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Hokey Min
University of Louisville

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Cover Page Footnote
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THE IMPACT OF LUMPER COSTS, EMPTY MILES, AND SHIPMENT SIZE ON THE PROFITABILITY OF MOTOR CARRIERS: A CASE STUDY

Hokey Min
University of Louisville

ABSTRACT

The passage of landmark deregulatory reforms in the Motor Carrier of Act of 1980 has constantly pressured the U.S. trucking industry to reduce transportation costs. Thanks to such pressure, total logistics costs have declined from 16.5% in 1980 to 10.1% of gross domestic product (GDP) in 2000. In particular, transportation costs have fallen from 7.6% to 5.9% of GDP in 2000. Transportation cost savings definitely benefit shippers, while jeopardizing the viability of carriers. To help transportation carriers cope with enormous cost pressure, this paper examines the impact that "lumper" costs, empty miles, and shipment size have on the very competitive trucking industry. Through an actual case study of a firm based in the Southeast U.S., we illustrate how lumper costs, empty front-haul and backhaul, and shipping weight and pieces can adversely affect the trucking firm's profitability.

BACKGROUND

In 2000, although the trucking industry's share of the nation's freight bill increased slightly to 81.5%, the demand for trucking services declined significantly. Such a decline in demand led to a record number of trucking company failures for the last two years. In fact, Wilson and Delaney (2001) reported that there were over 3,600 bankruptcies in the trucking industry, an increase of 35.5% over the previous high in 1997. In 2001, trucking companies failed at a rate of about 1,000 every three months (Reiskin, 2001). The high failure rate of trucking companies is partially due to slow revenue growth during the recent economic slump. In addition, fuel and carrier insurance costs are rising dramatically. For instance, the average cost of a gallon of diesel fuel has increased 73 % over the last 18 months (Lynch, 2001). Insurance costs have almost doubled as underwriters left the market and the September 11 terrorist attack exacerbated the security problem (Wilson and Delaney, 2001). The concern over the profitability of the U.S. trucking industry is growing despite strong shipment growth and a moderate increase in freight rates over the last few years. Such anxiety often stems from rising fuel prices, chronic driver shortages, and increasing competition. To make matters worse, some shippers have frequently charged hefty "lumper" costs to their carriers and subsequently undermined the carrier's profitability. Herein, a lumper is referred to as a contract laborer who is hired to unload shipments of goods. The cost of using a lumper is usually charged per load to a carrier. The lumper charge can also vary from one load to another and/or one shipper (customer) to another.

In addition, with the growing demand of shippers for quick-response services and the increasing effort of carriers to meet their drivers' needs for more time at home, empty miles are piling up. These empty miles can further reduce the motor carrier's thin profit margin and decrease competitiveness. During the period between 1980 and 1997, the average business failure rate for motor carriers was 143 per 10,000 compared to an average failure rate of 90 per 10,000 for other businesses (Roth, 1999). An important issue facing motor carriers is whether they should continue to absorb lumper charges. To help the carrier resolve this issue, this paper examines the effect of lumper cost and empty miles on motor carrier profitability. For the analysis, actual data were obtained from a company which primarily uses private carriers.

RESEARCH METHODOLOGY

This study is based on the case analysis of a manufacturing firm that is headquartered in the Southeastern United States. To ensure the confidentiality of the data, this firm is referred to as "*Gamma*." *Gamma* is a leading manufacturer of bed and bath products such as tablecloths, shower curtains, and towels. *Gamma* markets products under different brand names including *Ralph Lauren, Espirit, Martex, Vellux* and *Lady Pepperell*. They also operate over 40 outlet stores in the U.S. and Canada and recorded a total of more than $1.6 billion in annual sales for the past several years. However, in recent years, their annual sales have been somewhat stagnant. Consequently, they have begun to scrutinize their current cost/revenue structure to stay competitive and profitable. One of the areas they have looked at closely is transportation cost.

