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Marketing Advantages of Size in the General-Freight Motor Carrier Industry

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This paper focuses on a hypothesis that has been offered as an alternative explanation for the increasing concentration observed in the general-freight motor carrier industry. Although economic research on this question has traditionally been directed to the cost structure of the industry, this paper addresses a demand-side explanation, namely, the hypothesis that general-freight carriers with extensive terminal networks possess important marketing and service advantages over small firms. A formal test of the hypothesis that size affects marketing advantages, based on city-pair market data collected from carriers that offer single-line service in selected transcontinental markets, provided the following results. Those carriers with the largest route networks, whether measured by the number of terminals or by the number of standard-metropolitan-statistical-area (SMSA) points served, did not (other things being equal) possess the largest share of overall less-than-truckload (LTL) revenue in the lanes studied. Indeed, other factors, such as a carrier's relative financial health and regional identification, appeared to play a greater role in explaining market share than did network size. Nevertheless, carriers with extensive networks did earn higher average LTL revenue per shipment pound than did carriers that served a smaller number of terminals or SMSA points. These results, although based on a limited sample of city pairs, indicated that carriers with extensive terminal networks have balanced market-share objectives against other objectives such as shipment yield. Moreover, such carriers have been more successful in competing for high-rated traffic than have smaller carriers. The results thus suggest that, under the present regulatory system, large interregional general-freight carriers possess significant marketing advantages in soliciting high-rated freight and that these advantages have contributed to the high relative growth and profitability of such carriers.

This paper examines the hypothesis that large general-freight carriers that serve many points enjoy important marketing or service advantages over smaller firms (1-3). According to this hypothesis, carriers that offer regular service to many points will (other things being equal) win the greatest market shares in any given city-pair market. This hypothesis is supported by informal observations of shipper behavior in selecting motor carriers, which indicate that shippers have a strong preference for minimizing the number of carriers with which they deal and do so by selecting carriers that provide the greatest route coverage. Such a practice minimizes the number of interactions between shipper personnel and carriers, minimizes congestion at the shipper's loading docks, and concentrates the shipper's bargaining power, e.g., in negotiating special commodity or point-to-point rates.

The hypothesis of the marketing advantages of size is of particular interest in view of the controversy that surrounds the economics of the general-freight or less-than-truckload (LTL) segment of the motor carrier industry. This debate has focused on whether the increasing concentration observed in LTL transportation is the product of Interstate Commerce Commission (ICC) regulation or of structural economic factors.

Traditionally, research on this question has been directed to the cost side of the industry, i.e., to the issue of cost economies of scale. Over the past 20 years a number of studies have attempted to estimate the most efficient size for a general-freight carrier. The results of these studies suggested that economies of scale (if they exist at all) are achieved only by certain regional carriers, while interregional carriers are characterized by constant returns to scale (4-5).

Economists have interpreted the cost-study evidence as indicating that any given market should be able to support substantially more carriers than it currently does and accordingly that high concentration ratios reflect artificial regulatory restrictions on entry into the market. In contrast, members of the general-freight carrier industry have argued that concentration trends are explained by the nature of demand for LTL transportation, i.e., by the marketing advantages that accrue to large carriers that serve many points. They argue that, in the absence of regulation, the industry would come to be dominated by a few large firms. Given the importance of this question, this paper presents a formal test of the marketing-advantages hypothesis.

The next section of the paper discusses general-freight carrier marketing and service strategies as they have evolved under ICC regulation. Next, an empirical investigation of the relationship between the major dimensions of carrier service--route coverage, quality of service, and marketing effort--and carrier market performance in 18 transcontinental lanes is presented. A summary of the study's conclusions ends the paper.

Table 1. General-freight carriers that offer single-line service in study lane markets, 1973.

