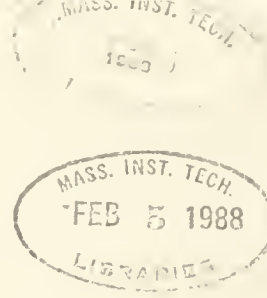


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WORKING PAPER
ALFRED P. SLOAN SCHOOL OF MANAGEMENT

AN ECONOMIC ASSESSMENT OF SURFACE FREIGHT
TRANSPORTATION DEREGULATION

Nancy L. Rose
January 1988

Sloan School of Management Working Paper 1971-88

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1. Introduction

Regulatory reforms during the late 1970s and early 1980s dramatically transformed the structure and performance of the U.S. surface freight transportation industry. After four decades of gradual decline, the number of firms in the interstate trucking industry exploded, increasing from 16,000 in 1975 to more than 33,000 in 1985. Real trucking rates fell nearly 20 percent over the same period. Deregulation of the rail industry led to mergers and consolidations that have slashed the number of large (Class I) carriers from 73 in 1975 to 26 in 1985. At the same time that real average revenue per ton-mile declined by 21 percent, real net railway operating income rose by over 160 percent.¹

The structural and performance changes associated with transport "deregulation" generated substantial redistributions of wealth among carriers, labor, shippers, and final customers and dramatically altered the costs and organization of transportation services. Many of these consequences were anticipated in the debate over deregulation; others have emerged during the regulatory transition. In general, economic deregulation has led to net social benefits. However, three issues-- motor carrier safety, railroad pricing for captive shippers, and increased concentration in both industries-- have attracted growing public attention and raised questions about the desirability of competitive transportation industries.

This study surveys the current state of the U. S. trucking and railroad industries and discusses developments that may merit policy attention. Section 2 describes the background to deregulation, identifying the major players and

¹ This figure may be somewhat overstated by changes in depreciation accounting adopted in 1983, although the increase in net income is nonetheless substantial. Both deregulation and changes in the tax laws are likely to have contributed to this improvement.

their positions in the political battle over deregulation. Section 3 reviews the effects of deregulation on five aspects of industry performance: prices, labor (employment and wages), costs/productivity, profitability, and service quality. Section 4 discusses the emerging issues in surface freight transportation that threaten to reinvoke economic regulation and evaluates their implications for future policy.

2. Setting the Stage for Deregulation: A Study in Contrasts

Understanding the regulatory environment in which motor carriers and railroads operated is essential to an informed discussion of the effects of regulatory reform in these industries. Although the ICC exercised authority over prices, entry, and exit in both industries, the regulatory environment in which trucking firms operated differed dramatically from that imposed on railroads. This led to quite disparate performance, and consequently different political interests, in the two industries.

Trucking

The regulated trucking industry was characterized by relatively high profits, especially for larger trucking firms, and relatively high wages, particularly for union members. This performance was supported by the ICC's system of stringent entry controls, restrictions on partially regulated or exempt carriers, and collective ratemaking with minimal Commission rate oversight. The ICC acted largely to preserve the status quo. To this end, entry applications typically were denied if they were shown to harm existing carriers (e.g., by lowering their profits) and independent rate-setting was strongly discouraged. This system raised trucking rates above competitive

levels, creating a pool of economic rents that was divided between owners of regulated trucking firms and Teamsters Union drivers (Moore 1978, Rose 1987).

In the mid-1970s, with support from both the Ford and Carter Administrations, the ICC began to re-evaluate its position on motor carrier regulation. In 1978 and early 1979, the Commission initiated a flurry of rulemakings and policy announcements designed to reverse its historic protectionist bias and increase competition. This effort was encouraged by legislation introduced by Senator Edward Kennedy in early 1979. Regulatory reforms were actively opposed by the common carrier trucking industry, represented by the Regular Common Carrier Conference of the American Trucking Associations (ATA), and by the Teamsters Union. These groups fought reforms through hearings before the ICC, lawsuits against the ICC, and Congressional lobbying efforts. The ATA's effectiveness was somewhat limited by its internal division on deregulation: contract carriers and especially private carriers within the ATA welcomed relaxation of restrictions on their business and were unwilling to participate in a unified ATA denouncement of all reform legislation. Proponents of deregulation included smaller truckers (particularly owner-operators) who were blocked from entering regulated markets; consumer groups; a variety of shippers' organizations including small shippers represented by the National Federation of Independent Businessmen as well as large shippers such as Sears, DuPont, and Lever Brothers; and congressional staff (Robyn 1987).

Despite intense opposition and after an initial stalemate, Congress adopted the Motor Carrier Act of 1980 in June 1980.² This Act codified most of the ICC's earlier reforms while somewhat limiting additional ICC incursions on

² See Robyn (1987) for an excellent discussion of the politics of trucking deregulation.

regulation. ICC and legislative reforms (popularly referred to as "deregulation," although the ICC maintains regulatory jurisdiction over the industry) led to a dramatic restructuring of the trucking industry. Between 1978 and 1985, the number of regulated trucking firms doubled and the operations of existing carriers dramatically expanded. The effects of these changes are discussed in the following sections.

Railroads

The regulated railroad industry, in sharp contrast to the trucking industry, was a declining industry characterized by low profits and relatively little new capital investment. The railroads' share of intercity ton-miles of freight fell from 61 percent in 1940 to 44 percent in 1960 to a low of 35 percent in 1978 (Transportation Policy Associates 1985, p. 6). The aggregate rate of return on stockholders' equity averaged 2.2 percent over 1970-1975, and a number of railroads declared bankruptcy during this period. ICC regulation restricted exit, route abandonments, and mergers rather than entry; the focus of price regulation during 1970s was maximum prices, not price floors.

