Disentangling Regulatory Policy:

The Effects of State Regulations on Trucking Rates

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I. Introduction

Numerous studies have documented the sizable gains to consumers that followed federal deregulation of various transportation sectors. Each of these studies estimated the effects of federal

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[1] With respect to airline deregulation, a 1990 Department of Transportation study concluded that "air travelers have benefited from the changes brought about under deregulation by receiving more service at a lower cost." (U. S. Department of Transportation (1990), Executive Summary, p. 1.) For railroads, which were deregulated by the 1980 Staggers Act, a 1990 GAO Study concluded that "shippers have benefited from reduced railroad regulation. Since 1980, rail rates, adjusted for inflation, have declined an average of about 22 percent. In addition, service has improved: train reliability has increased and freight car shortages have declined." (U.S. General Accounting Office (1990), p. 4. See also Barnekov and Kleit (1990) and Burton (1993). Winston *et al*. (1990) examined both railroads and interstate trucking, the latter having been deregulated by the 1980 Motor Carrier Act (MCA) and concluded that federal deregulation of these two industries provides net benefits to consumers of over $16 billion (1988 dollars) each and every year.

[2] The focus of this study is economic regulation, *e.g.*, rate regulation and entry controls. We do not examine safety regulation. Unless otherwise noted, we will use the word "regulation" to refer only to economic, and not safety, regulation. For a discussion of safety regulation, see Alexander (1992).

This study fills that gap by estimating the relationship between intrastate trucking rates and three different types of state-level regulations: (1) the strictness with which rates are regulated; (2) the requirements placed on motor carriers seeking to enter the market; and (3) whether the state provides antitrust immunity for decisions made by motor carrier rate bureaus. By combining a cross-section of intrastate trucking rates with information on the motor carrier laws and regulations in place at the time, we can estimate the relationships between particular types of regulations and trucking rates.

Our basic conclusions are consistent with previous studies which found that motor carrier regulations tend to raise rates. In the less-than-truckload ("LTL") sector (shipments of less than 10,000 pounds), there is a positive relationship between each of the three regulations studied and intrastate trucking rates. That is, motor carrier freight rates tend to be significantly higher in states that strictly regulate rates, in states that impose significant restrictions on new entrants, and in states that provide antitrust immunity for rate bureau decisions. Entry restrictions have the largest rate-increasing effect: in the LTL sector, significant entry restrictions raise trucking rates over 20 percent. With regard to the other two types of regulations analyzed, strict rate regulation raises LTL trucking rates over 5 percent, and antitrust immunity raises LTL trucking rates over 12 percent.

In the truckload ("TL") sector (shipments of more than 10,000 pounds), the results are somewhat different. A strong positive relationship emerges between trucking rates and the degree to which the state regulates those rates. This positive relationship is stronger than that found in the LTL sector. Specifically, states that regulate rates strictly have TL rates over 32 percent higher than states that do not regulate rates strictly. Unlike the results for the LTL sector, however, there is no significant relationship between TL trucking rates and either entry requirements or the provision of antitrust immunity.

[3] Keeler (1989) used the survivorship technique to obtain results

At the federal level, an important remaining vestige of the pre-MCA regulatory regime is the provision of limited antitrust immunity for rate bureaus.[4] The effect on rates from providing immunity to rate bureaus is not clear. On the one hand, as the Department of Justice has argued before the ICC, immunity from the antitrust laws could raise rates by facilitating tacit or explicit collusion among the rate bureau members.[5] Supporters of antitrust immunity for rate bureaus (Hausman (1983) and Tye (1987)) counter by arguing that immunity is necessary to foster the efficient exchange of information among the bureaus' members. Under the assumption that the industry is competitive, any benefits stemming from the efficient exchange of information would be passed on to shippers as lower rates.