Study Lane Market	Mileage[a]	Carriers[b]
Chicago-Los Angeles	2087	A-L
Chicago-San Francisco	2169	A-K
Chicago-Portland	2095	A, B, D, G, H, K, L
Minneapolis-Los Angeles	1889	A, E, J-M
Minneapolis-San Francisco	1940	A, E, J-M
Minneapolis-Portland	1678	A, K-M
St. Louis-Los Angeles	1848	A, B, D-G, I-L
St. Louis-San Francisco	2089	A, B, D-K
St. Louis-Portland	2060	A, B, D, G, H, K, L

Note: A = Consolidated Freightways; B = East Texas Motor Freight; C = Illinois-California Express; D = IML Freight; E = Lee Way Motor Freight; F = Navaho Freight Lines; G = T.I.M.E.-DC; H = Transcon Lines; I = Western Gillette; J = Yellow Freight System; K = Pacific Intermountain Express; L = Ringsby Truck Lines; M = Garrett Freightlines.

[a] Derived from Household Goods' Carriers Tariff Bureau, Agent Mileage Guide 9, MC-ICC 140. For rate-making purposes, these mileages are increased by 6 percent for circuity.

[b] General-freight carriers that advertise in the National Highway Carriers Directory publication (8).

IMPLICATIONS OF ICC RATE REGULATION

As in other industries in which prices are regulated and entry is restricted, competition among interregional freight carriers has focused on service, i.e., the building of market advantage through the provision of fast, reliable transportation over an extensive route network. Given the ICC's relatively permissive policy toward mergers that offer improved service, such competition has escalated in recent years as carriers have expanded their terminal-point coverage through end-to-end mergers and acquisitions of operating rights. In addition, many carriers have been aggressive in opening secondary or satellite terminals along existing routes.

However, at the same time, the fact that under the current regulated rate structure not all classes of traffic and shipment sizes are equally compensatory provides carriers with an incentive to engage in selective marketing. Attracting or marketing high-rated freight is generally regarded as a strategic factor in building a competitive advantage in the general-freight transportation business. For example, in a statement on the current motor carrier rate structure in ICC Ex Parte MC-98, one industry member observed (6):

> Further use of present structures will lead, through the simple thrust of economics, to an oligopoly in motor transportation. The remaining oligopolistic carriers may certainly not have been the more efficient carriers in terms of productivity; but assuming arguendo that all trucking management were equally efficient, there would still be carriers eminently more profitable than others due purely to operating environment.
>
> When I speak of operating environment, I do not mean differences in trucks and terminals; for in truth, the entire industry uses roughly the same tools of physical productivity. When I talk of operating environment, I mean the traffic environment--things that affect traffic environment such as short haul vs. long haul, on-line vs. interchange, low class vs. high class, head haul vs. back haul, etc.
>
> This environment is controlled not by management, but by rate bureau averages, classification board averages, ICC and intrastate operating authority, interline concurrences or lack of same, carrier traffic costing with computers or the lack of it, and, last but not least, the alteration of the environment through traffic selectivity. The game called profit in the trucking industry is not won on operating efficiency, but on operating environment manipulation; or simply knowing and understanding the inequities in the rate structure, and through environmental change making them work for you (emphasis added).

Carrier traffic selectivity takes a number of forms. Negative expressions of selectivity by carriers include avoidance of commodities considered to be undesirable traffic as the result of physical characteristics or volume, refusal to accept interline traffic in certain circumstances, refusal to accept traffic destined for cities or areas that do not generate large amounts of backhaul traffic, withdrawal of service from low-traffic-density points after merger, and bypassing of communities not served by the Interstate highway system. In such cases, the justification usually given by a carrier for its refusal to accept less-desirable traffic is that its facilities are overloaded and that the article tendered for transportation might be damaged or lost if held over until a slack period is reached.

On the other hand, positive expressions of traffic selectivity--service rivalry and marketing efforts aimed at attracting desirable freight--take on added importance in the presence of cross subsidization. For example, the Yellow Freight System believes that a major contributor to the success of its marketing program is a single-minded focus on a specific class of business. The essence of Yellow Freight's approach is careful allocation of salesmen's efforts on key accounts, as determined by the volume and length of haul of the LTL traffic that the account offers. Salesmen attempt to get the most-attractive business from customers as well as a balanced flow of traffic in and out and the optimum mix of high- and low-density shipments (7).

