A Half Century of Productivity Improvements in the U.S. Rail Freight Industry 1960 to 2010

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Revitalizing the US Rail System, 1960 - 2010

• Network rationalization transformed a 19th century rail system into one suited for the 21st century
• Regulatory change enabled greater pricing freedom
• Technological improvements reduced costs of track and equipment
• Advances in IT led to more effective management and control
• Labor agreements allowed more efficient operation
Employees Required per Unit of Output
Output Doubled, but Resource Requirements Shrank between 1966 and 2008 ...
... and Financial Performance (Eventually) Improved

![Graph showing financial performance metrics over time](image)
# Changes in Markets

(1000s of Carloads)

<table>
<thead>
<tr>
<th>Commodity</th>
<th>1969</th>
<th>1987</th>
<th>2008</th>
<th>% Change</th>
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<tbody>
<tr>
<td>Coal</td>
<td>5,152</td>
<td>5,430</td>
<td>7,713</td>
<td>50%</td>
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<tr>
<td>Chemicals</td>
<td>1,482</td>
<td>1,420</td>
<td>2,058</td>
<td>39%</td>
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<tr>
<td>Motor Vehicles</td>
<td>1,157</td>
<td>1,031</td>
<td>1,322</td>
<td>14%</td>
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<td>Farm Products</td>
<td>2,175</td>
<td>1,908</td>
<td>1,726</td>
<td>-21%</td>
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<tr>
<td>Food &amp; Kindred Products</td>
<td>2,306</td>
<td>1,326</td>
<td>1,501</td>
<td>-35%</td>
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<td>Non-Metallic Minerals</td>
<td>2,098</td>
<td>1,187</td>
<td>1,325</td>
<td>-37%</td>
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<tr>
<td>Pulp &amp; Paper</td>
<td>1,253</td>
<td>661</td>
<td>666</td>
<td>-47%</td>
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<tr>
<td>Metals &amp; Metal Products</td>
<td>1,480</td>
<td>451</td>
<td>692</td>
<td>-53%</td>
</tr>
<tr>
<td>Lumber &amp; Wood Products</td>
<td>2,098</td>
<td>986</td>
<td>392</td>
<td>-81%</td>
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</table>
1960s – False Hopes

- U.S. Rate of inflation was 1.6% in 1965
- 1965 & 1966: US Railroads achieved nearly 4% ROI and nearly 5% ROE, best years since before WW II.
- The prospective merger of the New York Central and the Pennsylvania Railroad was seen as highly beneficial
- Railroads had taken an aggressive stance to resolve impediments to productivity embedded in labor agreements (especially crew consist and basis of pay)
- Railroads were investing in hump yards

CSX Queensgate Yard in Cincinnati: construction of hump yards reduces costs of switching.
1960s - Problems on the Horizon

- Overbuilt Networks with Inadequate Track Structure
- Labor Strife (inability to resolve crew consist issues)
- Inflation
- Competition
  - Airlines and private autos
  - Truckload Carriers
- Regulatory Constraints
  - Pricing
  - Operations (unit trains, heavier cars)
  - Network rationalization (abandonments and mergers)
The Northeast Rail Crisis

Bankruptcies!

• June 21, 1970: Penn Central Railroad declares bankruptcy
• Several small northeastern railroads follow suit

Why?

• Penn Central cites four major problems:
  – Passenger service
  – Light density lines
  – Delayed rate hikes
  – Labor agreements

The potential collapse of the region’s rail system threatens the entire economy.
Federal Response

• Legislation:
  • Creation of Amtrak
  • The Regional Railroad Revitalization Act (3R Act) created the US Railway Association (USRA), whose studies and recommendations led to the creation of Conrail in 1976
  • The Railroad Revitalization and Regulatory Reform Act (4R Act) began to ease the regulatory framework

• Studies:
  • USRA
  • US Federal Railroad Administration (FRA)
  • FCUP: Freight Car Utilization Program
Meanwhile, Rail Problems Worsen ...