The political economy of rail deregulation differs dramatically from that of trucking deregulation. Congress, rather than the ICC, initiated rail regulatory reform, first with the 1976 4R Act (initially ignored by the ICC) and later with the 1980 Staggers Rail Act. Regulatory reforms were vigorously endorsed by the railroad industry, which contended it needed pricing flexibility and abandonment and merger rights to achieve some measure of financial viability. They were opposed by some shipping interests, particularly electric utilities, who feared substantial increases in coal transport rates, and by railroad labor. The railroads received a political boost to their efforts by the continuing and increasing losses incurred by Amtrak and Conrail. Faced

with growing financial drains on federal coffers, the decision to provide the industry with the means to reduce required subsidies looked increasingly attractive to Congress.

The Staggers Act fundamentally reoriented rail regulation by its explicit premise that the industry, once considered a natural monopoly, is now largely competitive. This premise led naturally to a system of reduced regulatory controls on pricing and service and increased reliance on market forces to control firm behavior. Because the industry is not perfectly competitive, the Act included maximum rate provisions designed to protect "captive shippers" (those served by one railroad with no close substitute transportation available) from monopolistic exploitation. These provide for Commission review of rates in excess of 180 percent of variable cost with provisions for higher rates if carriers do not earn an "adequate" rate of return overall. Continuing controversy surrounds the implementation of these provisions, particularly with respect to coal transport rates, as discussed below.

3. The Consequences of Deregulation: Aspects of Industry Performance

While opponents of regulatory reform threatened disastrous consequences from meddling with the regulatory framework, academic economists generally promised dramatic benefits from dismantling the system of price, entry, and exit controls. With six to ten years of post-deregulation experience behind us, it seems appropriate to explore what the actual consequences have been. The effects of deregulation on prices, employment and wages, production costs and productivity, profitability, and service quality are discussed below.

Prices

Assessing the actual impact of regulatory reform on freight prices is difficult given the multiproduct nature of the transport industry: there are literally thousands of prices to be considered, each applying to a particular commodity, shipment size, and origin-destination. Multiproduct price systems have two characteristics: the overall price level, or average price, and the pricing structure, or pattern of relative prices across different types of shipments. Regulatory reforms generally reduced the price level in both the trucking and railroad industries. These declines have been quite uneven, however. As a consequence, price structure effects have provoked considerable debate, particularly in the rail industry.

Trucking: Massive increases in entry by both new and existing carriers combined with a reduction in the scope of collective ratemaking put tremendous downward pressure on trucking rates. This effect was most intense in the truckload (TL) sector, where the bulk of new entry occurred. As illustrated in table 1,³ real revenue per ton-mile for the largest (class I and II) regulated motor carriers declined by 14 percent for common carriers (both less-than-truckload (LTL) and TL) and by 24 percent for contract carriers (TL) between 1978 and 1984. This pattern is echoed in a 1983 survey of shippers conducted

Table 1
Trucking Revenue per Ton-mile
(cents per ton-mile, 1986 dollars)

	<u>1970</u>	<u>1975</u>	<u>1978</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>
Common Carriers	20.34	17.71	16.76	17.25	17.03	16.13	14.93	14.46
Contract Carriers	18.70	15.16	16.65	15.74	14.04	13.77	12.57	12.26

³ Sources and notes for all tables are contained in appendix A.

by Thomas Gale Moore (1986). Moore finds declines of 15 percent in reported real LTL rates between 1978 and 1982 and declines of 25 percent in truckload rates over the same period.

Similar reductions are reported by Blair, Kaserman and McClave ('BKM,' 1986) in an econometric analysis of intrastate deregulation in Florida. Using detailed tariff data for 10 Florida trucking firms, BKM estimate the effect of deregulation on trucking rates per ton-mile. They find that tariff rates fell 15 percent after deregulation in 1980, holding constant shipment characteristics and fuel price. Given the increased prevalence of rate discounting under deregulation, these results probably understate the decline in actual rates. While available evidence suggests overall rate reductions since deregulation, rates have not decreased uniformly. For example, BKM find that rates fell by more in large markets than in small markets. Smaller declines or increases in LTL rates tended to raise rates for small shippers relative to those for large shippers.

An interesting characteristic of many survey results, and one that highlights the difficulty of implementing regulatory reforms, is the tendency of carriers to perceive greater costs than shippers perceive benefits. For example, a 1985 survey of California shippers and carriers found that the distribution of perceived price responses to intrastate deregulation differed substantially between the two groups (Frey, Krolick and Tontz, undated). Twenty-four percent of shippers reported increases of 10 to 20 percent in nominal LTL rates, and 16 percent reported increases of more than 20 percent. In contrast, less than 10 percent of the carriers reported nominal LTL rate increases greater than 10 percent. Twenty-six percent of the carriers but only

14 percent of the shippers reported nominal TL rate decreases of 10 percent or more.

Railroads: Deregulation has had enormous effects on both the average rate level and the structure of railroad rates across commodities. Moore's (1986) survey of 23 shippers using rail services indicated average real rate declines of 7 percent between 1980 and 1982. Average railroad revenue per ton-mile, reported in table 2, fell 18 percent in real terms between 1980 and 1985.

Table 2
Railroad Revenue per Ton-mile
(cents per ton-mile, 1986 dollars)

<u>1970</u>	<u>1975</u>	<u>1978</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
3.90	3.94	3.74	3.81	3.87	3.68	3.44	3.28	3.12

While this reflects in part a continuing shift of traffic toward lower revenue bulk commodities, there have been significant declines in average rates for specific commodities. Federal Railway Administration rate indices suggest declines of 3 to 8 percent in real rail rates for such commodities as farm products, chemicals, primary metals, and transportation equipment between 1980 and 1985 (Railway Age, July 1987, p. 41). Price reductions have been encouraged by the widespread use of confidential rail contracts authorized by Staggers, which enable railroads to grant price reductions to shippers in exchange for traffic volume and other commitments. Nearly 50,000 rail contracts have been signed since deregulation; these account for roughly one-quarter of industry freight revenues.