EMPIRICAL ANALYSIS OF MARKETING ADVANTAGES OF SIZE

This section provides an empirical investigation of the relation between the major dimensions of carrier service--route coverage, quality, and marketing effort--and carrier market outcomes in a number of major transcontinental traffic lanes between the Midwest and the Pacific Coast. Practical considerations dictated the selection of transcontinental corridors; because of the length of these corridors, the number of carriers from which data would be required (carriers with single-line authority) was held to manageable proportions. The lanes selected for analysis and the carriers that offer direct service in each are shown in Table 1.

Seven of the carriers that serve the lanes listed in Table 1 were able to provide 1973 data on origin-destination LTL and truckload (TL) revenue, shipments, and tonnage for each pair of cities in which they had authority: Consolidated Freightways, East Texas Motor Freight, Garrett Freightlines, Illinois-California Express, IML Freight, Pacific Intermountain Express, and Yellow Freight System. Because not all carriers that offer single-line service in the study lanes were able to provide data, it was necessary to estimate the total LTL and TL traffic base in each lane. This was done by using city-to-city traffic-flow reports prepared by the Rocky Mountain Motor Tariff Bureau (RMB) from its Continuous Traffic Study waybill samples.

Market Hypotheses

As discussed above, under the present regulatory system, carriers will not necessarily seek to maximize overall market share but rather will attempt to maximize share in selected high-rated traffic segments. Given these conditions, carrier service rivalry will be directed to market share and shipment yield, although nothing can be said about the form of this rivalry a priori. These hypotheses thus yield the following models:

$$R_i^j = f(M_j^j, Q_i^j, A_i^j, e_i^j) \quad f_1 = ?, f_2 > 0, f_3 > 0 \tag{1}$$

$$Y_i^j = f(M_i^j, Q_j^j, A_i^j, S_i^j, e_i^j) \quad f_1 > 0, f_2 > 0, f_3 > 0, f_4 < 0 \tag{2}$$

where

R_i^j = ratio of the actual LTL revenue market share of firm j in market i to the expected market share if the market had been divided equally,

Y_i^j = average LTL revenue per pound of firm j in market i,

M_i^j = ratio of the number of markets served by carrier j to the average number of markets served by all carriers with authority in market i,

Q_i^j = ratio of the service-quality ranking for carrier j to the average-quality ranking of all carriers with authority to serve market i,

A_i^j = ratio of marketing effort for carrier j to the average marketing effort of all carriers with authority to serve market i,

S_i^j = average LTL shipment size of firm j in market i, and

e_i^j = random error term.

The process of transforming the qualitative factors suggested above into explicitly defined quantifiable variables is constrained by data availability. The definitions of the variables used in this analysis (and their shortcomings) are outlined below.

Network Coverage

One of the key explanatory variables suggested by the marketing-advantages hypothesis is the extensiveness of a carrier's route network. In this study this variable (TERM) is defined as the number of terminals operated by the carrier as listed in the spring 1974 National Highway Carriers guide (8). Since the number of terminals does not necessarily indicate the marketing significance of a carrier's system in terms of population served, an alternative measure, SMSA, i.e., the number of standard metropolitan statistical areas served by a carrier, was tested.

Service Quality

Published data on carrier service quality do not exist. However, shippers increasingly use carrier profile and rating systems, which suggest that carrier financial condition is a good proxy for service quality. Indeed, there is general agreement in the motor carrier industry that a company's stability and service tend to be impaired when its operating ratio rises to more than 95 percent. For example, in shippers' carrier rating profiles, the use of the financial-condition yardstick has been explained as based on the premise that a carrier reacts either positively or negatively because of financial condition. It is reasoned that a carrier in financial difficulty may lack the incentive to deal equitably with the shipper on claims, rates, services, etc. Further, if a carrier's financial condition leads to bankruptcy, a shipper may be exposed to financial loss. In any event, bankruptcy proceedings necessitate the use of a new carrier.