In particular, *Gamma*'s management team was concerned about the uncontrollable and unpredictable lumper charges made to their fleets of carriers. Among the number of customer stores that they serve, these charges often fluctuate from one store to another and differences in lumper charges among different stores can be as high as $375. These customers include *Ames*, *Bradlees*, *Kmart*, *Macy's* and *Sterns*. In addition to lumper charges, some of the deliveries resulted in significant percentages of empty miles (a maximum of up to 82% for front-haul, 70.6% for backhaul). The added costs resulting from lumper charges and empty miles contributed to a loss reaching as high as $1,800 per store delivery.

A sample of 260 manifests and 191 freight bills was selected from *Gamma*'s customer files for a two-year span to collect data such as the number of miles per run, total shipping weight, number of pieces delivered to each customer store, gross revenue, revenue per mile, average lumper charge per load, percentage of empty front-haul miles, and percentage of empty backhaul miles. The *Statistical Package for the Social Sciences (SPSS) for Windows* (2000) was used to analyze the data collected from this sample.

Hypothesis Development and Testing

Based upon the sample, the following key hypotheses were developed to validate the significance of lumper costs, empty miles, and shipment size to the profitability of the carrier investigated in this study.

H_1: The average lumper charge per load fluctuates significantly from one shipper (store) to another.

Traditionally, some shippers have only allowed a certain lumper, designated by them, on their unloading docks and have not given the carrier much negotiation leverage in controlling hefty lumper charges. In an effort to control the lumper charge, the carrier under study explored the possibility of hiring a common carrier for certain shippers or involving its driver in the cargo unloading process. However, driver involvement in the cargo unloading process is not considered a viable option, because it increases the carrier's liability due to the potential risk of driver injuries and more stringent hours of service regulations. To determine which shippers should be served by common carriers or completely dropped from delivery services, the carrier needs to know if significant differences exist in lumper charges per load among different shippers.

Thus, the authors made a premise that the average lumper charge per load differs from one shipper (store) to another. To test this hypothesis, a one-way ANOVA test was utilized to see if significant differences occurred within any of the comparisons of the five major customer stores (*Ames*, *Bradlees*, *Kmart*, *Macy's*, and *Sterns*) in our sample. The test result (with *F-value* = 15.365, *p-value* = .000) demonstrates that significant differences exist within comparisons of average lumper charge per load among the five stores. Post hoc multiple comparisons were also made using the *Tukey* (*HSD-Honestly Significant Difference*) test to examine whether the average lumper charge of one store is significantly higher than another. Post hoc tests indicate that one of the stores, called "*Store Four*" (actual name was hidden to ensure confidentiality), tended to incur significantly higher lumper costs than the other four stores at a = .05. Also, "*Store Three*" incurs a significantly higher lumper cost than "*Store One*" and "*Store Five*" at a = 0.05. Hypothesis H_1 was therefore supported by the results.

H_{2a}: The average lumper charge per load is positively related to shipment weight.

H_{2b}: The average lumper charge per load is positively related to the number of pieces shipped.

H_{2c}: The average lumper charge per load is positively related to the number of miles per run.

Shipment size may influence the lumper charge, because a heavy shipment is likely to increase the unloading time at the dock. Similarly, the larger the number of pieces to unload, the higher the likelihood of a higher lumper charge. Since the long haul may increase the likelihood of freight consolidation, it is likely to increase shipment size and the subsequent lumper charge. To test these three premises, correlations among average lumper charges per load, shipping weight, the number of pieces, and miles per run were first calculated. A significantly positive correlation was found between shipping weight and average lumper charge with the Pearson correlation coefficient value of .487 (*p-value* = .000). Another strong positive relationship was found between the number of pieces and the average lumper charge with the Pearson correlation coefficient value of .659 (*p-value* = .000). However, the number of miles per run was not significantly correlated with the average lumper charge (*p-value* = .511). Therefore, hypotheses H_{2a} and H_{2b} were supported while hypothesis H_{2c} was rejected.

H_{3a}: The revenue per mile is negatively related to the number of empty front-haul miles.

