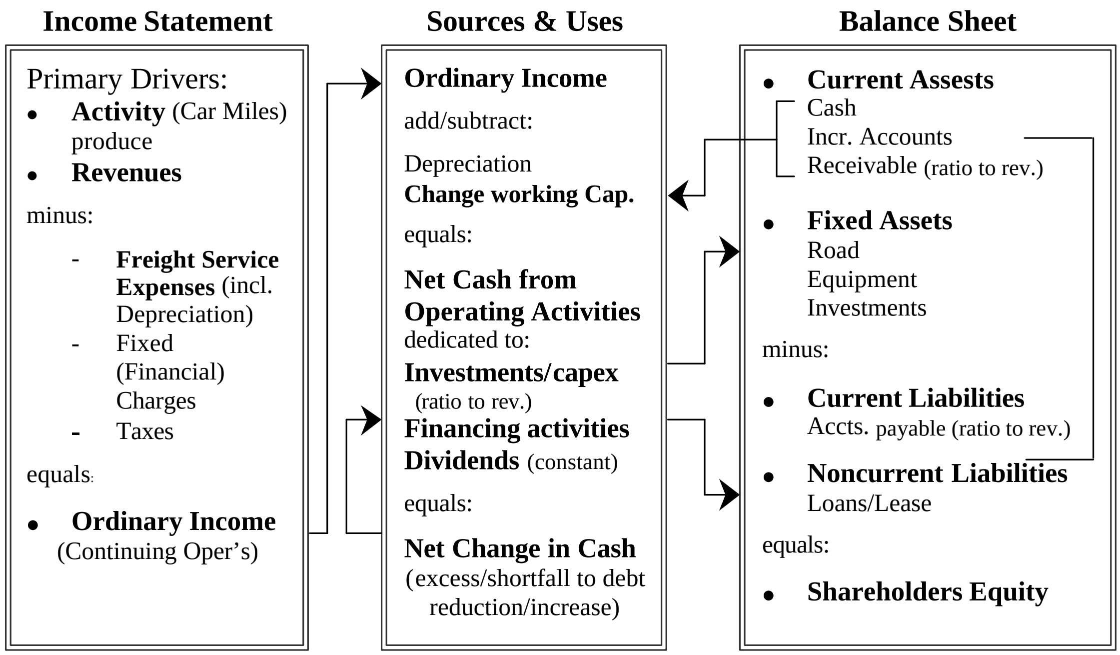


Figure XI-5. Rail Revenues

Percent change calculations in rail revenues were performed by the Surface Transportation Board (STB) with the highly confidential rail revenues in their sole possession. The use of these revenues provides an extra degree of accuracy in assessing rail impacts. The revenues that are available on the confidential version of the Waybill do not reflect actual contract revenues. Railroads, however, report these revenues to the STB. In most aggregate analyses, using the revenues provided on the Waybill would not be a problem, but because the ITIC Model uses individual shipments as input, we asked the STB to calculate percentage changes with the highly confidential data.

respond to increased truck competition by lowering their own rates down to variable cost, if necessary, to prevent diversion of rail freight to trucks. If motor carriers can offer shippers lower transportation and inventory costs than rail variable cost plus inventory costs, then the model assumes that the railroad will lose the traffic and it will divert to truck. As truck transportation costs decrease, the rail industry will experience three separate but related post-diversion effects:

1. Fewer rail shipments will reduce rail revenue.

2. As the railroads offer discounted rail rates to shippers to compete with motor carriers, additional revenue will be lost.

3. As rail car miles decrease due to losses in traffic, the unit (car mile) costs of handling the remaining freight traffic will increase.

It is important to note that for diverted traffic, railroads lose revenue and some costs. When discounting to hold traffic, railroads lose revenue but all costs remain.

The post-diversion effects listed above are measured by the following key ITIC Model outputs: (1) the remaining rail revenues after accounting for losses in revenues from both diversion and from discounting to hold traffic; and (2) the remaining post-diversion car miles used to assess the effect of diversion on rail FSE.