In this analysis, service quality is proxied by the carrier's average operating ratio for 1970-1972 (ORAVG). Because origin-destination traffic in the 18 study lane markets represents a relatively small portion of the study carriers' overall traffic, this measure may be considered exogenous to particular markets. (In no sample lane did a study carrier's origin-destination LTL revenues exceed 4 percent of its systemwide LTL revenues. Indeed, in nearly all cases, the ratio of carrier-lane LTL revenues to systemwide LTL revenues was less than 1 percent.)

Sales Effort

No data that pertained to carrier marketing budgets, sales staff, or sales policies in individual citypair markets were available. An alternative system variable, number of salespersons per SMSA (SALES), was used as a proxy measure for a carrier's marketing effort.

Dummy Variables for Network Characteristics

Several additional carrier network characteristics may be relevant to shipper carrier choice, i.e., whether or not a carrier is operating in a home market or in a market in which its regional identification factor is high or low. The following dummy variables were included to represent these factors: HOMEMKT, which had a value of 1.0 if a carrier's corporate headquarters was located at the point of origin in a city-pair market and zero otherwise; NORTHREG, which had a value of 1.0 for a predomi- nantly northern carrier that competed on a route served primarily by southern carriers and zero otherwise; and SOUTHREG, which had a value of 1.0 for a predominantly southern carrier that competed on a route served primarily by northern carriers and zero otherwise.

Dummy Variables for Firm Effects

As candidates for inclusion in an equation geared toward explaining differences in carrier market share and shipment yield on the city-pair level, the quantifiable variables outlined above have some obvious intuitive appeal. However, other important explanatory variables have undoubtedly been missed in this selection of variables. Some of these influences might be picked up by the inclusion of an additional dummy variable for each carrier. This variable would carry a value of 1.0 for the carrier associated with the variable and a value of zero for all the other firms in the market. By using the technique of introducing dummy variables into the regression equation, any previously unidentified, constant, and persistent factor that influences an individual carrier's lane-market performance should be picked up and highlighted by the dummy variable designed to characterize the firm effect of the carrier in the regression equation. (A long list of factors thought to influence shippers must go unmeasured in this analysis: actual transit time; consistency of meeting transit time; schedule of pickup, delivery, or pickup-and-delivery service; availability of equipment; capability of tracing; frequency of claims; settlement policies for claims; incidence of billing or rating errors; ability to expedite; willingness to negotiate special commodity

Table 2. Carrier system characteristics, 1973.

Characteristic	Carrier						
	A	B	C	D	J	K	M
Number of terminals	191	52	31	48	147	85	64
Number of SMSAs served	99	36	20	35	94	64	14
Number of the 50 largest SMSAs served	44	19	12	24	40	33	9
Average operating ratio 1970-1972 (%)	92.4	96.3	92.4	93.3	90.3	95.2	92.8
Number of salespersons	401	83	68	115	225	184	52

Note: Carriers are identified in Table 1.

Table 3. LTL revenue market-share estimates.