Econometric studies of individual rail rates have focused primarily on agricultural products. These studies find significant declines in rail rates for farm products. Sample rates from the ICC Waybill file suggest average

declines in nominal export rail rates of 12 percent for wheat and 4.4 percent for corn, controlling for shipment size, distance, and the degree of railroad and barge competition (MacDonald 1986). The averages mask substantial differences across locations, ranging from a nominal 2.7 percent increase for wheat shipped from Idaho to Pacific ports, to a 25 percent decline in rates for wheat shipped from Texas to Gulf ports. These variations are influenced by the extent of railroad and water competition, both of which are critical to maintaining or reducing rail rates (MacDonald 1986, 1987). Similar price declines are reported in studies that use grain price spreads between markets to estimate transportation rates (see MacDonald 1986, pp. 18-20 for a review).

Rail rate reductions have not been uniform across commodities. Although rail rates have been driven toward marginal costs in competitive markets, pricing freedoms also enable carriers to raise rates in more insulated markets. Indeed, given the presence of substantial fixed costs in rail transportation, some rates must be set above marginal costs if railroads are to avoid making losses. In the rail industry, coal markets tend to be among the least competitive and therefore are, at least in theory, likely to bear a large share of fixed costs. The actual effect of deregulation on coal rates is controversial. On the one hand, utilities and coal producers advocate active regulatory intervention in ratemaking to limit what they view as railroad exploitation of monopoly power.⁴ On the other hand, average revenue per ton for coal shipments has been roughly constant in real terms since enactment of Staggers (National

⁴ These interests, through Consumers United for Rail Equity ("CURE"), have lobbied for stricter regulation of railroads serving "captive" markets and substantial re-regulation of railroad activity outside these markets.

Coal Association 1986).⁵ Industry averages may mask significant variations in coal rates across railroads and locations, however. A recent study of the Powder River Basin coal market found that rail markups over marginal costs ranged from 6 to 69 percent and depended in large part on the elasticity of the purchasing utility's demand (Atkinson and Kerkvliet 1986). The controversy over railroad pricing in captive markets is discussed further in section 4.

Labor

Labor unions in surface freight transportation historically have been quite powerful. Unions in both the trucking and the railroad industries were able to raise wages substantially above competitive levels and to enforce restrictive work rules that inflated employment levels (the latter being particularly important in the railroad industry). The degree to which this influence depended upon regulatory restrictions differs sharply between the two sectors, however. The Teamsters Union has fared quite poorly in the newly competitive environment while the various railway unions have maintained much of their control.

Trucking: The Teamsters Union has been one of the primary losers from trucking deregulation. Relaxation of entry restrictions in 1978-80 opened the industry to a flood of nonunion entrants, particularly in the truckload sector. Lower labor costs also encouraged existing nonunion carriers to expand operations and induced a number of the largest unionized general freight carriers to expand their markets through the creation of nonunion subsidiaries. With nonunion wages 25 to 35 percent below union wages and a labor share of 60

⁵ In contrast, coal rates increased substantially prior to Staggers, suggesting that the energy crisis rather than deregulation may have been the catalyst for rate changes (Friedlaender 1986).

percent in total operating costs, nonunion carriers exerted substantial downward pressure on prices and wages.

Over the decade prior to deregulation, union wages for drivers in the regulated trucking industry were 50 percent above nonunion trucking wages and 13 percent above average union wages for blue collar workers elsewhere in the economy (Moore 1978, Rose 1987). Deregulation fundamentally altered this position. The effects of intense nonunion competition combined with the 1981 recession led the Teamsters Union to agree in its 1982 National Master Freight Agreement (NMFA) to an unprecedented freeze on wages. The 1985 NMFA authorized wage reductions for part-time workers and new hires. Table 3 reports the average base NMFA contract wage in constant 1986 dollars.⁶ The union premium over nonunion trucking wages dropped by half after deregulation, to 27 percent,

Table 3
Motor Carrier Employment and Earnings

<u>Year</u>	<u>Average Real Base Contract Wage</u>	<u>Employment (000)</u>	<u>Percent Union</u>
1971	\$13.31	1027	NA
1973	14.55	1073	63%
1975	13.73	996	55
1977	14.46	1038	60
1979	15.54	1286	58
1980	15.99	1194	58
1981	15.52	1157	61
1982	15.18	1121	NA
1983	14.61	1133	53
1984	14.07	1212	31
1985	14.13	1285	28

⁶ These understate the extent of concessions, since many firms withdrew from national bargaining to negotiate more favorable contracts with their local union.

and real union wages, controlling for worker characteristics, declined by 20 percent between 1973-75 and 1983-85 (Rose 1987). These estimates imply aggregate deregulation-induced union wage losses of \$990 million to \$1.8 billion in 1986 dollars (Rose 1987).

Employment effects of deregulation are difficult to measure, particularly since aggregate statistics include all trucking and terminal employment, not just employment in interstate or intercity for-hire firms, and the early years of deregulation were coincident with a severe economic recession. As indicated in column 2, trucking and terminal employment in the 1980s was below the peak employment year of 1979 but considerably higher than employment during most of the 1970s. This provides suggestive evidence that deregulation had a slight positive or no effect on trucking employment levels.

In contrast to aggregate employment patterns, union employment declined substantially with deregulation, exacerbating a trend begun during the 1960s. As reported in table 4, the number of workers covered by the NMFA declined continuously during the 1970s, largely due to traffic shifts away from the less-than-truckload general freight sector (which participates in the NMFA) to less expensive truckload carriers or private carriage. Union coverage fell off

Table 4
NMFA Contract Coverage

<u>Contract Date</u>	<u>Workers Covered</u>	<u>Percentage Change</u>
1970	306,037	--
1973	297,833	- 2.7
1976	283,366	- 4.9
1979	277,017	- 2.2
1982	242,909	-12.3
1985-high	200,000	-17.7
1985-low	160,000	-34.1

sharply after 1979, with NMFA contract coverage declining by 12 percent between 1979 and 1982 and by an additional 18 to 35 percent between 1982 and 1985. Even when non-NMFA union drivers are included, total union employment appears to be down, as indicated by the proportion of truck drivers belonging to the union in column 3 of table 3.