H_{3b}: The revenue per mile is negatively related to the number of empty back-haul miles.

H_{3c}: The revenue per mile is negatively related to the number of miles per run.

H_{3d}: The revenue per mile is positively related to the gross revenue.

After deregulation, motor carrier revenue per mile declined and significantly lagged behind inflation throughout the 1980s and into the late 1990s (Roth, 1999). A decline in capacity utilization caused by empty miles can further dampen revenue growth and the subsequent profit margin. In particular, considering that a large portion of carrier operating costs are variable, reduction in empty miles would help the carrier control operating cost. As a matter of fact, controlling cost was perceived to be the most important strategy for enhancing motor carrier profitability in a study conducted by Stephenson and Stank (1994). With this fact in mind, it was hypothesized that the percentage of empty miles for both front-hauls and backhauls is likely to impact carrier revenue per mile significantly. Also, given that total operating expenses such as driver wage, fuel costs, and maintenance/repair costs increase as the carrier travels for longer distances, it was expected that the number of miles per run would be negatively related to revenue per mile. It was also hypothesized that gross revenue contributes to the increase in revenue per mile. As a preliminary test of these hypotheses, the degree of relationship present between dependent (revenue per mile) and independent variables (empty front-haul miles, empty backhaul miles, total miles per run, and gross revenue) was measured through correlation matrices summarized in Table 1. Since significant correlations were identified among the independent variables at a = .05, additional statistical tests were conducted using step-wise regression to eliminate redundant independent variables.

Test results shown in Table 2 indicate that revenue per mile is inversely related to the number of empty backhaul miles and the total number of miles per run at a = .05. In particular, the multiple R shows a substantial correlation between the two independent variables "number of empty backhaul miles and total number of miles per run" and the dependent variable "revenue per mile" with R = .705. On the other hand, both the number of empty front-haul miles and gross revenue were not significantly correlated with revenue per mile. Therefore, both H_{3a} and H_{3b} were fully supported by the test results, and both H_{3c} and H_{3d} were rejected.

TABLE 1
CORRELATION MATRIX

	Revenue per Mile	Empty Front-haul	Empty Backhaul	Miles per Run	Gross Revenue
Revenue per Mile	1.0				
Empty Front-haul	-.022	1.0			
Empty Backhaul	-.241**	-.164*	1.0		
Miles per Run	-.708**	.074	.139	1.0	
Gross Revenue	-.484**	-.077	.127	.746**	1.0

*p < .05 **p < .01

TABLE 2
STEPWISE REGRESSION RESULTS

Dependent Variable: Revenue per mile

Independent Variables	Unstandardized Slope Coefficient	Standard Error	Standardized Coefficient (Beta)	Significance Level
Constant	2.813	.141		.000
Empty Backhaul	-.006874	.003	-.120	.034*
Miles per Run	-.00175	.000	-.679	.000**
Empty Front-haul	Excluded	Excluded	Excluded	.880
Gross Revenue	Excluded	Excluded	Excluded	.216

Adjusted R Square = .497 F-ratio = 80.618, significant at p < .01 **p < .01

These results clearly suggest that both long hauls and empty backhauls are culprits contributing to the decline in revenue per mile. Note that *Gamma*'s revenue per mile of $1.68 during the study period was slightly below the national average of $1.87 (Roth, 1999). A significantly negative relationship exists between revenue per mile and the total number of miles per run (i.e., length of the haul) with the Pearson correlation coefficient value of -.708 (*p-value* = .000). According to *Gamma*'s management team, they have noticed such a pattern over the years, but never had a chance to verify it with concrete evidence prior to this study. *Gamma* was particularly concerned with a long haul exceeding 500 miles for a number of reasons, including potential decline in revenue per mile and difficulty in driver scheduling under the changing hours of service regulations.

FINDINGS AND IMPLICATIONS

This section summarizes key findings from the study and practical implications for motor carriers who face the prospect of losing profit margin and market share.