Item	Dependent Variable = logLTLREV					
	A	B	C	D	E	F
Constant	-0.027 91	-0.017 63	-0.921 82	-0.026 85	-0.044 48	0.228 18
logTERM	-0.215 32	-0.664 86[a]	-2.698 2[b]			
	(0.193 62)	(0.201 34)	(1.373 9)			
logSMSA				-0.032 67	-0.308 37[b]	-4.416 2[a]
				(0.162 24)	(0.164 39)	(1.589 6)
logORAVG	-15.214[a]	-20.915[a]	-46.824[b]	-12.806[a]	-16.565[a]	-32.894[b]
	(5.353 3)	(4.805 5)	(25.795)	(5.096 4)	(4.741 7)	(15.109)
logSALES	1.680 0[a]	1.381 0[a]	17.313[b]	1.581 6[a]	1.110 7[a]	8.949 7
	(0.469 77)	(0.420 72)	(9.143 6)	(0.467 47)	(0.449 89)	(5.135 9)
SOUTHREG		-0.657 69[a]	-1.106 0[a]		-0.540 95[a]	-1.218 9)[a]
		(0.134 67)	(0.119 34)		(0.133 62)	(0.126 60)
NORTHREG		0.074 73	0.009 23		0.146 35	-0.095 07
		(0.093 13)	(0.083 34)		(0.094 19)	(0.090 24)
HOMEMKT		0.150 51	0.122 05[b]		0.097 62	0.113 24
		(0.121 05)	(0.071 20)		(0.126 37)	(0.069 50)
Firm 1			3.187 7			0.510 13
			(2.012 6)			(1.197 0)
Firm 2			-4.094 2[a]			-3.224 2[a]
			(0.395 14)			(1.257 6)
Firm 3			0.749 56			-0.673 40
			(0.538 70)			(0.875 06)
Firm 4			0.262 43			-0.992 00
			(0.464 71)			(0.644 76)
Firm 5			2.325 2[b]			0.971 93
			(1.277 1)			(0.803 42)
Firm 6			3.274 9[b]			1.727 6
			(1.715 2)			(1.039 4)
R^2	0.251 41	0.463 34	0.833 71	0.239 93	0.412 86	0.842 08
$\bar{R}^2$	0.222 62	0.420 41	0.804 79	0.210 70	0.365 89	0.814 62
F-Statistic	8.731 8	10.792	28.828	8.207 5	8.789 8	30.661
SE	0.359 62	0.310 52	0.180 21	0.362 36	0.324 79	0.175 61

Note: A = system variables; B = system variables plus network-characteristic dummy variables; C = system variables plus network-characteristic and firm-effect dummy variables; D = system variables with alternative scale variable SMSA; E = system variables with alternative scale variable SMSA plus network-characteristic dummy variables; F = system variables with alternative scale variable SMSA plus network-characteristic and firm-effect dummy variables. Values in parentheses are standard errors of the coefficients. N = 82.

[a]Significant at 0.01 level (two-tailed test).
[b]Significant at 0.05 level (two-tailed test).

rates; ability to provide rate and route information; and practices for credit, dunning, and collections.) The existence of strong firm effects would not result in the direct identification of additional variables that might be important in defining a firm's relative lane-market performance. However, if strong firm effects were observed, case studies might be undertaken to identify the causal factors at work.

Carrier system characteristics that correspond to these variables are shown in Table 2.

Empirical Results

Market Share

Since discussions of service rivalry in the general-freight motor carrier industry offer no precedents for functional form, three alternative functional forms--double-logarithmic, semi-logarithmic, and linear--were tested in analyzing the determinants of market share. This paper presents results for the double-logarithmic form [the results for the semilogarithmic and linear forms are given elsewhere (9)]:

$$\log LTLREV = b_0 + b_1 \log TERM + b_2 \log ORAVG + b_3 \log SALES + \text{dummy variables} \quad (3)$$

where LTLREV is defined as the ratio of actual carrier LTL revenue to expected LTL revenue if the market is divided equally among competing carriers, and the explanatory variables are as defined in the previous section. This model was also estimated with the alternative scale variable SMSA.

The market-share regression results are shown in Table 3. (The firm-effect dummy variables are not identified by company name in order to ensure the confidentiality of the carrier data.) Each of the estimated equations is statistically significant. As can be seen, however, comparison of the basic and expanded regression models indicates that inclusion of the dummy variables for regional and firm effects provides a more complete specification, which contributes significantly to the explanatory power of

Table 4. LTL shipment-yield estimates.