The combination of inflation and recession, which began to make itself severely felt in the last quarter of 1974, continued to worsen in the early months of 1975. Traffic dropped off in nearly all of the major categories, with only metallic ores and coal showing slight gains. Piggyback traffic declined sharply after two consecutive record years. ... Railroads fought – but ultimately lost – the battle against increased truck weight, which threaten to divert substantial rail traffic.

Yearbook of Railroad Facts, 1975, pp. 4-5

March 17, 1975: Rock Island declares bankruptcy
... Especially in the Midwest

- Unit trains serving large grain terminals depleted much of the traffic from midwestern branch lines

- March 17, 1975: Rock Island declares bankruptcy
Federal Response: FarmRail?

• What now?
  • Let others fail?
  • Farm Rail?
  • Deregulation?
• What would not require massive public investment or ownership?
• Studies of many aspects of rail operations, marketing, management, and regulation published in *A Prospectus for Change in the Freight Railroad Industry*
Continuation of the trends of the postwar period would result within the next 10 years in an industry facing enormous capital shortages, competing only for bulk shipments of low-value goods, lacking the resources needed for safe operation, and to a very considerable degree, operating under the financial control or ownership of public agencies.

U.S. Secretary of Transportation,
A Prospectus for Change in the Freight Railroad Industry, 1978, p. 3
1980 - The Staggers Act
Reduced Regulation Believed to be Highly Beneficial for Railroads

• Expanded pricing freedom allowed under 4R Act
  • Contract rates
  • Ability to adjust rates to meet market conditions
• Changed regulatory framework related to network rationalization
  • Reduced obstacles to abandonments
  • Reduced obstacles to mergers
Additional Reasons for Optimism in 1980

• Government investment in Conrail had proved successful
• Crew consist issue resolved on several railroads, providing a framework for the entire industry
• High fuel costs helped railroads compete with trucks
• The rail industry, with government support, opened a test facility in Pueblo Colorado to conduct the research necessary to upgrade track components
• Rapid growth in intermodal traffic was expected to continue
• The Clean Air Act made western coal a certain growth industry
However, Problems Remained at Start of 1980s

• Interest rates and inflation remained extraordinarily high
• Measures taken by federal government to combat inflation were about to plunge the nation into deep recession
• Railroads were far too slow in seeking an end to ICC regulations concerning car hire (incentive per diem), and unwarranted investments in general purpose equipment would produce a vast glut of boxcars and other general purpose equipment
• Trucking deregulation, along with rail rate freedom, ensured that competition would drive prices lower.
Productivity
1973 - 1983

• Rail traffic declines sharply after 1980
• Both rates and costs rise with inflation
• Productivity stable

• Output: freight revenue (1978$)
• Input: freight costs (1978$)

Productivity Factors, 1973-1983

- Shift from traditional carload service toward unit trains and intermodal
- General improvement in labor productivity
- General decline in network utilization
  - Reduction in yard switching
  - Increasing underutilization of light density lines
  - Underutilization of general purpose equipment
- Railroads used pricing freedom to raise rates on traffic they felt was unprofitable or underpriced.

The caboose became a relic of the past when federal safety regulations allowed railroads to attach an electronic device to the last car of a train that could communicate “I’m still here”.
In short, after all factors have been considered, there was no net improvement in total railroad productivity between 1973 and 1983. On the other hand, there was no net decline in productivity either, which is perhaps a remarkable achievement given the one third decline in output over this period and the once common perception of railroads as an industry with high fixed costs. Stable productivity means that all costs, fixed or variable, declined as rapidly as output declined.

C.D. Martland and G. McCullough, *Improving Railroad Productivity*  
MIT Studies in Railroad Operations and Economics, 1984, p. 59
Major Market Changes During the 1980s: Globalization – Low Sulphur Coal

Containerization & International Trade: Land Bridge or Panama Canal?

