Motor Carrier Industry Structure and Operations

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A prominent transportation analyst recently concluded, "Here we are twelve years after the motor carrier industry was deregulated in 1980 and the pace of change, if anything, has accelerated. It's been a very exciting industry to be involved in. Change continues at a very rapid pace and I have the feeling that it may continue for another 10 to 12 years" (*1*,p.27).

It is the objective of this paper to review the changes that have occurred in both the less-than-truckload (LTL) and truckload (TL) segments of the motor carrier industry. It is the goal of this paper to provide an understanding of the structure of these segments of the motor carrier industry and the operations of the firms in each of the two segments. The analysis will explain some of the very significant changes that have occurred in an industry adapting to radical change in the governing rules. There will be clear evidence of winners and losers as different carriers have adopted different strategies to cope with the new environment. The major underlying conclusion is that the motor carrier industry in 1993 is delivering a service that is of significantly higher quality and greater efficiency than it was in the regulated environment.

LTL Industry Segment

Overview

The transition from a highly regulated and controlled market to a substantially more competitive one has resulted in vast changes in the LTL segment of the industry. That segment has witnessed a tremendous shakeout in the number of its competitors as well as in the concentration of business among the largest firms. Despite this increased concentration, there are clear signs that competitive forces are exerting a strong influence on the marketplace, as anticipated by proponents of deregulation. During the transition period, the industry has significantly lowered its costs, primarily through substantial decreases in labor costs combined with notable efficiency improvements. At the same time, prices in the LTL segment have been lowered even farther than costs have been reduced. As a consequence, overall profitability in the LTL segment is down. Adding to their woes, LTL firms are facing new competitive forces outside their own industry segment that were substantially less significant in the regulated era.

To meet the new market conditions, firms have had to devise strategies that are distinctly different from the ones that worked well in the regulated environment. Firms can be differentiated on the basis of their ability to adapt to the new circumstances. Those that are most clever reap significant benefits; those not adapting or selecting ineffective strategies have failed. Indeed, there is strong evidence that individual firms can perform profitability in the new environment if their strategic response has been altered to reflect the new market forces.

Although some evidence indicates that firm size provides some advantages to carriers in a deregulated environment, econometric studies continue to show that there are no significant economies of scale among the LTL carriers. Indeed, some of the most profitable LTL carriers in this environment have been regional carriers with operating revenues substantially lower than those of the national carriers. As a consequence, the observed increases in industry concentration should not alarm policy makers or signal the need to reverse the forces of deregulation.

This section will document the changes experienced by carriers in the LTL segment as outlined in the preceding paragraphs. The discussion will conclude with a presentation of the range of strategies being devised to take LTL firms into the 1990s and beyond. Some of these strategies have expanded the traditional LTL firms into new and innovative business lines.

Increased Concentration and Reduced Number of Firms

For this discussion, the LTL segment of the motor carrier industry refers to "Instruction 27" carriers—that is, those carriers that derived an average of 75 percent or more of their revenues during the 3 previous calendar years from the interstate transportation of general freight. The primary activity of carriers in this group is to handle LTL quantities of freight. A few carriers in the Instruction 27 group handle very little LTL freight, but for purposes of comparison across years and with previous studies, the benefits of a constant carrier frame as provided by the Instruction 27 group were thought to outweigh the disadvantages associated with including a small number of carriers that might fit better in another category.

Figures 1 through 4 are based on an analysis of the Instruction 27 carrier data given in annual reports filed by Class 1 and 2 carriers to the Interstate Commerce Commission (ICC) (2). The annual report data were processed from the American Trucking Associations' computer tapes covering 1976 through 1989. Figures 1 through 4 demonstrate two salient points about the transition from regulation to deregulation: the LTL industry witnessed a substantial increase in market share among the largest of the carriers as well as a significant decrease in the number of competitors.

Figure 1 measures changes in the concentration of total revenues among firms in the LTL industry segment. In 1976 the top three firms in this segment accounted for 14 percent of total revenues, the top four firms for 17 percent, and the top eight firms for 24 percent; by 1980 these figures had increased to 18, 21, and 32 percent, respectively. The concentration of the revenues of the LTL firms among the top firms increased gradually through the deregulated years, as shown in Figure 1. By 1989 the top three firms garnered 35 percent of the segment's total revenues, the top four accounted for 40 percent, and the top eight were responsible for 52 percent.

Figure 2 also demonstrates a significant increase in concentration among the LTL carriers when ton miles are used as the concentration measure. In 1980 the top three firms had 20 percent of the segment's total ton miles, the top four had 25 percent, and the top eight had 38 percent. These numbers changed drastically during deregulation so that by 1989 they were 35, 43, and 57 percent, respectively. Figure 3 also presents convincing evidence of a sizable increase in concentration when operating assets of the LTL firms are used for the concentration measure.

The increase in the concentration of business among the segment's largest firms has been combined with a substantial decrease in the number of competitors. Figure 4 shows that in 1976 there were 614 Class 1 and 2 carriers in the LTL industry segment. Class 1 carriers are defined as those with revenues in excess of $5.78 million, and Class 2 carriers are those with

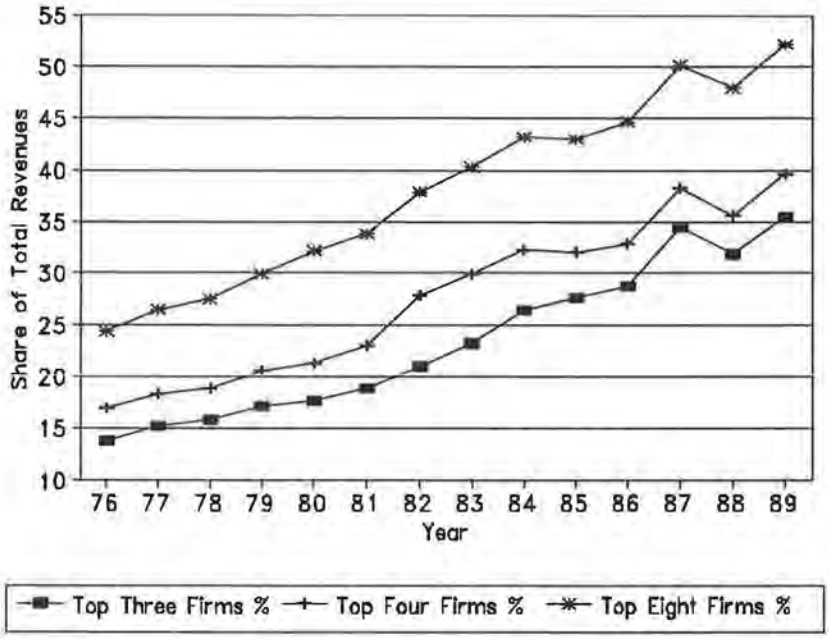

FIGURE 1 Concentration in LTL revenues.

revenues in excess of $1.16 million. By 1980 the number of Class 1 and 2 carriers had fallen to 498. The number of carriers has decreased under deregulation to 326 in 1984, 273 in 1987, and 237 in 1989. Thus by 1989 the number of Class 1 and 2 LTL carriers had fallen by more than 60 percent. The many Class 3 carriers that entered the marketplace after the Motor Carrier Act of 1980 were almost exclusively in the TL industry segment. Thus the decline in the number of Class 1 and 2 LTL carriers represents an absolute decline in the total number of carriers in the LTL segment.

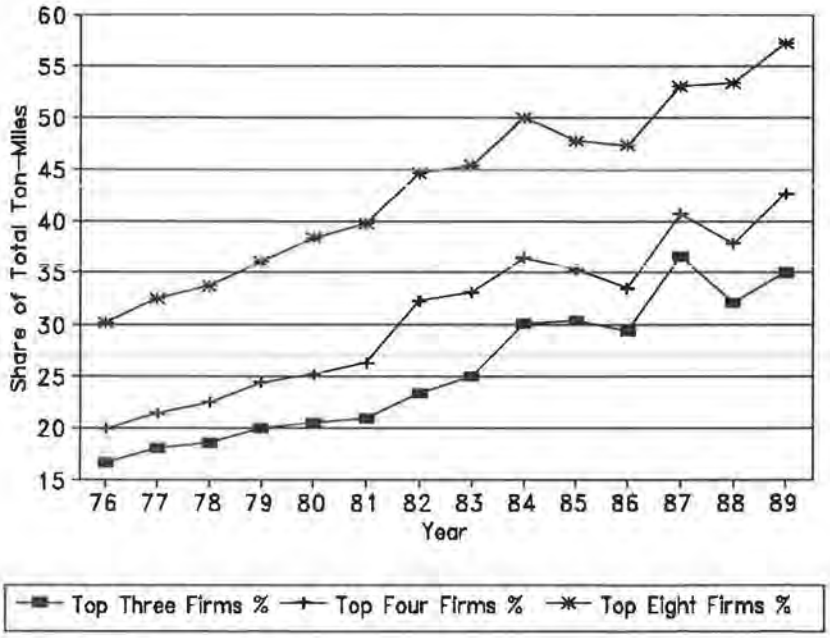

FIGURE 2 Concentration in LTL ton miles.