Item	Dependent Variable = LTLREVLB					
	A	B	C	D	E	F
Constant	0.053 85	0.044 41	-0.574 20	0.060 61	0.045 71	-0.391 78
LTLSIZE	-0.000 03[a]	-0.000 04[a]	-0.000 04[a]	-0.000 04[a]	-0.000 04[a]	-0.000 04[a]
	(0.000 01)	(0.000 01)	(0.000 01)	(0.000 01)	(0.000 01)	(0.000 01)
TERM	0.005 19[a]	0.006 14[a]	0.021 45			
	(0.001 75)	(0.002 02)	(0.012 82)			
SMSA				0.005 68[a]	0.006 74[a]	0.022 79
				(0.001 86)	(0.002 15)	(0.019 71)
ORAVG	0.055 12	0.063 17	0.831 08	0.044 31	0.056 44	0.475 10
	(0.062 76)	(0.065 60)	(0.445 59)	(0.060 41)	(0.063 71)	(0.335 78)
SALES	-0.005 69	-0.005 88	-0.142 43	-0.001 22	-0.000 21	-0.002 34
	(0.005 68)	(0.005 89)	(0.160 15)	(0.005 40)	(0.005 73)	(0.114 55)
SOUTHREG		0.004 25	0.007 32		0.004 55	0.007 50
		(0.003 70)	(0.005 68)		(0.003 70)	(0.005 89)
NORTHREG		0.001 36	0.000 42		0.000 28	-0.001 49
		(0.002 75)	(0.003 83)		(0.002 67)	(0.003 90)
HOMEMKT		-0.000 34	0.000 05		-0.000 60	0.000 46
		(0.003 47)	(0.003 50)		(0.003 47)	(0.003 52)
Firm 1			-0.075 63			0.002 49
			(0.081 34)			(0.056 90)
Firm 2			0.002 20			0.023 72
			(0.012 41)			(0.026 24)
Firm 3			0.005 21			0.023 79
			(0.017 24)			(0.023 50)
Firm 4			-0.006 18			0.019 94
			(0.024 68)			(0.023 74)
Firm 5			-0.049 60			-0.001 57
			(0.055 43)			(0.041 27)
Firm 6			-0.041 52			0.010 69
			(0.065 13)			(0.049 92)
R^2	0.258 72	0.272 09	0.352 57	0.262 45	0.277 60	0.338 93
$\bar{R}^2$	0.220 22	0.203 23	0.228 79	0.224 13	0.209 26	0.212 54
F-Statistic	6.718 7	3.951 5	2.848 5	6.849 8	4.062 3	2.681 8
SE	0.008 83	0.008 93	0.008 78	0.008 81	0.008 90	0.008 88

Note: A = system variables; B = system variables plus network-characteristic dummy variables; C = system variables plus network-characteristic and firm-effect dummy variables; D = system variables with alternative scale variable SMSA; E = system variables with alternative scale variable SMSA plus network-characteristic dummy variables; F = system variables with alternative scale variable SMSA plus network-characteristic and firm-effect dummy variables. Values in parentheses are standard errors of the coefficients. N = 82.

[a]Significant at 0.01 level (two-tailed test).

the model in each of the alternative functional forms.

The network-coverage variable (TERM) and its alternative (SMSA) showed a negative and generally significant association with market share in each of the alternative specifications. Although the marketing-advantages hypothesis suggests that a carrier wins consideration based on the extensiveness of network coverage, the results presented here indicate that, in the presence of rate cross-subsidization, the largest carriers (measured by number of terminal or SMSA points served) do not necessarily seek to maximize overall market share in a lane.

The coefficient on the service proxy variable (ORAVG) is negative and statistically significant across alternative specifications. This result indicates that, other things being equal, the more precarious a carrier's financial condition is (the higher the average operating ratio in the previous three years), the lower is the ratio of actual to expected market share. To the extent that a carrier's financial condition is an indicator of reputation for efficient operations and for service quality, this result supports the hypothesis that service quality (in the absence of price competition) is one key to building market share.

The marketing effort proxy (SALES) possesses a positive and statistically significant coefficient in all but one of the market-share regression specifications. Again, this is the expected result.

Finally, the inclusion of dummy variables for the network characteristics and firm effects as a group added significantly to the explanatory power of the market-share regressions. However, not all the dummy variables were statistically significant. For example, although the HOMEMKT coefficient had the expected positive sign in all the specifications, it was generally not statistically significant. Accordingly, it cannot be concluded that carriers operating in a home market enjoy a competitive advantage over other carriers in winning market share.