The ITIC Model provides values for revenue and car miles for both the base case and each scenario. Percent changes from the base case to the scenario were calculated from these values. These percent changes were then applied to financial and operating statistics in the AAR, *Analysis of Class I Railroads—1994* (grown to the Year 2000) to determine the revenues and car miles used as inputs into an Integrated Financial Model.

The Integrated Financial Model was used to estimate the impact that changes in TS&W regulations would have on the rail industry's financial condition. As inputs, this model uses ITIC Model outputs described above and the change in FSE with respect to changing car miles (cost elasticity) derived by Gerard McCullough in his 1993 dissertation, *A Synthetic Translog Cost Function for Estimating Output-Specific Railroad Marginal Costs*. FSE from the *Analysis of Class I Railroads —1994* represents variable cost, the variable and fixed cost portions of depreciation charges, and interest expense railroads incur.

According to McCullough, for the industry, the cost elasticity is 0.6101. As railroads lose traffic, measured in car miles, and the associated revenues, reductions in cost do not decrease in a one-to-one relationship with car miles as noted by the elasticity value, 0.6101. Rather, railroads shed costs much more slowly because of the high fixed and common cost component of total costs that characterize the industry. To illustrate, if there were a 10 percent decline in rail car miles, the application of the 0.6101 elasticity coefficient indicates that freight cost would decline only 6.1 percent. As a consequence, the cost to handle the remaining traffic in terms of cost per car mile would increase in the post-diversion case as would be expected in a decreasing cost industry. This increased cost for remaining rail traffic represents an offset to shipper cost savings experienced by truck and former rail shippers as a result of truck size and weight changes, yielding the net national change in shipper costs.

Figure XI-4 presents a "wiring diagram" that demonstrates how the Integrated Financial Model works. The model links the Income Statement, Sources and Uses of Funds, and Balance Sheet information, as well as ROI for the rail industry, to evaluate each of the truck size and weight scenarios under consideration. The model imports the independent variables noted above

—percent changes in revenues and car miles —from the ITIC Model into the Income Statement to calculate the effects on the industry balance sheet. By using measured changes in the Income Statement variables—revenues, expenses (including FSE), income, and cash generated and expended—the model produces a revised industry Balance Sheet as output. The output includes a new FSE resulting from a change in car miles in the post-diversion study Year 2000. The Integrated Financial Model is also used to calculate the post-diversion ROI, and the increase in rail rates that would be required to return the rail industry to pre-diversion financial conditions.

The Integrated Financial Model analysis was applied to the rail industry as a whole and four "focus" railroads. The analysis of focus railroads is described in Figure XI-6. Similar to the application of the cost elasticity for the industry, the analysis applies individual elasticity coefficients for each focus railroad.

The elasticities applied in the analysis for the industry and the study railroads are noted in Table XI-1. These elasticities demonstrate that individual rail carriers show different sensitivities to changes in cost resulting from changes in car miles. For example, Conrail has an elasticity of 0.5795 and the Union Pacific has an elasticity of 0.7893. For a 10 percent loss in car miles, Conrail would only lose 5.795 percent of cost while Union Pacific would lose 7.893 percent of cost. For the two railroads there is about a 30 percent difference in impacts.

Study Caveats

The rail impact analyses results are generally plausible but some imprecision may have been introduced due to data restrictions and, more importantly, because of assumptions made concerning present and future conditions in freight transportation. These assumptions are reflected in the growth rates applied to rail traffic volume.

DRI/McGraw Hill developed growth rate estimates for traffic volumes, both rail and truck, for the Year 2000, the study year. For rail, two growth rates were estimated, one for intermodal traffic and one for all other traffic. To expand 1994 car miles, revenue, and FSE to the Year 2000, a traffic-weighted average of these rail growth rates was applied to the

Table XI-1. Industry and Railroad Cost Elasticities

Railroad	Elasticity
Industry	0.6101
Santa Fe	0.7543
Union Pacific	0.7893
Conrail	0.5795