Railroads: Railroad unions, unlike the Teamsters, have been relatively successful in maintaining their financial position. Real hourly earnings and real annual compensation for railroad employees increased by 20 percent between 1975 and 1985, as shown in table 5. A number of factors contributed to this. First, railroad labor historically has exercised substantial political and economic power, as manifested by a separate labor relations law that enhances union bargaining power (the Railway Labor Act), extensive (and expensive) job protection statutes and regulations, and maintenance of payment systems and work rules that raise effective wages while reducing hours of work. Second, railroad unions generally were not threatened by potential entry of nonunion competitors after deregulation; deregulation accelerated consolidation and exit, not entry. There has been some increase in nonunion railroad employment as new local or regional railroads have been created to operate low-density track abandoned or sold by larger railroads. This effect has been fairly limited, however. Finally, deregulation has improved the overall financial condition of the railroad industry, reducing the wage-moderating threat of railroad bankruptcies.

Unions do pay for these high wages through lower employment, although employment effects are somewhat mitigated by the factors described above. Railroad employment has declined substantially through time, with employment in 1970 less than half of 1946 employment. Employment reductions accelerated

since deregulation, as illustrated in column 1 of table 5. Class I railroad employment declined by 2 percent per year between 1970 and 1980, and by 8 percent per year between 1980 and 1985. This was accomplished largely through "buyouts" of employees' contracts (including large severance pay or early retirement packages) and some work rule and crew consist concessions by railroad unions (Lieb 1984).

Although employment decreases have helped to rationalize the railroads' labor force, the process is by no means complete. With no apparent brake on railroad unions' wage demands and a substantial overhang of unproductive work rules remaining, increasing wages and continued efforts by management to reduce employment appear likely. This problem may be compounded by recent legislative efforts to extend labor protection to new railroads.

Costs and Productivity

The effects of deregulation on costs and productivity in the trucking industry are difficult to quantify. Studies of the regulated trucking industry suggested that regulatory restrictions raised costs by preventing companies from optimizing networks and traffic flows, although there has been little analysis of the actual responses of costs and productivity to regulatory reforms. Output measures provide mixed signals. Average length of haul has increased since deregulation, but average load (weight) has fallen. Total intercity trucking ton-miles per employee in trucking and terminal operations has remained roughly constant, although this measure includes both freight and employment outside the regulated trucking sector. Total operating expenses for general freight carriers have stayed roughly constant in real terms.

For railroads, changes in costs and productivity over the deregulated period have been dramatic. While some gains may be unrelated to regulatory

reforms, deregulation intensified cost-reduction pressures by increasing competition and enhancing flexibility in operating decisions. Progress has been made on a number of fronts. Single car shipments have been increasingly replaced by multiple car shipments and unit trains, which reduce switching and handling costs. Single car shipments of major grains to a variety of destinations decreased by 30 to 90 percent between 1981 and 1984; unit train movements of grain to export ports almost doubled over this period (MacDonald 1986). "Piggybacking" (trailers-on-flatcar and containers-on-flatcar) more than doubled between 1980 and 1985, accounting for 15 percent of total carloadings in 1985. These improve service quality and reduce rail handling costs, and have enabled railroads to capture some intercity traffic from motor carriers.⁷

Rail networks have been increasingly rationalized over the past decade, although the rate of change has not changed appreciably since Staggers. Class I railroads reduced system mileage by 25 percent over the 1975-1985 period (see column 1 of table 6) and increased traffic density (revenue ton-miles per mile of road) by 50 percent. Many of the discontinued low density lines can be profitably operated by local or regional railroads, particularly given their lower labor costs. This has induced substantial small scale entry (column 2, table 6). Continued reductions in excess labor and increases in average car size, train length, and distance travelled also contributed to enormous productivity gains.⁸

The net effect of these and other productivity increases has been immense. Railroads have realized enormous labor productivity gains, as shown in column 3

⁷ The predominant source of piggyback freight remains former boxcar traffic, however.

⁸ Unfortunately, I am unaware of any study that quantifies the relative contributions of various changes to the overall productivity gains.

of table 6. Ton-miles of freight per employee-hour increased 76 percent over the 1975-1985 decade, at a 7 percent annual compound rate since 1980. Operating costs fell substantially over the same period. In 1975, real operating expenses per revenue ton-mile of freight averaged 4.08 cents; in 1980, 3.82 cents. By 1985, real operating expenses per revenue ton-mile were 23 percent lower, at 2.95 cents.⁹

Table 6
Railroad Productivity

<u>Year</u>	<u>Miles of Line Owned</u>	<u>New RR</u>	<u>Rev. Ton-miles/ Employee-hour</u>
1970	196	NA	605
1975	192	NA	677
1978	176	NA	775
1980	165	9	862
1981	162	9	906
1982	159	24	927
1983	156	22	1073
1984	152	26	1169
1985	146	29	1195

Profits

Deregulation has had significant but opposite effects on profitability in the trucking and railroad industries. Increased competition reduced profits in the trucking industry, bringing industry profits more in line with "normal" competitive rates of return. While this resulted in significant wealth losses for owners of regulated trucking firms, there is no evidence that it has impaired the financial viability of the trucking industry. In contrast, rail

⁹ Part of the decline is attributable to accounting changes introduced in 1983. This bias is somewhat offset in 1985 by inclusion of a \$784 million special charge to operating expenses by CSX.

deregulation has considerably improved railroad profitability. Increased earnings have prompted new investment and enhanced the long-term financial outlook for the industry.