More and More Coal from the Powder River Basin
Technological Change: Railroad Track Structure

Improved Track Components – Premium Steel, Larger Ties

Advanced Inspection Technology – Detecting rail defects
Technological Change: Equipment Design

Simple Innovation – Massive Benefits

Heavy Haul Freight – 286,000-pound GVW
Longer, Heavier Coal Trains

- 1966: 7,000 tons (100 70-ton cars)
- 1980: 10,000 tons (100 100-ton cars)
- 1995: 12,880 tons (115 286,000 GVW steel cars, 112 tons of coal)
- 2008: 15,600 tons (130 286,000 GVW steel/aluminum cars, 20 tons of coal)

Left: Train of 125-ton cars operating over FAST/HAL Loop in Pueblo, c. 1990
Above: UP coal train, York Nebraska, 2003
Modern Intermodal Terminals

Backimg trailers onto flat cars at jerry-built ramps in early 70s

Using piggypackers to load double-stack trains in the 80s
After Staggers:
Productivity Gains Offset by Declining Freight Rates

Continuing a trend evident since the Staggers Rail Act of 1980 partially deregulated the rail industry, railroads realized significant productivity gains in 1995. ... Rail freight rates have fallen sharply and steadily in recent years. ... Today, nearly 70% of rail freight (up from nearly zero in 1980) is transported under contracts voluntarily negotiated between railroads and shippers.

Railroad Facts, 1996, p. 6
Productivity, Prices and Profitability 1965-1995

- 1969 to 1983
  - Declining output
  - Rising prices
- 1983 to 1995
  - Growing output
  - Declining prices
Reasons for Optimism in 1995

- Financial performance was the best since WWII
- Mega-mergers allowed economies of scale and consolidation of routes and terminals; sale of Conrail and further consolidation in the east was imminent
- Decades of productivity improvement had sharply reduced resources required
- Research had paid off - the track structure could now handle heavier cars
- Double stack container trains and the rapid economic growth on the Pacific Rim had led to continued rapid growth in rail intermodal traffic
Snapshot of the Industry: 1995

Problems on the Horizon

• Despite all the productivity improvement, price competition among railroads and with motor carries sent almost all of the benefits to customers

• Massive congestion following the most recent mergers highlighted the fact that the excess capacity had been eliminated – and now the railroads must invest if they want to handle more traffic

• Cutbacks in research budgets, especially related to operations and systems performance, could limit further productivity growth

• Many of the sources of productivity improvement had been largely exhausted
Longer, Heavier Trains: Changes from 1980 to 2006

• General Merchandise
  • 50% increase in average GVW
  • 25% increase in average train length

• Bulk
  • 10% increase in average net tons per load
  • 12% increase in cars per train

• Intermodal
  • Shift to double stack doubles containers per train while reducing tare weight
Changes in Prices 1995-2004

• Revenue per Ton: up 3.5%
• Revenue per Carload: down 3%
• Revenue per Ton-Mile:
  • Current $: down 2%
  • Constant $: down 17%
• Overall: traffic up 20% or more, while rates declined
Prices & Traffic Volume 1995-2004: Results Varied by Commodity

• Lower Prices, Strong Growth:
  • Coal
  • Specialized equipment: Chemicals, Motor Vehicles
• Larger loads, stable revenue/ton, modest growth except for ores
  • Bulk (e.g. minerals, ores)
  • Pulp & paper products
  • Grain
• Higher prices for some commodities
  • Lumber & wood products, Farm products (modest decline)
  • Intermodal (strong growth)
Rates Decline as Length of Haul Increases

Productivity
1985 - 2007

• Rail output triples
• Rail input declines by a quarter
• Productivity rises by a factor of 4
• Costs rise while prices decline

• Output: freight revenue deflated by STB rate index
• Input: freight costs deflated by Railroad Cost Recovery index

Index of output, input and productivity
(1985 = 100)
Sharing the Productivity Benefits:
Increases in NROI, Decreases in Rates

![Graph showing annual savings in billions of current dollars for Railroads and Shippers from 1980 to 2008.]
Net Railway Operating Income:
Little Improvement from 1984 to 2004
U.S. Class I Railroads
By 2007, the Railroads Really Were Prospering

Better output per employee, more efficient utilization of infrastructure, and improved locomotive fuel efficiency helped freight railroads attain their best industry operating ratio (78.6%) since World War II. The resulting financial performance, which included a return on equity of 11.3 percent and a return on investment of 10.2%, was a welcome and long-sought improvement after a disappointing record over the last forty years.