At the state level, the extent of motor carrier regulation varies significantly. Some states have completely deregulated the motor carrier industry. Other states strictly limit entry by providing operating certificates to prospective entrants only after a showing that the entry fills a compelling public need that cannot be met by existing carriers. Some states continue to regulate rates strictly; others provide for little or no regulatory review of rate changes. While every state permits motor carriers to belong to rate bureaus, only about half of

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[4] The MCA grants antitrust immunity for some but not all of a rate bureau's activities. Rate bureaus cannot, for example, collectively establish single-line rates, that is, rates on routes that can be handled by a single carrier. By contrast, the MCA does provide antitrust immunity for joint-line rates (routes involving more than one carrier) and for general rate increases (across the board increases on an entire menu of rates.)

[5] Petition of the United States Department of Justice for an Order Requiring the Members of the Rocky Mountain Motor Tariff Bureau to Show Cause Why Their Antitrust Immunity to Discuss and Agree on General Rate Increases Should Not Be Withdrawn, filed with the Interstate Commerce Commission, December 19, 1989.

them grant motor carriers antitrust immunity for the bureaus' joint activities, such as rate making and scheduling.

Decisions regarding the regulation of the motor carrier industry continue to arise at both the federal and state level. Notwithstanding the significant reforms contained in the 1980 MCA, economic regulations, such as tariff-filing requirements and continued antitrust immunity for some rate bureau decisions, remain at the federal level. In addition, forty-two states continue to regulate intrastate truckers, and states frequently consider proposals to relax or to expand the extent to which truckers are regulated in their states.[6] Such regulation has an important economic impact because approximately two-thirds of all shipments are intrastate. (Allen *et al*. (1990), p. 9) Proponents of continued or expanded economic motor carrier regulation typically claim that certain regulations provide stability to the industry, prevent "destructive competition", and do not contribute to higher prices. Our empirical analysis provides a direct test of this last claim.

III. Data

A. Rate Data

Our data contain point-to-point trucking rates, both interstate and intrastate, announced by motor carrier rate bureaus and on file with the relevant regulatory agencies in the continental U.S. during the

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[6] See, for instance, the discussion of state laws and regulatory initiatives in *Consumer Cost of Continued State Motor Carrier Regulation*, Twenty-first Report by the Committee of Government Operations, House Report 101-813 (October 5, 1990). In 1992, the Michigan Public Service Commission reconsidered its state's trucking regulations. See, *In the Matter of the Proposed Revisions to the Motor Carrier Rules, Order Publishing Proposed Revisions to the Motor Carrier Rules and Providing Notice of Hearing*, Case No. T-1210, Michigan Public Service Commission (released August 14, 1992).

spring of 1987. Each intrastate route has a companion interstate route emanating for the same origin city and terminating in a city of similar size after travelling roughly the same distance. The data contain 708 of these "triads" with origins in thirty-nine states.[7]

For each route the data contain the rates, denominated in cents per hundred pounds shipped, for a variety of commodity classes (typically twelve) and for a number of weight categories (typically less than 500 pounds through 20000 pounds), as well as the mileage between the origin and destination cities.

Three points about the rate data deserve mention. First, the rates are those filed with a regulatory agency by a motor carrier rate bureau.[8] While filed rates are available to shippers, they often are not the rates actually charged. Nonetheless, we believe that the filed rates should be representative of those actually charged, especially when discounting is accounted for (see below).[9]

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[7] The eleven excluded states fall into three categories. First, the rate data do not contain intrastate rates for the eight states that had deregulated their motor carrier industries by 1987: Alaska, Arizona, Delaware, Florida, Maine, New Jersey, Vermont, and Wisconsin. Second, Hawaii was excluded because interstate trucking rates cannot exist there. Third, Montana and Wyoming were excluded because the dataset did not contain any intrastate rate information for these states.

[8] At the interstate level, the rates were filed by one of the ten dominant interstate rate bureaus, whose operating areas (generally) do not overlap. At the intrastate level, various motor carrier rate bureaus typically operate; the data contain the rates filed by one of the larger (or the largest) rate bureaus operating in the state.