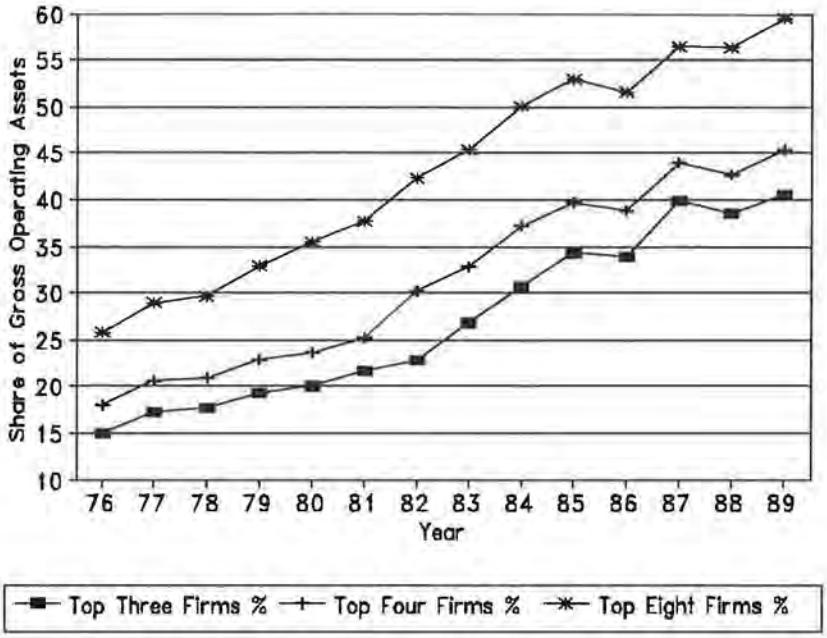

FIGURE 3 Concentration in LTL operating assets.

Cost Reductions, Productivity Improvements, and Price Reductions

Table 1 gives information on differences in costs between 1977 and 1987 for all LTL firms grouped together. The basic message in Table 1 is that the LTL firms significantly reduced their per-mile operating costs during the transition from regulation to substantial deregulation. The cost categories shown in Table 1 include the following on a per-mile basis: total operating expenses, employee compensation, fuel, operating licenses and taxes, purchased transporta-

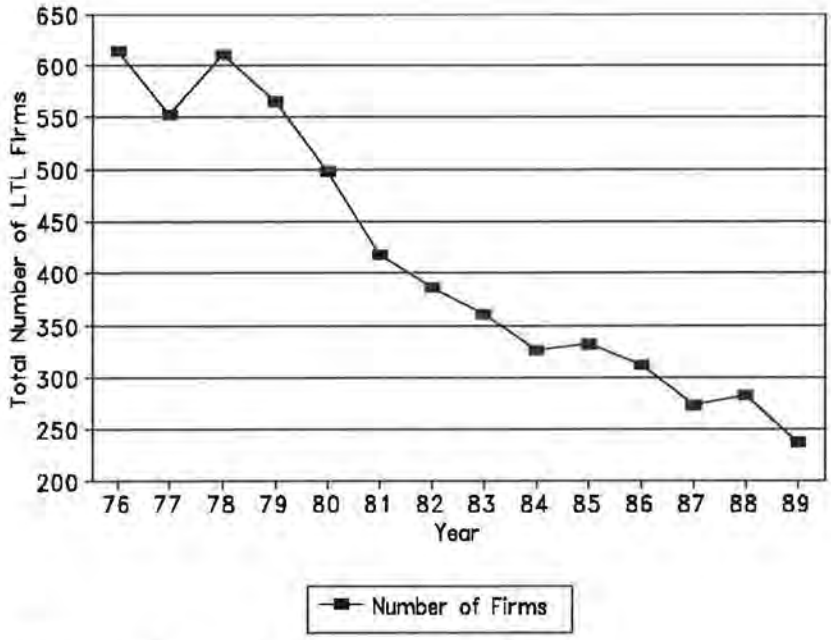

FIGURE 4 Concentration in number of LTL firms.

TABLE 1 LTL Costs Before and After Motor Carrier Act of 1980 ($ 1987) (3)

Carrier Expense Category	1977 ($)	1987 ($)	*T*-Ratio
Operating expense (per mile)	4.10	3.01	7.72*
Compensation (per mile)	2.28	1.42	9.00*
Fuel expense (per mile)	0.23	0.17	7.99*
Operating license (per mile)	0.23	0.11	3.83*
Purchased transportation (per mile)	0.34	0.39	1.19
Maintenance (per mile)	0.07	0.05	2.92*
Compensation (per employee)	35,500	28,500	4.20*
Line-haul expense (per mile)	1.13	0.93	3.75*

NOTE: * = statistically significant difference at .01 level.

tion, and maintenance. Total operating expenses are the sum of these individual categories in addition to a miscellaneous category not shown in Table 1. Also included in Table 1 are data on the average compensation per employee. [This section of the paper draws heavily on the article by Corsi and Stowers (3).]

As shown, the LTL carriers experienced a decline in operating expenses per mile of 27 percent, from an average of $4.10 in 1977 to $3.01 in 1987 (measured in constant 1987 dollars). The largest source of this overall decline is attributed to decreases in employee compensation per mile. Indeed, measured in constant 1987 dollars, per-mile employee compensation decreased from $2.28 in 1977 to $1.42 in 1987. Table 2, focusing on the sources of the observed reductions in real per-mile operating expenses, indicates that the employee compensation expense category accounts for 79 percent of the overall decline in per-mile expenses during the transition. Indeed, the average employee compensation in constant 1987 dollars decreased 19.7 percent, from $35,500 in 1977 to $28,500 in 1987.

The LTL carriers also experienced real declines in several other important expense categories: fuel and operating licenses and taxes; maintenance; and miscellaneous. Fuel expenses per mile for the LTL carriers decreased in real terms from 23 cents in 1977 to only 17 cents in 1987. This savings, combined with a decrease of 2 cents per mile in the real cost of operating licenses and taxes, resulted in a decrease of 8 cents per mile in real operating expense during the 1977 to

TABLE 2 Sources of Reduction in Real Operating Expenses per Mile, LTL Carriers (3,p.16)

Source of Operating Expense Decline	Real Decline ($)	Percentage
Overall	1.09	100
Employee compensation	0.86	79
Fuel and taxes	0.08	7
Maintenance	0.02	2
Purchased transportation	+0.05	+5
Other	0.18	17

NOTE: All figures in the table are declines except those with plus sign.

1987 period. These two categories combined represent 7 percent of the total real decline in operating expenses per mile.

Among the LTL carriers, the per-mile maintenance expenses in constant 1987 dollars decreased from 7 to 5 cents, a significant decrease that accounts for 2 percent of the overall reduction in real operating expenses per mile. This reduction most likely reflects the introduction of newer-model trucks with engineering and design improvements that necessitate fewer expenditures on routine maintenance.

Some of the real per-mile cost reductions observed for the LTL segment were a direct result of various productivity improvements from 1977 through 1987. Indeed, per-mile cost reductions stem from either direct cost reductions or increases in the vehicle mile output for a given level of input. In addition to the previously documented cost reductions, there is direct evidence that carriers in the LTL segment improved their productivity. Indeed, the average vehicle miles per power unit increased by 32 percent between 1977 and 1987, from 37,200 to 49,200 mi. Furthermore, the average length of haul increased from 211 to 313 mi between 1977 and 1987. This represents a statistically significant increase of 48 percent. This increase in length of haul represents the consequence of reduced entry control, which allowed the LTL carriers to expand their geographic territories and provide service to a wider geographic area without the need to interline.