Other Reasons for Optimism in 2007

- High fuel prices, which favored rail when competing with trucks
- Railroads’ willingness to invest in order to increase capacity
- Strong growth in traffic, especially intermodal
- Strong support for rail from public officials at all levels
- Examples of public private partnerships

Fueling locomotives at UP’s terminal in North Platte, which was expanded repeatedly to handle unit coals trains originating in the Powder River Basin. February 2, 2002.
However, Problems on the Horizon

• Railroads feared re-regulation
• Customers feared lack of capacity and, in some cases, unfair price increases
• Consistently high fuel prices seemed to favor rail – but would they last and what would the effect be on the broader economy?
• Public agencies that wanted much more passenger service often had little understanding of capabilities of the network
• Government requirements for PTC could place a financial burden on the industry
• Would the industry be able to expand rapidly enough to handle a greater share of freight?
Studies of Rail Freight Service Levels:

• Freight Car Utilization Program, 1975
  • 61 O-D movements reported by Allied Chemical, General Motors and DuPont
  • 6.8 days, 57% in two-day window

• Burlington Northern, 1988
  • 50 truck-competitive corridors
  • Average 7.1 days, 85% no more than a day early or a half day late

• AAR Reliability Studies, 1991
  • 1% sample of all moves in boxcars and covered hoppers in month ending in November 1991
  • Average trip time 8.8 days for boxcars, 9.0 for covered hoppers
  • For highest volume moves, average was 7.1 days with 49% in two-day window

• ASLRAA Study, 2006
  • 39 representative O-D pairs
  • Typical trips are 7-8 days, with considerable variability

Conclusion as of 2006: Despite continuing advances in technology for track, equipment, and control, the service provided to general merchandise freight has been relatively unchanged for more than 30 years.
Summary
There Really Was a Tremendous Improvement in Rail Freight Service Productivity Between 1965 and 2010
Should the Staggers Act Take Credit for these Improvements?

The evidence strongly indicates that rail deregulation has accomplished its primary goal of putting the U.S. rail freight industry on a more secure financial footing. Surprisingly, deregulation has also turned out to be a great boon for shippers as rail carriers have passed on some of their cost savings to them in lower rates and significantly improved service times and reliability.

Cliff Winston, The Success of the Staggers Rail Act of 1980, 2005
(www.brookings.edu/research, accessed 11/20/2021)
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Should the Staggers Act Take Credit for these Improvements?

NOT SOME! NEARLY ALL!

NO! “GENERALLY UNCHANGED” PLUS PERIODS OF EXTREME CONGESTION!
Was Regulation Really the Problem?

ICC minimum rate regulations and track abandonment procedures kept many Class I railroads competitive. ICC ownership certificate requirements reduced destructive competition in the trucking industry.

The Penn Central bankruptcy showed that the railroads had a variety of non-regulation related problems.

The ICC witnessed the survival of the railroads and truckers through significant economic and political changes, including increased competition, evolving industrial markets, high interest rates, inflation, urbanization, and two World Wars.

Many Things Contributed to Improved Productivity

Structural Change in Rail Networks:
   Rationalization
   Federal Investments in Amtrak and Conrail
Changing Markets:
   Focus on freight most suited to rail
   Globalization, western coal
Technological advances
   Heavy haul railroading
   Modern intermodal transportation
IT for management and control
Labor agreements and labor productivity

Taken together, these actions transformed a system designed for the 19th century into a system suitable for the 21st.