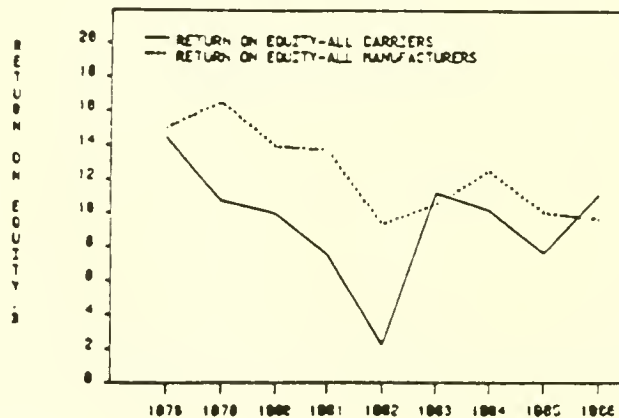
Trucking: Deregulation prompted a substantial transfer of wealth from owners of regulated trucking firms to their customers and final consumers. Under regulation, ICC operating certificates amassed considerable value. This value reflected the difference between the profits earned in restricted regulated markets and those earned in competitive unregulated markets. Moore (1986) reports that average prices paid for samples of operating certificates declined from \$500,000 in the mid-1970s to \$15,000 in 1982. The effect of deregulation on profitability also is reflected in reduced market values of publicly-traded trucking firms. Stock market values fell by 10 to 20 percent after deregulation, representing capitalized losses of more than \$872 million (1986 dollars), or 8 percent of gross revenues, for 32 carriers included in a recent study (Rose 1985).

Industry representatives express concern that deregulation has gone too far, reducing profits below the level needed to sustain financially viable trucking firms. Increased bankruptcies in the industry frequently are cited in support of this proposition. Current bankruptcy rates provide little evidence on long-term financial health, however. The expected business failure rate during the transition from regulation to competition is much higher than either the rate under regulation or the long-term expected rate under competition: inefficient firms that relied on the regulatory umbrella for protection will be forced out in the transition to a competition; carriers that are slow to adopt the new strategies and technologies demanded by a competitive environment will

be left behind; many of the small and inexperienced entrants that flooded the market when regulatory barriers to entry were struck down will fail.

Once the industry stabilizes, I expect a reduction in bankruptcy rates from current levels though not necessarily a return to the low level of failures experienced in the protected regulatory environment.¹⁰ In the meantime, successful companies appear able to attract the capital necessary to maintain or expand operations, and investors seem willing to finance new entry into the industry. Average accounting rates of return, while lower than their super-profitable regulatory levels, have increased from their recession lows (see figure 1). By all indications, the trucking industry will stabilize as a cyclically sensitive, normal profit, competitive industry.

Figure 1
RETURN ON EQUITY



Railroads: For the railroad industry, profits had (almost) no where to go but up in the aftermath of deregulation. The rate of return on net investment averaged less than 2 percent during the 1970s (table 7). When adjusted

¹⁰ Industries with large numbers of small firms and easy entry and exit tend to have higher bankruptcy rates than the economy-wide average. This suggests that the truckload sector and regional less-than-truckload sector will have higher than average bankruptcy rates in a deregulated environment.

railroad rates of return are calculated on a comparable basis to the overall U.S. nonfinancial sector rate of return, the average rate of return for major railroads was less than half that of the corporate sector overall, at 6.3 percent over 1971-79 (Keeler 1983, pp. 7-10).

Table 7
Railroad Profitability

<u>Year</u>	<u>1970</u>	<u>1975</u>	<u>1978</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
Net Income (millions)	\$1324	678	677	1753	1658	850	2026	2691	1793
Return on Net Investment (%)	1.73	1.20	1.58	4.22	3.98	2.11	4.29	5.70	3.83

Railroad profitability has improved dramatically since the Staggers Act, reflecting the dominance of productivity gains over average rate reductions. Real net railway operating income rose 160 percent between 1975 and 1985, from \$677 million to \$1.793 billion (table 7). The rate of return on net investment doubled, averaging 4 percent during the 1980s. For a number of railroads, returns appear to be approaching the corporate average rate of return. Adjusted rates of return for a sample of 7 of the largest railroads (excluding Conrail) averaged 12 percent over the 1982-84 period, compared to their 1971-79 average of 7.7 percent (Friedlaender 1986, Keeler 1983). For railroads with substantial coal traffic, returns are even higher--clearly within the range of the average return to the U.S. nonfinancial corporate sector (Friedlaender 1986, table 9). The Staggers Act cannot claim credit for all of this improvement; part is due to accounting changes and part to tax changes implemented in 1981. It is, however, unlikely that the improvements would have been so dramatic in the absence of substantial regulatory reform.

Service Quality

The ability of carriers to offer custom service tailored to shippers' particular needs appears to be a major benefit of deregulation. Rate flexibility and increased contract carriage permits carriers to offer a range of service quality/price combinations, allowing shippers to choose the level that best meets their needs. Expanded entry opportunities and reduced restrictions on contract carriers have enabled shippers to dramatically reduce the number of carriers they deal with. Evidence on service quality effects tends to be largely qualitative and anecdotal, however.

Moore's (1986) survey of major shippers indicates general satisfaction with the quality of trucking service since deregulation. On most dimensions, shippers citing improvements in service quality substantially outnumber those reporting declines. Frey, Krolick and Tontz's survey of California fresh fruit and vegetable shippers found constant or improved service quality for more than 90 percent of those surveyed, with no discernible difference between large and small shippers. Studies investigating the effect of deregulation on service to small communities find no deterioration, and in many cases, significant improvements, in service availability and quality (Pustay 1985).