The LTL carriers greatly cut their operating expenses per mile, primarily through substantial cost reductions (especially in the area of employee compensation) and improved operating efficiencies. The resulting reduced costs were passed on to the consumers in the form of lower prices. The operating revenue per mile for the LTL carriers in constant 1987 dollars decreased from $4.25 in 1977 to $3.06 in 1987, a decrease of 28 percent. Thus, among the LTL carriers the reductions in revenue slightly outpaced the reductions in cost.

Indeed, the experience of the LTL carriers during the transition to deregulation provides no evidence of monopoly exploitation of market advantages. Thus, despite the evidence of significant concentration increases, the marketplace is working effectively to bring about significant efficiency enhancements that are being fully passed onto the consumer in the form of lower prices.

Reduced Profitability and New Sources of Competition

Confirming the finding that revenues decreased at a faster pace than did costs, the following table shows that the LTL firms collectively experienced a decline in profitability during the transition from regulation to substantial deregulation (3,p.22):

Profitability Measures	*1977*	*1987*	*T-Ratio*
Operating ratio	96.1	98.5	4.79*
Net income/operating revenue	2.7	1.0	5.10*
Net operating income/assets	9.2	3.0	5.61*

(The asterisks show a statistically significant difference at .01.) As indicated, the average operating ratio of the LTL firms in 1977 was 96.1 percent. This figure worsened significantly to a level of 98.5 percent in 1987. Other profitability measures (i.e., net income/operating revenue or net operating income/total assets) also show significant worsening between 1977 and 1987. Net income as a percentage of operating revenue decreased from 2.7 percent on average in 1977 to 1 percent in 1987. Similarly, net operating income as a percent of total assets declined from 9.2 percent on average in 1977 to a level of 3 percent in 1987. Clearly, on average, LTL firms suffered significant profit losses as a consequence of deregulation.

The finding of profitability losses among the LTL firms is consistent with other analyses of the impacts of the regulatory change (4) and was anticipated by the proponents of the Motor

Carrier Act of 1980 (*5*). As will be outlined in the following section, however, it would be wrong to assume that the "overall" profitability malaise was shared equally by all LTL firms.

In addition to substantial overall profitability declines, the LTL carriers faced sizable new competitive forces, outside the domain of the LTL carriers, during the transition period. These new forces, weak or nonexistent before the move toward a deregulated transportation market, grew much faster than did the LTL carriers during the transition.

The impact of the new sources of competition on the LTL carriers is shown in Figures 5 through 7 (*36*,p.*55*). Figure 5 indicates that the total size of the LTL market (in terms of total operating revenues) increased from slightly more than $11 billion in 1976 to about $17 billion in 1989. However, Figure 6 demonstrates that during this same period, LTL carriers experienced competition in the "small-shipments" markets from a variety of additional competitors. Indeed, during the transition period, United Parcel Service (UPS) (not including its air package operations) and the air carriers substantially increased their participation in the small-shipments market.

In 1976 LTL carriers controlled about 80 percent of the total small-shipments market of about $15 billion (Figures 6 and 7). However, during the 1980s LTL carriers saw their share of the small-shipments market decrease so much that by 1989 they controlled less than half of the total market. Indeed, the total small-shipments market increased from slightly less than $15 billion in 1976 to $35 billion in 1989—an increase of 133 percent. This compares with an increase during the same time in the total revenues of LTL carriers of only 55 percent.

LTL firms made important inroads in their market dominance from UPS and the air carriers. UPS experienced an increase in its share of the small-shipments market from 10 to almost 30 percent between 1976 and 1989. Air carrier small shipments increased from about 8 percent of the total market in 1976 to approximately 22 percent in 1989.

Thus, the LTL firms overall suffered significant profitability losses during the move to deregulation and a deterioration in their dominance of the small-shipments market as both UPS and air carriers outpaced the LTL firms in terms of market growth. It is certainly an understatement to suggest that the transition to deregulation for the LTL firms, in general, was very difficult.

The LTL carriers also suffered losses in market share for the TL business that they used primarily as back-haul traffic in the regulated years. Many LTL carriers cited loss of TL traffic as a major problem during the early years of transition to a deregulated marketplace. The TL

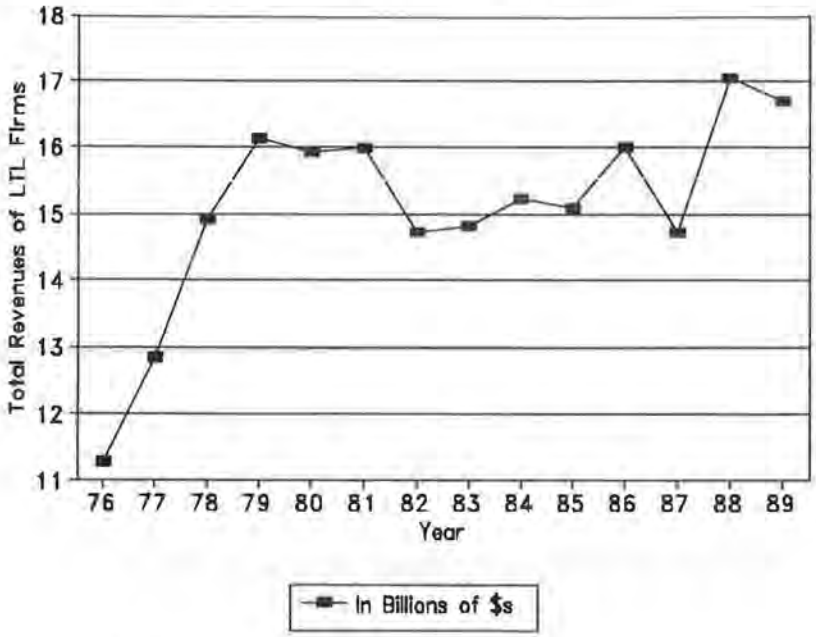

FIGURE 5 Size of LTL market in total revenues.

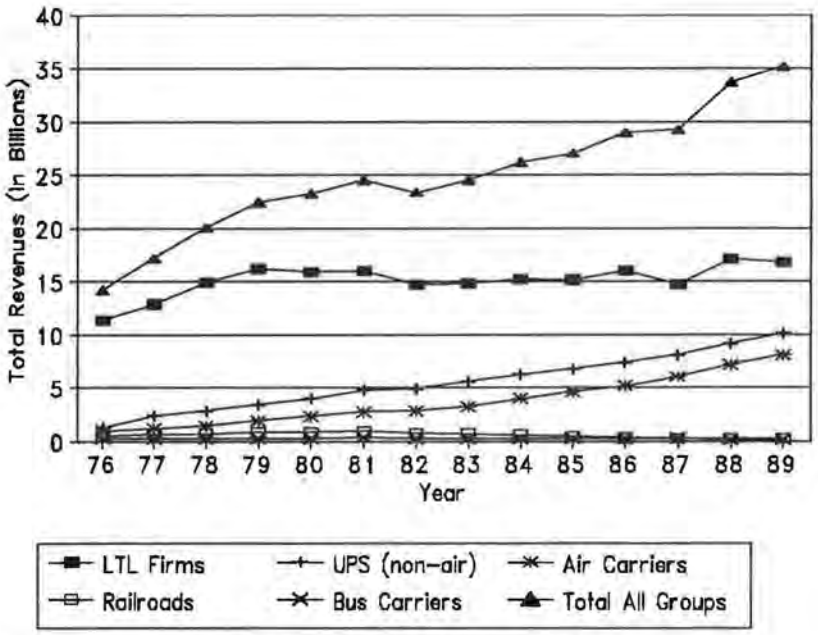

FIGURE 6 Market size, LTL firms and their competitors.

carriers had a lower cost structure than did the LTL carriers and were able to take the back-haul TL traffic of the LTL carriers through aggressive pricing. Between 1977 and 1987, the TL business that the LTL carriers had enjoyed under regulation virtually disappeared.