[9] We note that there appears no way other than relying on filed rates to obtain data on intrastate rates from enough states to conduct an analysis as comprehensive as this. Actual transaction prices are not

(continued…)

Second, carriers typically offer shippers discounts from filed rates. We account for discounting by reducing the filed rate by the discount generally available. We discount all interstate rates by 27.81 percent, which is the average of the discounts provided by rate bureaus during the spring of 1987.[10] For intrastate rates, we use the discounts typically offered during this period as reported in Allen *et al*. (1990).[11]

Third, the rates analyzed in this study are class rates. Motor carriers typically offer two types of common carrier rates: class rates and commodity rates. Commodity rates, as the name implies, pertain to a particular commodity (such as lumber) and are typically offered to larger-volume shippers who can provide truckload quantities. Class

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[9](…continued)
publicly available, and data on particular carriers (such as those contained in the American Trucking Association's Annual Report) are not state-specific. (See, *e.g.*, Ying and Keeler (1991) and Winston *et al*. (1990)).

[10] We obtained information on interstate discounts from the ICC. The applicable discounts were culled by ICC staff from filings made by the interstate rate bureaus. Because the variation around the average was relatively small, and because it is difficult to determine which discount to apply to routes that traverse the territory of two rate bureaus, we chose to use the simple average for all interstate rates.

[11] Of the thirty-nine states included in this study, thirteen do not permit discounting. For those states that do permit discounting, Allen *et al*. (1990) attempted to obtain two estimates for the discount typically available -- one from a shipper, and another from a state regulatory official. For states in which they obtained two estimates for the typical discount, we conducted our analysis using the higher discount, the lower discount, and the average of the two. Our empirical results do not change depending on which of these intrastate discounts are used; the results reported below use the higher discount (where more than one was available).

rates, by contrast, are offers to ship goods in particular classes at specified rates. Each product is assigned to a numbered class, and rates are higher for higher-numbered classes. An alternative to common carrier shipments is contract carriage, which occurs when relatively large shippers contract directly with carriers for a series of shipments of merchandise over a period of time. Such shipments are moved under "contract" rates, but information from these contracts is not publicly available.

Recent data do not exist on the proportion of shipments handled under class -- as opposed to commodity or contract -- rates. Detailed data on interstate common carriage shipments were collected by the ICC in the late 1970s and early 1980s. According to the Motor Carrier Ratemaking Study Commission ("MCRSC") (1983, p. 182) approximately 87.9% of common carriage interstate shipments in 1980 were made under class rates, 5.1% under commodity rates, 1.9% under "commodity column" rates, and 2.6% under exception rates. Thus, in 1980 the overwhelming percentage of common carrier shipments were moved under class rates.[12] The percentage of common carrier shipments handled under class rates was high for less-than-truckload (LTL) shipments (90.0%) but significantly lower for truckload (TL) shipments (27.1%). These figures imply that our data may reflect more accurately the rate structure for LTL shipments than for TL ones.

As noted above, the data contain rates for a number of different classes for each route. After examining the data, we discovered that the rates for various classes, holding route and weight fixed, were very highly correlated. In many cases, the rates were perfectly correlated, that is, the rate for class 100 was exactly twice that for class 50, and

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[12] The data indicated that shipments under class rates tended to be shorter in distance and smaller in size than those under commodity rates. Of the total amount of interstate traffic carried under common carrier rates, shipments under class rates accounted for approximately 73% of the revenues collected and 49% of the tonnage shipped.

the rate for class 150 exactly three times that for class 50. Given the high correlation across classes, we arbitrarily chose to analyze class 100 rates.