4. Some Emerging Issues in Transportation

Deregulation has led to substantial social benefits by lowering the real cost of surface freight transportation. Its benefits have not been unmixed, however, and a number of interests have been economically disadvantaged by regulatory reforms. A number of issues raised by some of these groups have attracted public attention and raised concern about the desirability of competitive transportation markets. Three of the most significant are:

railroad pricing in "captive" markets, trucking safety, and increasing concentration, particularly in less-than-truckload trucking. These are discussed below.

Captive Shippers

The effect of deregulation on "captive" shippers has been the primary controversy surrounding railroad regulatory reforms. The Staggers Act recognized that the assumption of competitive rail markets might not be tenable for these shippers and retained ICC control over the maximum rates railroads could charge in markets they dominated (with dominance defined by rates in excess of 180 percent over variable costs). How that control should be exercised and whether it is effective in constraining monopoly railroad behavior are the subjects of continuing dispute.

The differences between competitive and monopoly markets can be substantial. For example, Atkinson and Kerkvliet (1986) found that the two railroads operating with geographic monopolies in the Wyoming Powder River Basin coal market captured a significant share (23 percent) of economic rents over the 1980-82 period studied.¹¹ This reflects an estimated average rate markup of 53 percent over marginal costs, with markups highest for those purchasers (utilities) with the least elastic demand. The influence of competition is highlighted by the Chicago and Northwestern Railroad's entry into the Powder Basin market in 1984: when the market was converted from geographic monopolies to duopolies, rail rates fell by as much as 30 percent.¹² MacDonald (1986, 1987)

¹¹ This does not necessarily reflect the influence of deregulation per se. Coal rates increased substantially during the 1970s, prior to significant regulatory reforms.

¹² This may reflect cost savings from shipping coal to less distant markets as well as more competitive pricing behavior.

finds that inter-railroad and barge competition also act as important suppressants on rates in grain markets.

The debate over maximum rate policy has focused on three competing standards (with minor variations). The first is a cost-based standard, which would prohibit rates in excess of some mark-up over variable costs, such as the 180 percent criterion embodied in the Staggers market dominance definition. The second is Ramsey pricing, which would set maximum rates according to demand elasticities and the amount of fixed costs common to both competitive and captive markets.¹³ The third, currently in use by the ICC, is "constrained market pricing," which essentially sets the maximum rate at the level that would cover all costs incurred by a firm that served only the captive market (the "stand-alone" cost).¹⁴ Ramsey prices generally are agreed to have desirable static efficiency properties, while cost-based maximum prices are perceived as more equitable. Depending on their implementation, stand-alone cost ceilings may or may not be statically efficient.¹⁵

In evaluating these competing standards, it is important to recognize that this issue is fundamentally one of transition (Meyer and Tye 1985 and 1987, Friedlaender 1986). In the absence of regulation, we would expect shippers

¹³ See Willig and Baumol (1987) for a discussion and defense of this standard. Because demand elasticity in competitive markets is quite large, Ramsey prices for captive shippers would be set to cover the variable costs of serving captive shippers and most common fixed costs.

¹⁴ Coal rates in an unregulated market would be constrained by the long-term contract rate that would be negotiated between potential coal producers and railroads prior to sinking investments, not by the stand-alone cost of providing service. While the ICC's constrained market pricing test would theoretically set maximum rates based on the former, it is in practice closer to the latter.

¹⁵ Given substantial economies of scope, maximum rates based on stand-alone costs for a single shipper may not be binding. The result may be railroad monopoly rates in excess of Ramsey prices.

and railroads to set the terms of transportation through long-term contracts in advance of making large, specific, sunk investments. This is the type of relationship we most frequently observe in other industries where there are substantial idiosyncratic investments. Such contracts were prohibited by rail regulation, however, and investments were made on the presumption that the ICC would prevent opportunistic behavior by the railroads. In maintaining ICC control over maximum rates in captive markets, Congress apparently intended to prevent the large-scale redistributions that would result from changing the regulatory system in mid-stream.

Maximum rate policies should be concerned not only with minimizing transition problems for shippers, however, but also with encouraging appropriate railroad adjustments to a new market equilibrium. There is a danger that setting maximum rates too high may send railroads the wrong signal about long-run market equilibrium. In this respect, Ramsey prices and stand-alone prices may be statically, but not dynamically, efficient. For example, deciding that prices should include an adequate rate of return on current capital stocks is likely to discourage railroads from shrinking their capital stock, even when merited by long-run equilibrium conditions. Higher rates for coal traffic may distort investment incentives by both shippers and railroads.

These factors suggest that considerable caution should be exercised in evaluating railroad pricing in captive markets. Allowing railroads complete rate freedom, either de facto or de jure, seems unwise. At the same time, reimposing extensive regulation, as advocated by CURE and implemented in legislative proposals such as Consumer Rail Equity Act of 1987, defers any transition to regulation and may rescind many of the benefits accomplished by regulatory reform. The optimal policy response to the current set of issues is

likely to involve re-evaluation of maximum rate standards with more explicit attention to the important dynamic issues involved in the regulatory transition. Certainly the ICC should be wary of wholesale abdication of rate ceilings through revenue adequacy tests based on rates of return. While there is every indication that railroads continue to underperform the market in returns to capital, continued incentives for cost reductions may be more appropriate for the long-run viability of railroads than is permission to increase their share of quasi-rents from coal transportation.

Safety

Motor carrier safety has attracted increasing attention during recent years. In the trucking industry as in the airline industry, safety issues often have been raised as arguments for renewed economic regulation.¹⁶ This focus is misleading and draws attention away from the primary issue: is the level of trucking safety less than is socially desired? If the answer is yes, we should determine how to most efficiently achieve the desired level of safety. It would be surprising if an instrument as clumsy as economic regulation were the best mechanism for accomplishing this objective.