Figure XI-6. Focus Railroads

This study focuses on the rail industry as a whole and on four "focus railroads" —two in the West, the Atchison Topeka and Santa Fe Railway (Santa Fe) and the Union Pacific Railroad—and two in the East, Conrail and Norfolk Southern Railroad. Looking at different railroads operating in different regions of the country demonstrates that the industry is not monolithic. Individual railroads handle significantly different traffic mixes and operate over different types of terrain and geographic areas. As a result, individual railroads' response to increases in truck sizes and weights, measured in percent of lost revenue, increased freight service expense, and lost car miles, will vary. For example, some railroads handle a larger portion of truck competitive traffic than others, while some carriers handle chiefly non-truck competitive bulk commodities, such as coal. Western carriers operate over extreme mountainous terrain, significantly different than in the East. Another important factor is the distance over which the carriers operate. For example, the four railroads operating in the West in 1994 moved traffic over much longer distances than railroads operating in the East. Selection of two railroads from the West and two from the East illustrates the disparity in effects that changes in TS&W can have across different railroads.

Analysis of Class I Railroads – 1994 base year data.

One criticism of this approach is that it fails to account for continued improvements in rail productivity over the 1994 to 2000 period. Rail technology and operations are considered static in the study, although capital investment and certain other factors are adjusted to account for the 2000 traffic volume. Given the extensive productivity gains made by railroads since passage of the Staggers Act in 1980, the issue is whether, and to what extent, this assumption unduly affects the rail impact results.

A consensus among observers of the rail industry is that the railroads have virtually exhausted the efficiencies that can be wrung from their existing plant, and significant future productivity gains will require massive infusion of capital investment. Whether, and to what extent that capital investment will be made is highly uncertain, particularly if there is erosion of railroad financial viability as a consequence of changes in truck sizes and weights. In any case, while stepped up investment will be made to accommodate 2000 traffic, efficiency or productivity gain is expected to significantly lag the industry's performance in recent years. Therefore, it can be concluded that the effect on the rail impact results of the assumed static productivity are minor.

The rail analyses makes use of a rail FSE elasticity coefficient to account for the railroad's declining cost structure. As previously noted, the elasticity applied to the Class I Railroads as a group is 0.6101. It was developed in an econometric

Table XI-2. Railroad Cost Studies

Study	Returns to Density**	Cost Elasticity
Keeler (1974)	1.79	0.5586
Harris (1976)	1.72	0.5813
Harmatuck (1979)	1.92	0.5208
Friedlaender & Spady (1981)	1.16	0.8620
Caves, Christensen, Tretheway, & Windle 1985)	1.76	0.5681
Berndt, Friedlaender, Chiang, & Velturo (1993)	1.57	0.6380

* Gerard J. McCullough, *A Synthetic Translog Cost Function for Estimating Output Specific Railroad Marginal Costs,* p. 4, October, 1993.
** Returns to density for all of the studies except Berndt et al. are reported in Caves et al. (1985). Elasticity of cost with respect to output is the inverse of returns to density.

analysis of the industry based on *Analysis of Class I Railroads* data from 1978 through 1991. The issue is whether the coefficient can be applied credibly to data for the Year 2000, *i.e.*, to what extent has the coefficient changed in the intervening years? While the precise change in the elasticity coefficient is unknown, and would require an entirely new econometric analysis to determine, we believe the change in the study's impact measurements would be insignificant. Table XI-2 shows the results of six studies stretching from 1974 - 1993 where different researchers calculated returns to density for the industry and the elasticity of cost with respect to changes in rail output. In general, the elasticity coefficients have not changed significantly over a period of more than twenty years. McCullough observes that early work by Freidlaender & Spady (1981) was subsequently revised downward, which corresponds more closely with results noted in Table XI-2. Therefore, for the purpose of this study, and calculation of rail financial impacts, use of the 1991 cost elasticity coefficient is unlikely to have a substantially misleading effect on the outcome.