Management's Strategic Response

The Motor Carrier Act of 1980 identified the enhancement of market competition in the industry as one of its primary objectives. It was anticipated that such an environment would

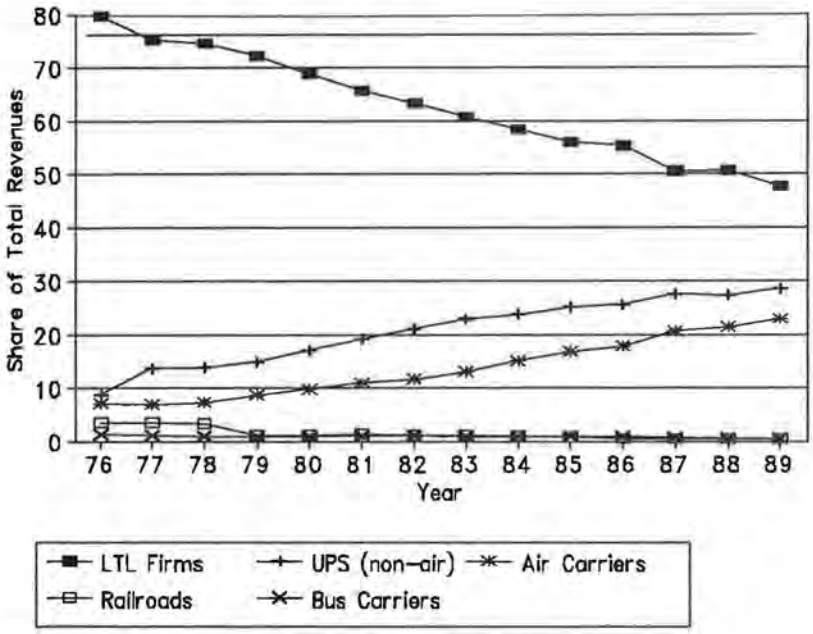

FIGURE 7 Market share, LTL firms and their competitors.

challenge motor carrier managers to increase the efficiency of their operations and would allow the more innovative ones to gain marketplace rewards. Scholars of strategic management would expect that a major environmental change, such as the move to substantial deregulation, would dictate a need for firms to alter their strategic focus in order to cope with the new circumstances.

Implicit in these assumptions is that some motor carrier managers would not recognize the need to alter strategies to fit the new environment. Other managers would set off on a course inappropriate for the changed environment. In both cases, specific managerial decisions would start the firms down a course leading ultimately to bankruptcy. The new market environment does not protect the managers from the consequences of their decisions. It is, thus, not surprising that many LTL firms went bankrupt during the years of transition to a competitive market.

A recent investigation of strategic change in the LTL segment during the transition documented many of these beliefs (*7,8*). The study found that in a regulated environment, there was no statistically significant difference in performance across the LTL firms grouped according to the strategic focus of the firm. Regulation provided the LTL carriers with a very protected environment that shielded them from both rate competition (through highly effective government-sanctioned rate cartels) and new entry (through highly restrictive entry procedures). Given these protections, it is plausible that firms placed low priority on identifying their strategic missions. Certainly, performance in this environment was not related to firm strategy.

The study found, however, that in the deregulated environment there were notable performance differences across the firms grouped by identified strategic focus. In the competitive environment, certain strategies appeared to work quite well while others worked much worse. Firms pursuing a strategy of differentiation realized a level of performance far higher than that of the rest of the firms. In contrast, firms pursuing a low-cost or broad product and geographic strategy performed worst of all. The differentiation strategy was characterized as one supporting a high level of service quality with high prices and high rewards for their employees. In contrast, the low-cost strategy is characterized by firms attempting to produce the motor carrier service output at the lowest possible cost. Finally, the firms using the broad product and geographic strategy are those covering the widest geographic area and handling a greater mix of TL shipments (with their primary LTL basis) of all the identified strategies.

Furthermore, the study found that although the mere act of changing strategic focus during the transition did not guarantee better performance, certain types of strategic changes had effects that enhanced profit. Specifically, firms moving from a product focus to a differentiation strategy improved their profitability. Likewise, firms moving from a regional focus to a differentiation strategy and those moving from a broad product and geographic focus to a low-cost one were also successful. A separate study has investigated the factors that best explain the factors enhancing the likelihood that firms will make a strategic change during the transition to deregulation (*9*).

Overall, the new competitive environment challenged firms to adapt their strategic focus to the new circumstances. Although there was a general profitability decline among the LTL firms, the firms making specific strategic changes were able to perform at a level consistent with average firm performance under regulation.

Firm Size Advantages in Deregulated Environment

Although an examination of costs and revenues for LTL carriers during the transition period provided direct evidence of substantial market competition, the evidence of increased concentration among LTL carriers is a source of concern among some analysts (*10*).

Many industry analysts have argued that the new competitive environment gives distinct advantages to large firms and corresponding disadvantages to smaller firms. Large firms have broad geographic coverage and the ability to handle all the shipping needs of customers

committed to consolidating their transportation business with a limited number of carriers to improve their bargaining position (*11*). One author has characterized the advantages to large carriers as "marketing economies" (*12*). A recent investigation of the effects of firm size, combined with firm strategic focus, on performance demonstrated the disadvantages of small size in a deregulated environment. The authors found that

> when the effects of firm size are coupled with strategy selection, the disadvantage of small size in the deregulated environment is even more striking. Overall there is no strategy that results in significantly better performance for small firms. When large firms couple their size advantage with a particular strategy, such as differentiation, regional focus, or contingency, their superiority over the small LTL firms is even more significant. (*13*,p.142)

This picture contrasts sharply with the regulated environment, in which firms attempting to exercise their size advantages were hindered by regulatory decisions designed to enhance the profitability of the "averaged-sized" firm.

This experience under deregulation deviates from econometric evidence regarding the relationship between firm size and costs. The overwhelming consensus of the literature has been that there are no economies of scale in the LTL sector in either the regulated or the deregulated environment (*14*,*15*). In fact, the previously cited study indicating the disadvantages of small firm size in a deregulated environment also found that

> medium-sized firms perform close to the level achieved by large firms. In fact, medium-sized firms pursuing a differentiation strategy outperformed large firms pursuing any individual strategy. Thus, small firms need only increase their size slightly (to the level of medium-size firms) to remove their disadvantage. These results do not support the contention that only the very largest motor carriers can succeed in the deregulated environment. (*13*,p.142)

A recent review of the performance of LTL firms found that "regional LTL carriers continued to leverage their service and labor cost advantages to outperform the nationals. The operating margin for the regionals appears to be stabilizing at about 9 percent, or three times the average for the nationals" (*16*,p.6).

In conclusion, even though traditional econometric studies have not found any statistical economies of scale for LTL carriers, there has been no increased concentration of business among the largest carriers. The source of advantage for the large firms may very well be in the area of marketing economies or density economies associated with higher levels of output per terminal or per route mile. In fact, recent work has established the existence of terminal and line-haul density economies among the LTL carriers (*17*,p.35;*18*).

Despite the advantages to large firms, there is reassuring evidence that medium-sized firms can do quite well. In fact, there is evidence that these firms outperform the very largest LTL carriers. Thus, any public policy action regarding the evils of increased competition appears to be unwise and unwarranted.

Range of New Strategies Among LTL Firms

Although the overall profitability of the LTL sector has deteriorated since deregulation, individual firms pursuing appropriate strategies have maintained levels of profitability approaching those reached in a protected, regulated environment.

The new competitive environment has challenged carrier managers to redefine their business focus and innovate with new services and business plans. It is clear that the 1990s will contain an acceleration in strategic experimentation.