Because the socially optimal level of safety is difficult to determine, most studies take the level of safety under regulation as optimal and compare current performance to pre-deregulation trends. Accepting this benchmark for the moment, we can ask whether safety seems to have declined since deregulation. Table 8 presents data on aggregate accident trends over 1978-1986. Bureau of Motor Carrier Safety (BMCS) data in column 1 record self-reported interstate trucking accidents involving a fatality, serious injury, or property

¹⁶ Given dramatic improvements in railroad safety since 1980, this issue has not attracted much attention in the rail regulation debate.

damage in excess of \$2000. Adjusted BMCS data in column 2 control for inflationary effects by using a property damage threshold of \$2000 in constant 1973 dollars. The Fatal Accident Reporting System provides more accurate data on all fatal accidents involving heavy trucks (intrastate and interstate), as reported in column 3.

Table 8
Trucking Safety

<u>Year</u>	Total Trucking Accidents, BMCS <u>Unadjusted</u>	Total Trucking Accidents, BMCS <u>Adjusted</u>	Fatal Accidents <u>FARS</u>	Fatal Accidents/ <u>10⁶ truck miles</u>
1978	33,998	32,077	4,351	.0647
1979	35,541	32,322	4,597	.0691
1980	31,389	28,220	4,036	.0673
1981	32,306	27,772	4,121	.0698
1982	31,756	27,001	3,754	.0623
1983	31,628	26,032	3,968	.0539
1984	36,854	29,579	4,200	.0546
1985	39,156	29,068	4,241	.0534
1986	*24,740	24,740	4,167	—

* See note, appendix A.

While all three series record increases in the number of accidents during 1984-1985 (well after the onset of deregulation), it makes little sense to talk about accidents independent of risk exposure. A 10 percent increase in total accidents when traffic has increased 20 percent has quite different implications for safety than does a constant number of accidents when traffic has declined 10 percent. Consequently, an argument that safety has declined based on the 1984-1985 increase in total BMCS or FARS accidents is potentially quite misleading. Column 4 adjusts for uses the Federal Highway Administration's combination vehicle miles series to calculate fatal truck accidents per million

vehicle miles.¹⁷ In contrast to the raw totals, accident rates per million truck miles show continued improvement through the 1980s.

The aggregate data provide little evidence of declines in safety consequent to economic deregulation, although they are not dispositive.¹⁸ Other types of evidence are mixed. For example, studies that compare accident rates of regulated and unregulated carriers find so significant differences, suggesting that economic regulation does not have a major effect on carriers' safety decisions (Schweitzer 1987, p. 15). However, preliminary evidence from safety records of regulated carriers indicates that new entrants underperform relative to established carriers (Corsi and Fanara 1987). If these differences persist, they could imply lower safety over time. The evidence is too sparse at this time to conclude that safety performance has changed without additional investigation and corroboration.

Most importantly, looking for possible changes in safety or linkages with economic deregulation focuses attention on the wrong issue. If current safety levels are suboptimal we should develop policies to improve safety. As in the vast majority of industries, these are likely to involve not economic regulation but increased attention to and enforcement of safety regulations. While regulatory effects may be uncertain, increased enforcement and inspection intensity is likely to have a direct effect on improved safety compliance. For example, California data indicates a strong inverse correlation between

¹⁷ These exposure data understate vehicle miles for the universe included in the FARS database. Unfortunately, we lack any better exposure data for the trucking industry.

¹⁸ Most surveys of truck drivers seem to provide less information on safety than on labor's dissatisfaction with the results of deregulation and on company drivers' dislike of owner-operators. For this reason, I heavily discount this type of "evidence."

California Highway Patrol inspection intensity and the truck-at-fault accident rate (Schweitzer 1987, pp. 15-16). Similarly, the high failure rates of trucks inspected under the Motor Carrier Safety Assistance Program (MCSAP) probably is more reflective of years of low enforcement levels for federal safety standards than of deregulation: prior to introduction of the joint federal-state MCSAP program in 1983 there were only 100 inspectors responsible for enforcing federal safety regulations on hundreds of thousands trucks used in interstate commerce.

Enactment of the Commercial Motor Vehicle Safety Act of 1986 is a step in the direction of improved safety regulation and enforcement and its rapid implementation should be given high priority. The creation of one nationwide truck driver's license will raise competency standards for drivers and should reduce the ability of poor or reckless drivers to escape detection by shuffling licenses from one state to another. Given the substantial fraction of accidents in which driver error is a contributing cause, consideration of driver training standards appears warranted. Increased funding for joint state-federal inspections programs is another important element in improving motor carrier safety and may be combined with higher penalties for violations of safety standards. These raise the expected cost of non-compliance and should reduce current inspection failure rates of 30 percent nationally and as high as 60 percent in some areas (Hanley 1986). Finally, additional safety data should be developed, both to assess the extent of the problem and to investigate the relationship between particular standards or programs and accident rates. Much of the debate over motor carrier safety is carried on in relative ignorance of the facts due to the dearth of relevant data. If concern over safety is genuine and not just a red herring for efforts to renew federal

regulatory protection, measures such as these offer the potential for significant improvements.

Concentration

Many of the opponents of trucking deregulation warned that regulatory reforms would increase industry concentration, ultimately reducing competition and leading to higher rather than lower prices. The exit (through bankruptcy or acquisition) of a number of the largest firms in the industry and the growth of a few of the remaining firms have been cited as evidence in support of this argument. While there may be increases in the market share of the largest carriers (even this is unclear, as discussed below), this does not necessarily threaten competition and may confer significant benefits. Even if concentration threatened to reduce competition, in this area as in the safety area policies attacking the problem directly are likely to be preferred.