Assessment of Scenario Impacts

Base Case

Table XI-3 illustrates the total freight revenues, total FSE, contribution, and ROI for the industry and the four focus railroads for the base case. The base case applies the 1994 revenue per car mile to estimated Year 2000 car miles. For the industry, freight revenues would be

Table XI-3. Revenues, Freight Service Expense, Contribution, and ROI for Base Case Scenario

Railroad	Revenue	Freight Service Expense	Contribution	ROI %
Industry	$35,390,022,000	$29,832,728,000	$5,557,294,000	9.8
Santa Fe	3,090,909,000	2,659,124,000	431,785,000	7.7
Union Pacific	5,957,431,000	4,833,812,000	1,123,619,000	11.9
Conrail	4,198,333,000	3,566,132,000	632,200,000	8.7
Norfolk Southern	4,517,226,000	3,382,563,000	1,134,663,000	11.4

$35.4 billion. FSE incurred for moving the traffic would be $29.8 billion.

Contribution is the difference between revenue and freight service expense. It represents the amount available to cover fixed cost, income taxes, shareholder profits, and capital investment to improve and maintain the plant to continue to meet customers' demands. For the industry, it would be $5.6 billion. Because contribution is closely linked to ROI, changes in contribution are an important measure of the impact of the scenarios on the rail industry.

ROI is the bottom line measure of a railroad's financial health because it affects access to financial markets. An insufficient ROI generally means that a railroad will not be able to generate sufficient financial resources to replace capital assets over the long run. Using results from the ITIC Model, ROI was calculated using the Integrated Financial Model for each scenario.

Uniformity Scenario

The Uniformity Scenario tests the impact of eliminating State grandfather authority and establishing current Federal TS&W limits on the National Network for large trucks. The potential diversion from truck-to-rail and therefore the impact on railroads was not tested due to limitations of the ITIC model (see Chapter IV).

North American Trade Scenarios

Two North American Trade Scenarios are analyzed: the first tests a 44,000 pound tridem-axle and the second tests a 51,000 pound tridem-axle. These axle weights are tested on one currently allowed configuration—the six-axle tractor semitrailer—and one new configuration—the twin 33-foot eight-axle double-trailer combination.

44,000 Pound Tridem Axle

This scenario specifies maximum GVWs of 90,000 pounds for the six-axle tractor semitrailer and 124,000 pounds for twin 33-foot eight-axle double trailer combinations.

Table XI-4 shows lost revenues, FSE, and contribution resulting from the application of this scenario. For the industry, the 44,000 pound Tridem scenario would result in total lost revenues of $3.2 billion, including $2.4 billion in lost revenue due to diversion from rail to truck. An additional $837 million would be lost as railroads reduced rail rates down to variable costs in response to lower truck rates in an effort to hold on to the remaining rail traffic.

For the industry, the $3.2 billion in lost revenues is matched by a $857 million reduction in FSE, illustrating the fact that railroads do not shed costs proportionately as revenues are lost. Rail contribution would be depleted by nearly $2.4 billion.

Table XI-5 shows losses in car miles, FSE, revenues, contribution, and resulting ROI in percentage terms. For the industry, there was a 4.7 percent loss in car miles with an associated 2.9 percent decline in FSE. Railroad revenues would decline by 9 percent, falling three times faster than FSE. As a result, contribution would fall a full 42.8 percent. ROI for the industry would fall from 9.8 percent in the base case to 6.3 percent.

Under this scenario, the eastern railroads —Conrail and Norfolk Southern— would have the greatest losses. This can be attributed to their relatively shorter hauls and higher rates compared to the Western focus railroads. Conrail would lose 9.1 percent of its car miles, 16.1 percent of its revenues, and a full 76.8 percent of its contribution. As a result, post-diversion ROI would decline by more than 60 percent to 3.2 percent from 8.7 percent in the base case. Norfolk Southern would lose 9.2 percent of its car miles, 6.5 percent of its FSE, and 12.6 percent of its revenues, resulting in a 30.5 percent

Table XI-4. Lost Revenues, Freight Service Expense, and Contribution for North American Trade Scenario With 44,000 Pound Tridem Axle

Railroad	Revenues Lost from Diversion	Revenues Lost from Rail Discounting	Total Lost Revenues	Total Lost Freight Service Expense	Total Lost Rail Contribution
Industry	$2,401,272,951	$836,914,049	$3,238,187,000	$857,265,000	$2,380,923,000
Santa Fe	140,219,754	38,744,246	178,964,000	44,729,000	134,235,000
Union Pacific	348,984,545	148,461,455	497,446,000	166,730,000	330,715,000
Conrail	503,011,987	171,240,013	674,252,000	188,472,000	485,780,000
Norfolk Southern	451,548,257	115,815,743	567,364,000	221,264,000	346,100,000