The managers of the largest LTL firms, recognizing that the growth in the size of the LTL market is not keeping pace with the growth in the overall small-shipments market (Figure 6), have expanded into new services in an attempt to increase growth rates while rationalizing

their core LTL network. Joseph M. Clapp, President and Chairman of Roadway Services, Inc., summarized his firm's differentiation strategy like this:

> At Roadway Services, we've been working hard on this matter of differentiation for awhile. And I honestly believe we are seeing that happen. Back in 1980, Roadway Express was a pure play, long haul LTL carrier. Today, Roadway Services is a multi-modal provider of transportation and logistics services. Roadway Express is a North American network LTL carrier. Roadway Services had four regional carriers focused on highly dependable overnight distribution services to their area markets. We have a business-to-business small package carrier reaching 80 percent of the population in 43 states. We have a highly successful critical-shipment, time-definite carrier providing very specialized precision deliveries. We have another company that provides integrated logistics services. (*19*)

Roadway has become the prototype LTL firm that has transitioned from the highly protected regulated market to the intensely competitive deregulated market. The role of the national LTL firms has reached its peak. The major national LTL firms have shown definite signs of rationalizing their networks by closing some regional consolidation terminals (*20*). The emphasis has shifted somewhat toward delivery of fast, high-quality service to customers who require on-time deliveries to meet the just-in-time inventory schedules of today's global economy. In many situations, regional, often nonunion, LTL carriers are in the best position to provide these time-sensitive deliveries. As stated by a leading industry analyst,

> the interregional carriers . . . tend to have more productive labor. They tend to be nonunion carriers, several of which are located in the Southeast. They tend to have faster transit times because they don't break the freight as often en route, and they are able to offer tailored service packages because they're not constrained by unwieldy union work rules. So, interregionals are picking the pockets of the larger national carriers. (*1*,p.19)

The global economy of the 1990s will place significant emphasis on efficient, highly integrated logistics systems. Transportation firms able to respond to these very sophisticated shipper needs will be in the best position to reap significant rewards. The main drive behind the move by the national LTL firms toward the establishment of independent third-party logistics services is the recognition that shippers face an increasingly complex array of transportation price and service options and need guidance in creating an integrated logistics system. The aggressive, innovative national LTL firms, such as Roadway, are positioning themselves not only to design integrated logistics systems through their independent third-party logistics subsidiary, but also to provide possible transportation services associated with an integrated logistics plan. The array of services include the core, national LTL business along with regional LTL services, time-sensitive package express, and air freight deliveries.

TL Industry Segment

Overview

Like the LTL segment, the TL segment of the motor carrier industry has undergone tremendous changes in response to the new regulatory environment. As anticipated by proponents of deregulation, firms in this segment lowered their costs and improved their efficiency in adapting to the new regulatory conditions. As a reflection of the strong competitive forces at work in this segment, these improvements have been passed on fully to the shippers as lower prices.

Just as in the LTL segment, certain firms in the TL segment recognized that they could achieve large gains through strategic innovation. An entire class of carriers, commonly referred to as "advanced truckload" firms, emerged with a cost structure that clearly outpaced industry

competitors. The advanced TL firms focused on high-density, long-haul corridor traffic for their primary business, and they were well-rewarded for their efforts.

The growth of and openings gained by the advanced TL firms were challenged as a result of the spread of the double-stack container trains initiated in the 1980s. This service, used to move import containers from Japan through the West Coast to markets in the Midwest, East, and South, provided excess capacity for moving domestic traffic from these regions back to the West Coast. Through an aggressive pricing structure, the double-stack operators began filling this excess capacity and taking over some of the traffic of the advanced TL firms.

However, the advanced TL firms as well as other innovative TL firms have responded aggressively to the double-stack encroachment through a number of important strategic initiatives: forging intermodal partnership agreements with railroads, committing to containerization, and shifting to shorter-haul markets with shipper-carrier partnerships to minimize shippers' total logistics costs.

Cost Reductions, Productivity Improvements, and Price Reductions

Table 3 displays the shifts in operating costs and revenues (measured in 1987 constant dollars) among the TL carriers in each of 10 different TL segments. [This section of the paper draws primarily from work by Corsi and Stowers (*3*).] Table 3 indicates that in all but 1 of the 10 TL segments listed, operating expenses per mile and operating revenue per mile decreased significantly in real terms between 1977 and 1987. The highest percentage decrease in real per-mile costs occurred among the TL general freight carriers (55.8 percent decrease), which was followed by decreases of 27.8 percent among heavy machinery carriers and 27.2 percent among refrigerated carriers.

In seven of the nine segments with a decrease in real per-mile operating costs, the decrease in real operating revenue per mile outpaced slightly the decrease in costs. This is direct evidence that the anticipated positive gains from a competitive market are in effect: all reductions in costs are passed on in full as lowered prices.

As among the LTL carriers, the TL carriers were able to achieve lower costs through savings in direct expense items as well as improved efficiencies. For example, among the TL general freight carriers, the annual miles per power unit increased from 35,400 in 1977 to 73,400 in 1987. Furthermore, the TL general freight carriers increased their average loads from 9.1 to 13.2 tons and their average lengths of haul from 176 to 467 mi. In a similar fashion, other specialized commodity haulers increased their average annual miles per power unit from 60,400 to 67,000 and their average loads from 12.0 to 13.6 tons. [The TL general freight category defined by the ICC and used in this analysis consists of carriers with general freight as their primary commodity and TL transportation as their primary activity. In 1977 carriers in this group had a mixture of TL and LTL general freight. In 1987, however, carriers in this group focused on TL general freight to the near total exclusion of LTL activity. Thus some of the differences in cost and revenue per mile, power unit utilization, average load, and average length of haul may reflect the exclusion of the LTL traffic by the TL general freight carriers.]

Thus, as it was among LTL carriers, the transition to deregulation among the TL carriers meant competitive pressure to reduce costs and to pass along cost savings to customers. Furthermore, efficiency gains played an important role for TL carriers in achieving lower costs.

Strategic Repositioning: Advanced TL Firms

The post–Motor Carrier Act environment of intense competition in the TL industry sector challenged motor carrier managers to be innovative in order to gain market advantage. Obviously, the new competitive conditions allowed the failure of managers who were slow to adapt or made strategic errors. No longer did a regulatory umbrella protect managers from the consequences of their own decisions.

TABLE 3 TL Carriers: Shifts in Costs and Revenues, 1977 to 1987 (*3*,p.23)

Industry Segment	Year	Expenses ($)	Change (%)	Revenues ($)	Change (%)
TL General Freight	1977	4.07		4.25	
	1987	1.80	-55.8	1.86	-56.2
Heavy machinery	1977	3.49		3.56	
	1987	2.52	-27.8	2.51	-29.5
Petroleum	1977	2.07		2.16	
	1987	1.80	-13.0	1.85	-14.4
Refrigerated	1977	1.91		1.97	
	1987	1.39	-27.2	1.43	-27.4
Dump trucks	1977	1.81		1.89	
	1987	1.68	- 7.2	1.73	- 8.5
Agricultural	1977	1.58		1.63	
	1987	1.40	-11.4	1.41	-13.5
Motor vehicles	1977	2.15		2.25	
	1987	2.20	+ 2.3	2.28	+ 1.3
Building materials	1977	1.95		2.00	
	1987	1.50	-23.1	1.54	-23.0
Forest products	1977	1.36		1.42	
	1987	1.29	- 5.2	1.34	- 5.6
Other	1977	2.33		2.43	
	1987	1.73	-25.8	1.76	-27.6

NOTE: Expenses and revenues are per-mile measures in 1987 constant dollars.

Not surprisingly, as observed in the previous section on the LTL sector, there were carriers in the TL sector whose managers moved aggressively in the new environment to offer a much-improved level of service at a cost substantially below the level that was being offered. This combination of improved service at lower costs enabled certain innovative TL carriers to gain market advantage. A previous study has investigated the strategic approaches used by carriers in the TL general freight segment of the industry and evaluated the success or failure of firms that used these strategies (*21*).

A specific group of TL carriers with a particularly innovative strategic focus has been identified as advanced TL operators (*1*,p.7;*22*). These firms broke from the pack in the years after passage of the Motor Carrier Act by competing for long-haul traffic in high-density corridors. They employed an innovative management approach that resulted in costs far below those of traditional TL carriers and in service far above the industry standards. These advanced TL firms use driver teams and relays, as compared with the single-driver owner-operator, to keep tractors operating more hours per day, with a significant increase in annual tractor

mileage. These firms have found that their rapid growth, plus the use of company drivers, allows them to buy equipment in large quantities and achieve discounts of up to 20 percent. These operating practices and their associated cost savings combined with a very sophisticated computer load matching capability focused on securing freight in long-distance, medium- to high-density corridors with balanced traffic flows. "In combination, these factors result in empty mileage in the 6 to 8 percent range, as opposed to the 15 to 20 percent empty mileage rates that are typically achieved by more traditional TL firms" (3,pp.11–12).