The significance of market concentration differs substantially between industry sectors. The truckload sector is as close to the ideal of a "contestable" market as one can imagine: attempts to raise prices above competitive levels are likely to bring in a flood of new entrants offering lower prices, suggesting that potential rather than actual competition will constrain prices. Entry is not quite as easy in the LTL sector (particularly at a national level), given the requirement for terminals to assemble and reassemble shipments into truckload lots, which leads to network economies of scale, scope, and density. This may suggest that actual competition is more effective in constraining LTL prices, and gives at least potential theoretical importance to market concentration. This suggests two questions: 'Has concentration increased since deregulation?' and 'Is this likely to reduce competition?'

Only if the answers to both questions are affirmative is there cause for concern.

The argument that concentration in the LTL sector has increased is based on very little evidence, most of it with no bearing on the question. Much of the concern is focused on increases in the revenue market share of the top carriers: for example, the share of industry revenues accounted for by the four largest carriers increased from 8.5 percent in 1978 to 10 percent in 1985. The size of the largest firms also has increased (see table 9). In 1975, no

Table 9
Size Distribution of Trucking Firms

% of Industry Revenues	1975		1980		1984	
	# firms	% Revenues	# firms	% Revenues	# firms	% Revenues
> 5 %	0	0.0	2	11.6	3	20.8
2.5-5.0	4	14.4	3	10.5	2	7.1
1.0-2.5	7	10.2	12	17.5	11	17.1
TOTAL	1181	100.0	882	100.0	779	100.0

firm exceeded 5 percent of Class I and II aggregate revenues. By 1980, 2 firms were in this size class, and by 1984, 3 firms were in this class. The fraction of revenue accounted for by the largest firms also has increased. In 1975, the 11 largest firms accounted for 25 percent of industry revenues; by 1985, the 16 largest firms accounted for 42 percent of industry revenues. While these statistics suggest that the industry structure may be evolving toward larger firms, they provide almost no information on market concentration. What matters from the standpoint of market power is the degree of competition in specific markets. For example, if each of 100 identical markets prior to deregulation were served by a separate carrier, the aggregate revenue share of the top 10 carriers would be only 10 percent, but the markets would be

characterized by perfect monopoly. If with deregulation only 10 carriers survived but all 10 served each market, the top 10 carriers would have a revenue share of 100 percent, but every market would be competitive. Given the ICC's protectionist policies under regulation and the widespread expansion of firms after deregulation, the number of competitors in major markets is likely to have increased rather than decreased. Unfortunately, city-pair data that would enable us to test that proposition are unavailable. An effort to collect this type of information seems warranted; appropriate antitrust or other policy interventions depend critically on concentration levels in individual markets rather than on national industry revenue shares.

Even if concentration has increased, it may be that even a small number of firms is sufficient to maintain competitive pricing in national markets. The three largest firms--Yellow Freight, Roadway, and Consolidated Freight--currently appear to be quite aggressive competitors. While a number of their higher cost competitors intimate that their motive is predatory pricing (as a prelude to monopoly pricing), the data suggest that these are low-cost carriers competing against each other for increased traffic.¹⁹

It is difficult to prescribe sensible policies when we know so little about the magnitude of existing or potential problems. Nevertheless, the costs of allowing the industry to become sufficiently concentrated to override competitive pricing behavior suggest that a blanket policy of non-intervention is inappropriate. At minimum, information on the number of firms and degree of competition in individual markets must be collected. The experience of the last few years in the airline industry also suggests vigorous application of

¹⁹ This is consistent with competitive models of behavior though not with making inefficient competitors happy.

antitrust merger regulations to the LTL trucking industry to avoid consolidation of market power and consequent rate increases. Antitrust, not economic regulation, seems to be the key to dealing with any threats from concentration.

5. Conclusions

While the transition from a system of rigid regulatory control to one of relatively unconstrained market competition has not been free from bumps, the deregulation of surface freight transportation generally appears to be working. Substantial benefits have been conferred on shippers and presumably passed on to final consumers. Resources devoted to transportation and logistics have declined considerably over the past decade, with a significant fraction of this reduction attributable to improved efficiencies associated with deregulation. Nevertheless, the wealth redistributions resulting from regulatory reforms have been substantial and a number of disadvantaged interests continue to press for legislation that would reverse some of their losses. These efforts should be opposed if we are to retain the progress that has been made over the last ten years.

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Appendix A
Sources and Notes on Tables

Note: All dollar figures are converted to constant 1986 dollars using the implicit GNP price deflator, Economic Report of the President 1987, table B-3.

Table 1, Trucking Revenue per Ton-mile: U.S. Department of Commerce, Bureau of the Census, Statistical Abstract of the United States 1987. Table 1007.

Table 2, Railroad Revenue per Ton-mile: Association of American Railroads, Railroad Facts, various years.

Table 3, Motor Carrier Employment and Earnings: col. 1: 1971-1981, Perry (1986), p. 56. 1982-85, author's calculations.

col. 2: U.S. Bureau of Labor Statistics, Employment and Earnings, various issues. Includes all trucking and terminals.

col. 3: U.S. Bureau of the Census, Current Population Survey data tapes. See Rose (1987), table 2.

Table 4, National Master Freight Agreement Coverage: Perry (1986), p. 110.

Table 5, Class I Railroad Employment and Earnings: Association of American Railroads, Railroad Facts, 1986 ed.

Table 6, Railroad Productivity: col. 1 and 3: Association of American Railroads, Railroad Facts, various years.

col. 2: Railway Age, July 1987, p.42.

Table 7, Railroad Earnings and Profitability: Association of American Railroads, Railroad Facts, various years.

Note that because of changes to Depreciation Accounting in 1983, financial statistics for 1983-1985 are not directly comparable to those in earlier years.

Table 8, Trucking Safety: Schweitzer (1987) tables 2,4.

Note that the BMCS accident data use an inflation-adjusted threshold for damages beginning in 1986. Unadjusted totals are not directly comparable to earlier years.

Table 9, Size Distribution of Trucking Firms: Keeler (1987).

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