Table XI-5. Car Miles, Freight Service Expense, Revenues from Operations, Contribution, and ROI for North American Trade Scenario With 44,000 Pound Tridem Axle

Railroad	Car miles Percent Change	FSE Percent Change	Revenues Percent Change	Contribution Percent Change	Post Diversion ROI
Industry	-4.7	-2.9	-9.0	-42.8	6.3
Santa Fe	-2.2	-1.7	-5.8	-31.1	5.6
Union Pacific	-4.4	-3.4	-8.4	-29.4	9.1
Conrail	-9.1	-5.3	-16.1	-76.8	3.2
Norfolk Southern	-9.2	-6.5	-12.6	-30.5	8.4

loss in contribution. Norfolk Southern would lose one fourth of the value of its ROI which fell from 11.4 percent to 8.4 percent.

For the western carriers, much of the rail traffic that would be susceptible to diversion moves over long distances at relatively lower per mile tariffs making it highly truck competitive. But the two focus railroads experience different impacts as a result of this scenario. Even though Santa Fe would face a smaller reduction in car miles, FSE, and revenues than the Union Pacific, the effect on its contribution would be greater. Santa Fe would experience a 31.1 percent loss in contribution compared to Union Pacific's loss of 29.4 percent. This is largely the result of Santa Fe's higher cost structure relative to its revenue. The ROIs for this scenario are shown in Table XI-5.

Because the rail industry is a decreasing cost industry with relatively high fixed cost, the cost per car mile for handling post-diversion traffic rises as traffic is lost. Where FSE is the measure of that cost, the base case FSE per car mile for the industry is $1.167. Post-diversion FSE per car mile increases to $1.19. For Conrail FSE per car mile increases from $1.25 to $1.303. Norfolk Southern's would increase from $1.024 to $1.054.

The effects on Union Pacific and Santa Fe are somewhat less. Union Pacific's FSE per car mile would increase from $1.005 to $1.015 while Santa Fe's would go from $1.058 to $1.064.

51,000 Pound Tridem Axle

This scenario specifies the maximum legal GVWs at 97,000 pounds for six-axle tractor semitrailers and at 131,000 pounds for twin 33-foot eight-axle double trailer combinations.

Table XI-6 shows that under this scenario the industry is estimated to experience losses in revenues of $3.8 billion and a reduction in FSE of $1.05 billion. Rail contribution is estimated to drop by $2.8 billion. Table XI-7 illustrates that car miles are estimated to drop by 5.8 percent under this scenario with a resulting 3.5 percent decline in FSE for the industry. The industry could lose 11 percent of its revenues, which is more than three times the reductions in costs following the losses in traffic. As a result, industry contribution would fall nearly 50 percent. ROI would fall from 9.8 percent in the base case to 5.8 percent. The effects on the study railroads are summarized in Tables XI-6 and XI-7.

Under this scenario, FSE per car mile for the industry increases from $1.167 to $1.195. Conrail's FSE is estimated to increase from $1.25 to $1.311 while Norfolk Southern's goes from $1.024 to $1.061. Union Pacific's FSE per car mile would increase from $1.005 to $1.017. Santa Fe's would increase from $1.058 to $1.065.

Longer Combination Vehicles Nationwide Scenario

This scenario allows both larger and heavier trucks over an extensive road network. (See Chapter III). Table XI-8 illustrates the total dollars lost in revenues, FSE, and contribution for the industry and the focus railroads resulting from the Longer Combination Vehicles (LCVs) Nationwide Scenario. For the industry, revenues losses total nearly $6.7 billion, including revenues lost from discounting of $1.1 billion. Reductions in FSE total $3.6 billion. Rail contribution is depleted by $3.1 billion.