The advanced TL firms experienced rapid expansion and high profitability through the 1980s. One source has summarized the success of these firms as follows:

> The 1980s were a period of rapid growth [among these advanced truckload firms] with 30 to 40 percent annual revenue increases for many carriers, including J. B. Hunt, Schneider, Werner, and MS Carriers. At the beginning of the 1980s, Schneider's total revenues were $250 million increasing to $908 million in 1991. . . . J. B. Hunt began the decade with $25 million on the top line and finished 1991 with $732 million. Werner Enterprises grew from $94 million in 1986 to $323 million in 1991, while MS Carriers went from $35 million to $152 million over the same time span. Extraordinary growth rates for these predominately non-union truckload carriers were achieved by continually lowering costs through intensive equipment utilization. Relatively low-cost operations enabled many carriers to capture truckload freight from the national LTL carriers, long-haul private fleets, and rail boxcars. (23)

Thus, the move to a competitive environment enabled carriers to innovate and experiment with various strategic approaches. As observed with the LTL carriers, among the TL carriers certain strategic approaches were more successful than others. The management and operating practices of the advanced TL firms emerged as a highly successful approach under the new market conditions.

Double-Stack Challenge and Response by Innovative TL Firms

In the 1980s, steamship lines (American President Lines, in particular) introduced double-stack train service in the United States as a way to move containers (for imports and exports) in an efficient manner. In an effort to avoid the movement of empty containers back to the West Coast (because of imbalances in trade between the United States and Japan), steamship operators began offering the empty container capacity for domestic traffic from the markets in the Midwest, East, and South to the West Coast. The steamship operators were able to offer this essentially back-haul capacity at marginal costs.

The double-stack service made some important inroads in the traffic of the advanced TL firms as a consequence of its price advantages. Experts have placed the costs of the line-haul portion of a double-stack trip at between 50 and 55 cents a mile. Even when terminal and drayage costs are added, most railroads still can transport a container for less than 80 cents a mile—a cost substantially below that achieved by the advanced TL firms (24,p.2C). The cost advantage combined with aggressive pricing resulted in traffic losses for the advanced TL firms.

Some advanced TL firms moved to answer the challenge of double-stack train operations just as they had moved after passage of the Motor Carrier Act. The following paragraphs outline a series of recent moves by advanced TL firms to re-establish their strategic position. It should also be noted that these "second-wave" innovations respond to a variety of factors and conditions beyond the double-stack challenge. Firms in the TL sector recognize that they need to anticipate and plan for changing circumstances and developments.

Intermodal Partnerships and Commitment to Containerization

J. B. Hunt, noted earlier as a prominent advanced TL firm, interpreted the challenge of double-stack operations as an opportunity to expand into intermodal operations. The entire double-

stack phenomenon demonstrated that rail service had improved enough to make intermodal operations a viable transportation service. J. B. Hunt believed that if it converted its trailer fleet to specially designed containers (predominately 53-ft containers) and chassis, it would have the option of using rail for line-haul service. Reliance on an improved rail intermodal service attracted Hunt because of its previously demonstrated cost advantage. An equally important consideration for Hunt was the availability of truck drivers. A series of developments had created real and long-term driver shortages. A recent summary of the driver issue and its effect on TL carriers such as Hunt concluded that

> in addition to competitive economics, another factor has led truckload carriers to look favorably on intermodal. During the 1980s, many truckload carriers experienced driver turnover each year in the 80 percent range. This was a result of drivers spending long periods on the road (3 to 4 weeks was common). High driver turnover was offset through 1990 by heavy recruiting from a pool of trained drivers. However, this pool has dropped dramatically during the past two years for three principal reasons: First, driver training schools were funded by federal student loans that have been shut down because of high loan default rates. Second, drug testing has become mandatory. Third, the National Commercial Driver's License has pushed bad drivers out of the industry. (*23*)

These factors led J. B. Hunt into a series of intermodal partnership agreements with several individual railroads [including Burlington Northern, Consolidated Rail Corporation (Conrail), Southern Pacific, and Union Pacific] to provide line-haul service for Hunt's containers. Hunt has committed convert its fleet to containers over the next 5 years. In this regard, Hunt has ordered 10,000 containers for delivery in 1993 (*25*). The importance of this intermodal traffic to Hunt is summarized in the following statement:

> During 1991, J. B. Hunt tendered nearly 42,000 intermodal loads, generating $72.7 million in intermodal revenue compared to its $690 million for over-the-road operations on 720,000 loads. Thus, for J. B. Hunt, the intermodal portion accounted for 6 percent of its total loads while generating 10.5 percent of total revenues. Hunt has publicly forecast $150 million to $160 million in intermodal revenue for 1992. (*29*)

Other leading advanced TL firms have begun rail intermodal partnership agreements as well. Schneider National began intermodal agreements with Southern Pacific in 1991. In 1992 Schneider entered agreement with Conrail. Schneider expects continued growth in revenue from intermodal operations into the future (*23*). Other notable examples are MS Carriers Inc. and KLLM Transport Services, Inc. (*26*).

Shifts to Shorter-Haul Markets with Shipper-Carrier Partnerships

Another response to the challenge of double-stack rail service on the high-density, long-haul corridors has been for the advanced TL firms to direct more attention toward securing business on shorter-haul regional markets. To improve their share of this business, individual TL firms have initiated carrier-shipper partnerships in which the carrier becomes directly involved in the logistics systems of the shipper in an effort to minimize total logistics costs.

The importance of the shorter-haul regional markets should not be underestimated. A recent report has estimated that 70 percent of total revenues in the TL segment come from shipments of fewer than 500 mi (*1*,p.17). A number of the advanced TL firms are expanding their business in these short-haul markets. J. B. Hunt, Schneider National, MS Carriers, Swift Transportation, and Heartland Express are just a few of the prominent carriers that have expanded their short-haul opportunities in the past several years (*27*).

Service reliability and on-time performance are key elements of effective participation in the short-haul markets. In this regard, the advanced TL carriers have worked to develop strong partnerships with shippers to minimize logistics costs. Shippers have become willing to devote a substantial portion of their business with so-called core carriers that will allocate resources to deliver a high-quality service.

In many carrier-shipper partnerships, the carrier makes a commitment to deliver high-quality service in exchange for a commitment by the shipper to concentrate business with their carrier partner (*28*). In some cases, the carriers have added satellite- and land-based mobile communications and tracking systems to monitor the location of their power units and supply the shippers with real-time information about shipment location (*29*). These capabilities have significantly enhanced the quality of their service and enabled the carriers to improve productivity of their equipment.

Summary

Clearly, the message of the new competitive environment is that certain TL firms will respond quickly and aggressively to any challenges that may arise. When the initiation of double-stack service pointed out the workability and cost advantages of intermodal service, advanced TL firms established partnerships with railroads.

In addition, TL firms moved to strengthen their positions in the short-haul markets by creating shipper-carrier partnerships. These partnerships provided TL carriers with the business commitments necessary to allow them to invest in productivity-enhancing advanced technologies.

New Markets and Opportunities for Innovative TL Firms

The new competitive environment has challenged TL firms to find new markets and opportunities. Two interesting markets not yet fully exploited are conversions of private fleet activity and access into large LTL shipments. However, ability of the TL carriers to expand into new markets is directly affected by the driver shortage issue.

A leading transportation analyst has estimated the size of the private fleet conversion market that is available for TL carriers:

> Plenty of opportunities for private-carriage conversion still exist in this market. . . . There is roughly $85 billion worth of private fleet business available for conversion. Even if only $5 billion to $10 billion of that can be converted over to truckload common carriage or dedicated contract carriage, it seems . . . that there is a huge opportunity here for the short-haul specialized carriers. (*1*,p.11)

Certainly the efforts by the advanced TL firms to improve service quality, efficiency of operations, and productivity indicate a strong desire to obtain additional conversions of private fleets.

Another opportunity for new business for the TL firms involves large LTL shipments. In the previous section on the LTL firms, it was demonstrated that air freight and specialized small package carriers had penetrated the LTL business for small packages. In the same manner, very large LTL shipments are subject to diversion to TL carriers. Through innovative marketing and pricing, the TL carriers could fill a container or trailer with a limited number of large LTL shipments. If these shipments were destined to a limited number of drop-off points, it would be possible for the TL carrier to make the movement. Alternatively, the TL carrier could pick up a limited number of large LTL shipments bound for the same region and negotiate with an LTL regional carrier to distribute the shipments within that region. Of course, the ability of the TL carriers to develop an inroad into the large LTL shipments requires special traffic flow patterns combined with innovative marketing and pricing. Advanced TL firms are pursuing these options, nonetheless.