The coefficient on the dummy variable SOUTHREG, which represents southern carriers that operate on a northern route, was negative and statistically significant in nearly all cases. This result suggests that, other things being equal, carriers that have southern-based terminal networks appear to be at a competitive disadvantage on northern routes. In contrast, the coefficient on the dummy variable NORTHREG was positive in most cases, although it was never statistically different from zero. It is thus interesting to note that, in general, northern-based carriers do not appear to be at a competitive disadvantage on southern routes.

The signs and significance of the dummy variables for the firm effects varied across specifications due to relatively high collinearity between some of the dummy variables and system-characteristics variables. Nevertheless, three of these variables contributed significantly to the explanatory power of the market-share regressions. This result invites further investigation to determine whether unidentified systematic factors are at work.

LTL Revenue Yield

Three alternative functional forms were also tested in analyzing the determinants of average carrier revenue per shipment pound in a lane. This paper presents results for the linear form [the results

for double-logarithmic and semilogarithmic forms have been reported elsewhere (9)]:

$$\text{LTLREVLB} = b_0 + b_1\ \text{LTLSIZE} + b_2\ \text{TERM} + b_3\ \text{ORAVG} + b_4\ \text{SALES} + \text{dummy variables} \quad (4)$$

where LTLREVLB is defined as carrier average revenue per shipment pound in a lane and LTLSIZE is defined as carrier average LTL shipment size in a lane. (With the exception of minimum-charge shipments, the LTL class rate structure is based on weight.) The remaining variables are as defined above. The shipment-yield regression results are shown in Table 4.

Each of the estimated equations is statistically significant. In contrast to the market-share estimates, the inclusion of the network-characteristic and firm-effect dummy variables lowered the significance of the relations, i.e., it did not contribute to explaining the variation in carrier shipment yield.

Although the estimated coefficients on the service-quality proxy (ORAVG) and marketing-effort proxy (SALES) were statistically insignificant in all cases, the coefficients of the network-coverage variable (TERM) and its alternative (SMSA) were positive and statistically significant in all but two cases. That is, carriers that had more-extensive terminal networks generally earned higher average LTL revenue per hundredweight than did carriers that served a smaller number of terminals. This result suggests that carriers that have large route networks have been more successful in winning high-rated traffic than have other carriers.

CONCLUSION

The analysis provided some interesting results. Those carriers with the largest route networks, measured either by the number of terminal points served or by SMSA points served, did not, other things being equal, possess the largest share of overall LTL revenue in the study lanes. Indeed, other factors, such as a carrier's relative financial health (a proxy for service quality) and regional identification, appeared to play a greater role in explaining market share than did network size. Nevertheless, carriers with extensive networks did earn higher average LTL revenue per shipment pound than did carriers that served a smaller number of terminals or SMSAs.

These results, although based on a limited sample of city pairs, indicate that, under the existing regulatory environment, carriers with extensive terminal networks have balanced market-share objectives against other factors such as shipment yield. Such carriers have been more successful in competing for high-rated traffic than have smaller carriers.

Through pursuit of selective marketing strategies, the largest carriers appear to have made the differential profit opportunities inherent in the LTL class rate structure work to their advantage. The results presented here thus suggest that large interregional general-freight carriers do possess marketing advantages in soliciting high-rated freight and that these advantages are important in explaining the high relative growth and profitability of such carriers.

At the same time, the results present a number of additional questions: Do carriers with extensive route networks possess marketing advantages relevant to all shippers or to only certain shippers? What service strategies would be pursued by different groups of carriers in the absence of regulation? Would selective service strategies remain viable or would all carriers pursue a generalist strategy? What role would price competition play? Finally, what impact would historical market strategies and positions have in shaping postregulation strategies and performance? These questions invite further research, especially case studies of carrier service and marketing strategies.

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