Table XI-6. Lost Revenues, Freight Service Expense, and Contribution for North American Trade Scenario With 51,000 Pound Tridem Axle

Railroad	Revenues Lost from Diversion	Revenues Lost from Rail Discounting	Total Lost Revenues	Total Lost Freight Service Expense	Total Lost Rail Contribution
Industry	$2,909,059,441	$898,906,559	$3,807,966,000	$1,046,554,000	$2,761,412,000
Santa Fe	167,837,728	41,727,272	209,565,000	52,551,000	157,012,000
Union Pacific	412,849,877	162,042,123	574,892,000	203,739,000	371,153,000
Conrail	579,790,182	191,863,818	771,654,000	213,064,000	558,590,000
Norfolk Southern	529,870,511	119,706,489	649,577,000	264,174,000	385,403,000

Table XI-7. Changes in Operational and Financial Indicators Under the North American Trade Scenario With 51,000 Pound Axles

Railroad	Car miles Percent Change	FSE Percent Change	Revenues Percent Change	Contribution Percent Change	Post Diversion ROI
Industry	-5.8	-3.5	-11.0	-49.7	5.8
Santa Fe	-2.6	-2.0	-6.8	-36.4	5.3
Union Pacific	-5.3	-4.2	-9.7	-33.0	8.8
Conrail	-10.3	-6.0	-18.4	-88.4	3.2
Norfolk Southern	-11.0	-7.8	-14.4	-34.0	8.1

Table XI-9 illustrates the relationships between the losses in car miles, freight service expense, revenues, contribution, and resulting ROI in percentage terms that would occur under the LCVs Nationwide Scenario. Industry results show that following a 19.6 percent decline in car miles, FSE would fall by 12 percent. At the same time, railroad revenues would decline by 18.9 percent, falling more than cost. As a result, industry contribution would fall 55.8 percent. ROI for the industry would fall from 9.8 percent to 5.3 percent.

Under this scenario, the eastern railroads —Conrail and Norfolk Southern— with their shorter hauls and higher rates would be affected more than the western carriers—Santa Fe and Union Pacific—in terms of reductions in traffic.

Because Conrail experiences attractive revenue divisions from its connecting carriers on joint line movements and exhibited higher cost structures, it is more severely affected by the LCVs Nationwide scenario than other carriers. Conrail would lose a high proportion of its intermodal traffic and a significant portion of its boxcar traffic. Table XI-8 shows that Conrail would lose $1.5 billion in revenues with an offsetting decrease of only $1.04 billion of FSE, for a contribution loss of $463 million. As a result, Conrail's ROI would fall from 8.7 percent in the base case to 3.7 percent post-diversion. Norfolk Southern, however, would lose 32.9 percent of its car miles, 23 percent of its FSE, 23.3 percent of its revenues, and 21.9 percent of its contribution. As a

Table XI-8. Lost Revenue, Freight Service Expense and Contribution for LCVs Nationwide Scenario

Railroad	Revenues Lost from Diversion	Revenues Lost from Rail Discounting	Total Lost Revenues	Total Lost Freight Service Expense	Total Lost Rail Contribution
Industry	$5,581,006,318	$1,097,090,682	$6,678,097,000	$3,574,666,000	$3,103,431,000
Santa Fe	357,309,105	132,290,895	489,600,000	190,749,000	298,851,000
Union Pacific	771,615,472	214,467,528	986,083,000	544,829,000	423,254,000
Conrail	1,319,955,701	180,528,299	1,500,484,000	1,037,007,000	463,477,000
Norfolk Southern	935,969,692	102,089,308	1,038,059,000	789,166,000	248,893,000

Table XI-9. Changes in Operational and Financial Indicators Under LCVs Nationwide Scenario

Railroad	Car miles Percent Change	FSE Percent Change	Revenues Percent Change	Contribution Percent Change	Post Diversion ROI
Industry	-19.6	-12.0	-18.9	-55.8	5.3
Santa Fe	-9.5	-7.2	-15.8	-69.2	3.1
Union Pacific	-14.3	-11.3	-16.3	-37.7	8.4
Conrail	-50.2	-29.1	-35.7	-73.3	3.7
Norfolk Southern	-32.9	-23.0	-23.3	-21.9	9.5

consequence, its post-diversion ROI would fall to 9.5 percent from 11.4 percent in the base case.