As noted, any of the identified market opportunities for the TL carriers is limited by the extent to which the nation faces a driver shortage. The adoption of drug testing in combination with the commercial driver's license has shrunk the pool of available drivers, but obviously the drivers being eliminated from the pool are precisely the ones that should be taken off the road.

These new developments have changed the position of the truck driver in the eyes of the TL carriers. TL firms now have direct incentives to improve driver wage and benefit packages in an

effort to retain more drivers and, thereby, reduce costly turnover. Part of the motivation of the advanced TL firms to pursue intermodal partnership agreements with railroads was a desire to cut down on drivers' on-the-road time and limit the need for additional manpower (*30*).

Owner-operators, particularly the more experienced ones, were shunned initially by the advanced TL carriers because of their independence and lower productivity levels than driver teams, but they have reemerged as an alternative. They look especially attractive to firms trying to establish themselves in new markets, since they represent an opportunity for such firms to add capacity with a minimal fixed investment (*31–33*).

In any case there will be continuing concerns about the availability of qualified drivers during the 1990s. These concerns will at the very least dictate improved wage and benefit packages for the TL drivers and, as a result, some increases in costs. At the very worst, the driver shortages will constrain the opportunity of the TL carriers to move into new markets.

Future Issues and Conclusions

Several important issues and developments will affect motor carriers in both the LTL and TL segments. These issues will be discussed, and associated policy options will be presented. The paper will conclude with a discussion about the type of industry data needed to address policy questions and the specific nature of research studies needed to provide guidance to policy makers.

Intrastate Deregulation

Although a few states have deregulated motor carrier service, most continue to regulate it. The recent Supreme Court decision freeing Federal Express from all regulations in California will quickly achieve what economists and other policy makers have been advocating for years, that is, intrastate deregulation of all motor carrier services. It has long been argued that the remaining intrastate regulation of motor carriers operations is out of sync with interstate deregulation and results in motor carrier service that is inefficient and more expensive (*34,35*). Exact estimates of the magnitude of the direct additional costs associated with intrastate regulation vary widely, but these costs are substantial. There are many examples of regulatory inefficiencies associated with these intrastate regulations. Firms have moved production operations out of state, farther from markets, in order to avoid the use of intrastate, regulated motor carrier services.

It is anticipated that the Supreme Court decision with respect to the operations of Federal Express in California will put direct pressure on Congress to develop a unified response to the problem. It is clear that the major motor carrier interests will be lobbying Congress to put them on an equal footing with Federal Express. It is hard to imagine a solution to the California situation that will not involve fixing the entire problem and eliminating intrastate regulations. The recommended solution involves federal preemption of restrictive state motor carrier regulations.

Truck Size and Weight Considerations

The direct issue of truck size and weight regulations is the subject of other papers, but a few considerations appear to be appropriate for this paper. It seems that almost without exception, various investigations have concluded that substantial productivity gains are to be achieved by increasing truck sizes and weights (*36*). Important issues of public policy remain, however, especially concerning safety and rail diversion. Yet in examining the history of truck size and weight regulations, it appears clear that there will be changes and that those changes will be toward increased sizes and weights. It is hoped that the move in this direction will result in a more cohesive system than the current patchwork of exceptions and grandfather clauses that

currently constitutes our national policy. Efforts to achieve such cohesion have proven very difficult in the past, though, and the author is only cautiously optimistic that they will be successful in the future.

The movement by the TL carriers toward intermodal partnerships with the railroads is an encouraging development in the debate over truck size and weight. One of the biggest misconceptions is that any increases in size and weight will result in damaging diversions from rail service. What the TL intermodal partnership agreements have shown is that if rail service is of a quality high enough to allow its cost advantages to dictate results, rail traffic will do quite well if truck size and weight are increased to a limited degree. Unfortunately, the issue of truck size and weight has suffered from the infusion of hysteria through inappropriate advertising "scare" tactics. A more reasonable discussion of the issue might yield more appropriate public policy.

If truck size and weight are increased, truck productivity will be enhanced. Furthermore, some of the concerns about the availability of qualified drivers will be erased. The resultant decrease in demand for drivers would, hopefully, allow carriers to hire only the most qualified drivers. Such actions by the carriers would have some positive impact on highway safety.

The country would be better served if the truck size and weight policy were accorded greater cohesion on sizes and weights on a national level, better recognition of the productivity benefits associated with higher weights and sizes and vehicles with appropriate safety design considerations incorporated, less hysteria, and a more reasoned approach to the rail diversion issue.

Concerns About Structure of LTL Industry Segment

Several prominent authors have warned that the increase in concentration among the LTL carriers (as documented earlier in this paper) will lead to a near monopoly in this segment. According to Boyer,

> it is impossible to predict at this point how far the concentration of the American trucking industry will proceed. The industry may ultimately resemble the inter-city bus industry or the small package delivery service, each of which are organized essentially as monopolies (Greyhound and UPS, respectively). It is more likely that the industry will come to look like the U.S. airline industry in which traffic is dominated by a handful of carriers with national coverage or like the for-hire trucking industries of other nations in which as few as three or four carrier have dominant shares. (*10;37*,p.485)

The notion that the LTL industry segment will turn into a virtual monopoly or, at best, a limited oligopoly, appears to be at odds with the facts presented earlier in this paper. The increase in industry concentration is undeniable. However, the adverse monopoly-pricing consequences associated with the increased concentration have not materialized. The real cost of LTL services and the real prices charged to the shipping public have decreased significantly in the years since the passage of the Motor Carrier Act. Such costing and pricing behavior is not evidence of monopolies.

The most profitable LTL carriers in the past few years have been the regional ones. These carriers have appeared in a better position to offer faster service to shippers (with regional origin-destination patterns). In fact, the major LTL national carriers have taken direct initiatives to improve their service times and reliability in selected regional traffic lanes in response to the actions of the regional LTL carriers.

In the face of the direct evidence of significant competition among the LTL carriers and the success of the regional LTL operations, it is hard to agree with Boyer's conclusions. Having said this, it is equally important to stress that several questions about motor carrier operations must be answered if the future market structure of the LTL carriers is to be understood comprehensively.

There should be a clearer understanding of the impact of firm size on LTL carrier performance. Even though the econometric studies show no economies of scale, it is known that firms tend to be getting larger in this segment. The effects of size on performance need further

investigation. The advantages of size may not strictly involve size, by itself, but may also involve economies of density—that is, firms may be able to reduce costs and gain advantages by increasing the density of traffic over their networks. The only way for the firms to increase their traffic densities, however, may be to increase their size and market access.

However, economists have not answered these questions since the data available in readily accessible form are inadequate. To show density economies, researchers need data on the route structures (and route miles) of the LTL carriers. Such data were collected and reported on routinely by the ICC in the regulated era, but the data are no longer reported and not readily available. The ability to show that LTL firms have density economies would require obtaining route structure data on a systematic basis for all involved firms. The author believes that such a study would show that the real cost advantage for LTL firms involves density economies (i.e., increasing traffic over a fixed-route structure). It is certainly arguable that large firms have a greater likelihood than do small firms of having high traffic densities. But it is also conceivable that regional firms with high service levels and intensive marketing could achieve high traffic densities as well.

The author believes that the concerns of researchers such as Boyer and Dempsey that the LTL industry is heading toward a monopoly situation could be better addressed if systematic research were undertaken to show the impact of traffic density on firm costs. This is an important policy question and should receive priority attention and funding for a research project.

Concerns About TL Industry Segment

For years economists wrote about the economic advantages of intermodal (rail-truck) services for long-distance hauls. Yet throughout the 1960s, 1970s, and into the 1980s, the growth in intermodal services never met the economists' expectations. The initiation of double-stack train service in the 1980s finally provided the impetus for a rapid growth in intermodal services.

As noted, the growth in double-stack service, coupled with serious concerns about truck driver availability, led a number of advanced TL operators to initiate partnerships with railroads for intermodal services. Operators such as Schneider and J. B. Hunt have pursued such partnerships aggressively. These carriers, through their size, are in a position to direct the nature of TL services offered to the shipping public.