First, as *Gamma* suspected, average lumper charge per load varies significantly from one customer store (shipper) to another. The test result indicate that one customer store (*Store Four*) tended to charge higher lumper fees per load than any other customer store. *Store Four* not only assessed higher average lumper charge per load (approximately $100 more than the store with the lowest lumper charge per load), its lumper charge also fluctuated substantially from one load to another. Other customer stores' lumper charges remained relatively stable over time. The high variability of lumper cost for *Store Four* was due to the wide variance in shipping weight, ranging from 3,791 to 36,732 pounds per shipment, and total number of pieces ranging from 502 to 5,222 per shipment. It would have been better for *Gamma* to ask *Store Four* to cover its lumper cost. However, *Store Four* is one of *Gamma*'s major customers and *Gamma* cannot afford to take such direct action. Two alternative courses of action suggested to *Gamma* were to: (1) use a common carrier to avoid the excessive lumper cost; (2) design a customized trailer equipped with a built-in conveyor belt on the floor of the trailer to reduce unloading time.

In addition to these options, Gamma should re-evaluate its current accounting procedure to examine whether lumper costs are being accurately estimated. Gamma may want to consider activity-based costing (ABC) to better capture lumper activity in servicing its customers. The result will be a more accurate assessment of profitability. ABC can provide an economic map to identify which customers are truly profitable by identifying cost drivers.

Second, revenue per mile was *negatively* correlated with empty backhaul miles and the length of haul. Considering that empty backhaul miles represent the underutilization of truck capacity, it makes sense that empty backhaul miles are detrimental to revenue. The negative relationship between revenue per mile and the length of haul can be explained by the increase in variable costs (e.g., driver pay per mile, fuel cost, maintenance and repair cost) as it relates to total miles traveled by the carrier.

Based on the findings, *Gamma* was encouraged to explore the possibility of using common or contract carriers for some delivery lanes that currently involve empty backhauls. The rule of thumb suggested by Schneider (1985) indicates that if empty backhaul miles are within the range of 10% to 20%, management should consider replacing a private fleet with for-hire carriers. *Gamma*'s average percentage of empty backhaul miles was 32.12% (with a standard deviation of 19.58%). This high percentage of empty backhaul miles justifies the for-hire carrier option. In addition, declining revenue per mile associated with long hauls further justifies such an option. *Gamma* also came up with their own rule of thumb: the continued usage of private carriers for a delivery of up to 199 miles per run; the potential use of contract carriers for a delivery ranging from 200 to 399 miles; the potential use of common carriers for a delivery ranging from 500 to 999 miles; the potential use of intermodal operations for a delivery of 1,000 miles or more. Although these rules of thumb sound plausible, their verification requires further research. Once a certain for-hire carrier is selected for outsourcing transportation services, *Gamma* should consider establishing a core carrier program that will allow *Gamma* to take advantage of rate reductions for volume commitments.

Another innovative option to consider is the use of an on-line freight exchange system that can provide *Gamma* with real-time management of freight movement to increase profit and maximize equipment utilization through an e-commerce platform. Carriers may share their excess loads with others to reduce empty backhaul miles and consequently improve their operating ratio (a ratio of operating expenses to gross freight revenue).

For example, *National Transportation Exchange (NTE)* integrates its public marketplace with an on-line auction service that allows closed negotiations for the best truckload-matches between shippers and carriers. *NTE* posts the pre-committed freight rates for each load on its website and presents load opportunities for backhauls by combining small carriers as a single virtual fleet through real-time shipment information and web interfaces. Thus, *Gamma* can exploit such an online freight exchange program that will help it reduce empty backhauls.

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AUTHOR BIOGRAPHY

Hokey Min is a professor of supply chain management and executive director of the Logistics and Distribution Institute at the University of Louisville. As an executive director, he oversees activities of four research centers including the UPS Center for World-Wide Supply Chain Management. Dr. Min earned his Ph.D. in management sciences and logistics from the Ohio State University. His research interests include global logistics strategy, e-synchronized supply chain, benchmarking, and supply chain modeling. Dr. Min has published more than 65 articles in various refereed journals.