For the western carriers Santa Fe could be expected to experience greater impacts in both absolute and relative terms because a high proportion of its revenues are generated from intermodal traffic, which has a relatively higher cost structure. While the Santa Fe would lose 9.5 percent of its car miles, it would suffer a 69.2 percent decline in contribution, resulting in a post-diversion ROI of 3.1 percent versus 7.7 percent in base case. In contrast, Union Pacific would lose 37.7 percent of its contribution due to the fact that its cost structure has been lower relative to its revenues.

Under this scenario, the industry and the focus railroads face the greatest increases in FSE per car mile. For the industry, FSE per car mile goes from $1.167 to $1.279. Conrail's increases from $1.25 to $1.78 and Norfolk Southern's increases to $1.171 from its base of $1.024. Union Pacific faces increases from $1.005 to $1.041. Santa Fe's goes from $1.058 to $1.086.

H.R. 551 Scenario

The H.R. 551 Scenario would decrease the cubic capacity for the existing five- and six-axle tractor semitrailers. The potential diversion from truck-to-rail, and therefore the impact to railroads, was not tested due to limitations of the ITIC Model (see Chapter IV).

Triples Nationwide Scenario

This scenario tests the impacts of allowing triple-trailer combinations with a GVWs 132,000 pounds on an extensive road network.

Table XI-10 illustrates the total dollars lost in revenues, FSE, and contribution for the industry and the focus railroad resulting from this scenario.

As a result, the industry would face losses in revenues of $2.9 billion, including $645 million from discounting to hold onto traffic. FSE would decline by $735 million. Rail contribution is depleted by $2.1 billion.

Table XI-11 indicates the percentage change in car miles, FSE, revenues, contribution, and resulting ROI under the triple-trailer combination nationwide scenario for the industry and the focus railroads.

Overall, for the individual focus railroads, the impact with respect to changes in contribution was relatively the same with the exception of Conrail. The eastern carriers, however, did experience more traffic losses to trucks than those in the West. Conrail and Norfolk Southern both experienced over a 7 percent loss in car miles. However, even with this similarity, the impact on Conrail was far greater with respect to lost contribution, as it loses 73.4 percent compared to Norfolk Southern's loss of 29.1 percent. Conrail's ROI fell from 8.7 percent in the base case to 3.5 percent post-diversion.

In contrast, Union Pacific would experience a 4.24 percent loss in car miles, followed by a 3.3 percent reduction in FSE and a 7.39 percent loss in revenues. Its loss in contribution was 24.8 percent. As a result, its ROI fell from 11.9 to 9.6 percent. Santa Fe, with its high cost structure relative to its revenues, lost 2.3 percent of it car miles, 1.7 percent of its FSE, and 5.6 percent of its revenues, resulting in 29.2 percent reduction in contribution for a post-diversion ROI of 5.7 percent compared to 7.7 percent in the base case.

Table XI-10. Lost Revenues, Freight Service Expense, and Contribution for Triples Nationwide Scenario

Railroad	Revenues Lost from Diversion	Revenues Lost from Rail Discounting	Total Lost Revenues	Total Lost Freight Service Expense	Total Lost Rail Contribution
Industry	$2,218,231,487	$644,821,513	$2,863,053,000	$735,318,000	$2,127,735,000
Santa Fe	139,566,283	32,597,718	172,164,000	45,531,000	126,633,000
Union Pacific	336,281,771	103,972,229	440,254,000	161,770,000	278,484,000
Conrail	482,968,363	126,629,637	609,598,000	146,313,000	463,285,000
Norfolk Southern	420,662,284	83,911,716	504,574,000	174,518,000	330,056,000

Table XI-11. Changes in Rail Operational and Financial Indicators for the Triples Nationwide Scenario

Railroad	Car miles Percent Change	FSE Percent Change	Revenues Percent Change	Contribution Percent Change	Post Diversion ROI
Industry	-4.04	-2.5	-8.09	-38.2	6.7
Santa Fe	-2.27	-1.7	-5.57	-29.2	5.7
Union Pacific	-4.24	-3.3	-7.39	-24.8	9.6
Conrail	-7.08	-4.1	-14.52	-73.4	3.5
Norfolk Southern	-7.26	-5.2	-11.17	-29.1	8.5

This scenario has least impact on changes in FSE per car mile. For the industry, FSE per car miles increases from $1.167 to $1.187. Conrail's would increase to $1.291 from $1.024 and Norfolk Southern's would increase from $1.024 to $1.048. Union Pacific and Santa Fe are virtually unaffected but do face increases. For Union Pacific FSE per car mile increases to $1.015 from $1.005. Santa Fe's increases from $1.058 to $1.064.