It appears clear that the major TL operators recognize that the economics of long-haul shipping dictate intermodal partnerships. The commitment by these operators to intermodal operations will cause sharp reductions in the amount of long-haul, cross-country trucking operations. Much more TL service will be provided through intermodal partnerships between major TL carriers and the railroads. This development has significant repercussions for a variety of actors in the transportation scene: owner-operators and truck drivers, railroads, and TL operators.

The fortunes of the owner-operators have risen and sunk through the adjustment to deregulation. It now appears that those owner-operators who have survived these difficult years with excellent safety records will be in high demand. The notion of driver shortages, although mitigated by the shift to intermodal operations, is still real. Owner-operators just starting in business will have a difficult time gaining employment, which will have serious implications as the current corps of owner-operators reaches retirement age.

The shift to intermodal partnerships for long-haul trucking operations will mean that fewer owner-operators and truck drivers will be involved in cross-country, multiple-week trips away from home. The norm will be a series of regional trips (300- to 500-mi) with a fixed route and home base. This change in operating patterns will most likely have a tremendous favorable impact on the available pool of drivers.

The railroads will probably gain significantly from the increasing reliance placed on their services by the TL carriers. The ability of the railroads to deliver high-quality intermodal services is the biggest change in making such operations attractive in the marketplace. In the

1960s and 1970s, whereas the economics may have indicated that intermodal services were competitive, railroad service was totally inadequate to provide a competitive threat. The streamlined and efficient railroads of the late 1980s and 1990s can now provide a competitive service. It certainly can be argued that the railroads needed to be freed from the regulatory restraints and to be completely restructured so that they could realize their competitive advantage in the marketplace.

The growth and prominence of large advanced TL carriers raise some questions about the emerging structure of the TL industry segment. It is clear that carriers such as J. B. Hunt and Schneider are dictating some fundamental changes in the type of TL long-distance services available. The real question is whether the marketplace will continue to have places for smaller TL carriers that offer different kinds of services. As with the LTL carriers, the TL carriers have experienced some significant increase in concentration. However, the author thinks a similar argument can be made that the TL marketplace, like the LTL marketplace, will allow for a variety of carrier types and services. The marketplace results from the first decade of operations under deregulation show no signs of monopoly power. Carriers are engaged in a fierce competitive struggle for business. A few carriers, such as J. B. Hunt and Schneider, are growing rapidly, but there is no evidence that the TL industry segment will gravitate toward an oligopoly. Smaller niche carriers are competing effectively right alongside the large players.

Service and Pricing Concerns in a Deregulated Market

Although the data presented in the analyses of the LTL and TL segments showed significant decreases in the real price of motor carrier services, some critics have argued that the gains from deregulation have been uneven, concentrated among the very large shippers with strong economic power over the carriers. They point out that such favoritism toward large manufacturers has disastrous impacts on the U.S. economy and its reliance on the small entrepreneur. According to Dempsey,

> Professor Donald Harper has noted that the ability of small shippers to compete against larger rivals is hindered by relatively higher freight rates. Hence, discriminatory transportation costs contribute to the economies of scale that larger entrepreneurs enjoy throughout the American economy. The higher cost of access to the stream of commerce endured by small shippers places them at a competitive disadvantage vis-à-vis their larger rivals. Assuming all other factors are equal, the large manufacturer with relatively (and, in many cases, significantly) lower transportation costs will be able to market his product at a lower price than his smaller counterpart. Deregulation facilitates this discrimination. These deleterious economic consequences have a broader social impact, for small businesses create most of America's jobs. (*10*,pp.58–59)

There are several fundamental fallacies in this line of reasoning. The first problem is that it assumes that motor carrier rates under regulation involved no elements of discrimination. This is quite wrong. The entire rate classification system and the manner in which the regulated carriers implemented the system involved systematic elements of discrimination. Furthermore, many of the discriminatory aspects of the rate classification system and its application were not based in any cost differences.

Second, under deregulation, there may be clear differences in the rates charged to large shippers than to smaller shippers, but these differences are based on differences in cost. Hence, it is inappropriate to call these rate differences discriminatory. To the extent that the differences in deregulated rates for the large and small shippers are not cost-justified, the expectation is that the differences could not be maintained in the long-run. The conclusion is that the deregulated environment will result in a rate system that is cost-based. Congress has declared that the cost-based system is preferable to the previous system. There is a recognition that the larger shippers may be able to obtain lower rates, but such differences are a consequence of lower costs of service.

International Market Opportunities and Open Borders

The emergence of a global economy is becoming an accepted fact in the transportation world. U.S. motor carriers are recognizing that they need to develop business links beyond the 48 continental states. In this regard, selected carriers have been pursuing opportunities in Mexico, Canada, and even Europe and Asia.

The signing of the North American Free Trade Agreement signals a new era in trade among the United States, Canada, and Mexico. A number of major U.S. motor carriers are pursuing opportunities aggressively. They recognize that the free trade agreement has the potential to expedite the movement of manufacturing capacity south of the border and increase the demand for international movement of products into the United States. Still, many issues need to be resolved regarding the participation of U.S. motor carriers in Mexico and Canada as well as the participation of carriers from these countries in the United States. Further complicating these considerations are the various truck size and weight laws in the three countries involved.

Some U.S. motor carriers have set up non-vessel-operating common carrier (NVOCC) subsidiaries to handle their international shipments to Europe and Asia. In addition to establishing the NVOCCs to handle the ocean portion of the international movement, the U.S. carriers have reached agreements with foreign-based motor carriers or foreign NVOCCs to deliver the freight (*38*). U.S. motor carriers contend that they have initiated these services in response to customer demands for a single-carrier responsibility for the entire movement.

Clearly, the future will see a significant enhancement of international shipments in response to the increasingly global economy. It appears necessary for U.S. motor carriers to position themselves to make strategic gains from these developments and to ensure that foreign motor carriers (especially from Canada and Mexico) do not gain unfair advantage at the expense of the U.S. carriers.

Data Needs and Research Opportunities

The previous discussion has presented an argument in favor of a research stream designed to investigate the relationship between motor carrier firm size and associated cost advantages. In that connection, it was argued that size effects must be combined with density economies in order to realize marketplace cost advantages. However, the substantiation of this argument will require the systematic collection of LTL firm route structure information to enable researchers to construct density measures (i.e., tons or ton miles divided by route miles).

Several other research topics merit systematic investigation. This paper has investigated the changing dynamics of competition in the LTL and the TL segments, but there are definite data gaps in this area. Often there is some aggregate information about how the total TL or LTL traffic is divided among the various competitors. However, rarely is there information on traffic lane/state-to-state competition among the modes. In effect, the level of aggregation is too great for researchers to understand in complete terms the dynamics of intermodal and intramodal competition.

It is with great anticipation that transportation researchers await the availability of new Census of Transportation data, which will provide for the first time in more than 20 years systematic data on intermodal competition in all the various transportation markets on a geographic-specific basis. The analysis of these data will yield significant insights on the changing nature of intermodal competition in the dynamic deregulated environment.

Conclusion

The motor carrier industry has experienced rapid change as a result of the transition from a highly regulated to a competitive market. This environment has been particularly harsh to carriers without the foresight or the wherewithal to make strategic adjustments to cope with new circumstances.

This paper has documented the major changes in both the LTL and the TL segments of the industry. It has focused on carriers that anticipated marketplace changes and moved aggressively to position themselves to take advantage of the changed opportunities. Clearly, the new environment enabled carriers to be successful if they made good decisions, but it hurt carriers whose managers were not as skillful in adapting to the situation.

However, the overriding consideration in evaluating the transition period is that the type of motor carrier service being delivered in the 1990s is one that is of much higher quality and that benefits from sizable efficiencies. It is hard to imagine that the innovations presented in this analysis would have been possible had Congress not passed the Motor Carrier Act of 1980. Although the transition has not been without its rough spots, the general direction of the changes has been positive. Any serious discussion of a return to the very complacent regulatory environment is almost inconceivable. Certainly, the highly competitive global economy dictates that all U.S. activities be conducted in the most efficient manner possible. This, of course, requires a continuing commitment to a competitive environment free of governmental economic regulations.

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