Interpretation of

Results

Railroad Response

Rate Increases Necessary to Replace Contribution

The analysis above uses the ITIC Model combined with the Integrated Financial Model to estimate the impact of a change in truck sizes and weights on the rail industry. But how the rail industry will respond to the loss of rail traffic, revenues, and contribution is not known. For example, will individual rail carriers be able to increase prices on remaining rail traffic to replace lost revenues or will the erosion in financial strength take place unabated?

The section presents the results of additional analysis undertaken to estimate how much rail rates would have to increase in order to recapture contribution and restore railroad ROI to pre-diversion levels. While this is an interesting intellectual exercise, the unique characteristics of the rail industry need to be taken into consideration in determining the probability that such a strategy could actually take place. Some maintain that contribution replacement could take place if railroads are able to increase rail rates on captive shippers, those shippers with no transportation alternative. However, consideration of this option is not a very realistic solution. First, the number of captive shippers is small relative to the total number of rail shippers. Second, it is likely that railroads are already charging all shippers, including captive shippers, the maximum rates possible—rates are constrained by both competition and maximum rate regulation.
But, even if rail rates were to increase, the rate increase would be followed by a further reduction in rail traffic, as more rail shippers would be induced by the higher rail rates to ship their goods by truck. Because this study is a static analysis, it is unable to evaluate the real world, long term, dynamic response of the rail shippers to a rail rate increase designed to recapture the projected lost rail revenues.

For the LCV Scenario, Table XI-12 illustrates the rail rate increases for all traffic that would be required to replace lost contribution and restore ROI for the industry and each of the focus railroads to pre-diversion levels. These rate increases are estimated by assuming that all remaining traffic would bear the consequential increases evenly (not likely to be the case). For the other scenarios, rate increases necessary to replace lost contribution and restore ROI would be somewhat less. If it were

Table XI-12. Estimated Rail Rate Increase on All Traffic to Replace Lost Contribution and Restore ROI

Industry	11%
Conrail	17%
Santa Fe	11%
Union Pacific	8%
Norfolk Southern	6%

possible to examine and apply these rate increases to captive traffic only, then the increases noted in Table XI-12 would be significantly higher.

Erosion of Financial Strength

As previously discussed, the financial condition of the rail industry and each of the focus railroads deteriorated under each of the scenarios. For the industry, the loss in contribution in the LCV Scenario was nearly 55 percent. Under the two Tridem-Axle scenarios—44,000 and 51,000 pound—losses in contribution were 43 percent and 50 percent, respectively. Under the Triples Scenario, the loss was 38 percent.

Corresponding with these losses were reductions in ROI, which would affect the industry and each of the focus railroads' ability to access capital.

Clearly no industry can endure the loss of half its contribution as predicted in the LCV Scenario. If these losses were to occur, the effects would be predictable: total elimination of any shareholder distributions and cancellation of capital spending, at a minimum. Since 1990 the industry has put in place over $30 billion of capital investment to replace plant and equipment. At the rate of loss implicit in the above calculations, this would be depleted in less than a decade.

While it is unlikely that railroads would be able to increase rates and restore contribution and ROI to pre-diversion levels, one can only assume that the carriers would have difficulty gaining access to financial capital to maintain and replace assets. On the one hand, such difficulties would force the carriers to shrink their systems to return ROI to acceptable levels and once again gain access to financial markets. If shrinkage of the system is not possible, then the carriers would be forced to defer maintenance and would be unable to replace assets needed to meet their customers' needs. As a consequence, there would be service deterioration.