We focus on three different weights: less-than-500 pounds, 2000 pounds, and 20000 pounds. The first two are less-than-truckload (LTL) categories; the last is a truckload (TL) weight. We have two reasons for focusing on these weight levels. First, our empirical analysis (described below) uses rate data from both interstate and intrastate routes. These three weights had the largest number of "matches" in the data. Second, it has been argued that any benefits of antitrust immunity and collective decision making are more likely to arise in the LTL, rather than the TL, sector of the industry. In the LTL sector, coordination among carriers in scheduling routes and

[13] In order for a triad to be included, the computerized rate base had to have an interstate rate and an intrastate rate for the weight class of interest.

Table 1
SUMMARY STATISTICS
(various weight categories)

	WEIGHT CATEGORY		
	< 500 lbs.	2000 lbs.	20000 lbs.
Number of routes	673	644	290
Number of states with origin cities	38	36	17
Average mileage (std. deviation)			
intrastate route	198 (115)	200 (117)	237 (125)
interstate route	202 (113)	204 (114)	242 (123)
Average population (std. deviation)			
origin city	214,015 (601,663)	197,291 (546,637)	307,730 (842,485)
destination, intrastate	67,119 (156,450)	57,110 (89,113)	85,819 (218,027)
destination, interstate	62,290 (111,889)	59,076 (104,289)	70,928 (129,116)

Table 1 reveals that the intrastate and interstate routes are, on average, approximately the same length and terminate in cities of approximately the same size. Origin cities are, on average, approximately three to four times larger than destination cities. Figures M1-M3 are maps showing, for each weight class, the states included in the analysis.

C. State-level regulations

Our information on the motor carrier regulations in place in the various states in 1987 is taken from a survey of state motor carrier regulations compiled by Daniel Baker, an attorney affiliated with the Transportation Lawyers' Association (TLA). On behalf of the TLA, Baker annually surveys individuals familiar with the motor carrier laws and regulations that exist in each state.

The Baker survey contains a number of questions concerning motor carrier regulation. We use the answers to the following four questions to characterize a state's regulatory regime. In brackets following the questions are the possible responses.[14]

(1) To what extent does the state regulate motor common carrier rates? **[strict regulation; not strict regulation]**

(2) What is required to obtain motor common carrier authority from the state? **[strict requirements; not strict requirements]**

(3) How effective are protests to motor common carrier applications? **[very effective; somewhat effective; not effective]**

(4) Does antitrust immunity exist for tariff bureaus that publish motor carrier rates? **[YES, bureaus are immune; NO, bureaus are not immune]**

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[14] In the actual survey, respondents were offered more choices than are contained in the brackets. The responses in the brackets distill the responses into two categories for use in the empirical analysis. A copy of the 1987 Baker survey is contained in Appendix A of this report.

Question 1 is a measure of the degree to which state regulators are involved in establishing and maintaining a particular tariff structure. Note that protests by incumbent carriers (question (3)) can only be effective in states where significant entry barriers already exist (question (2)). Finally, question (4) pertains to whether rate bureau actions are shielded from antitrust scrutiny at the state level.

Based on the responses to these questions, we characterize state-level trucking regulation with four 0-1 dummy variables.

RATEREG	=	dummy variable equal to one if the state strictly regulates motor carrier rates; zero otherwise.
ENTRY1	=	dummy variable equal to one if the state has strict entry requirements and if protests by incumbent carriers against applications for new entry are very effective; zero otherwise.
ENTRY2	=	dummy variable equal to one if the state has strict entry requirements and if protests by incumbent carriers against applications for new entry are somewhat effective; zero otherwise.
IMMUNE	=	dummy variable equal to one if the state grants rate bureaus antitrust immunity; zero otherwise.

Table 2 contains the number of states in which these four variables assumes the value one for each of the three weight classes analyzed.

Table 2

Number of states with various motor carrier regulations in 1987 (percent of total in parentheses)

Variable	WEIGHT CATEGORY (n = number of states included in analysis)		
	< 500 lbs. (n = 38)	2000 lbs. (n = 36)	20000 lbs. (n = 17)
RATEREG	19 (50%)	18 (50%)	11 (65%)
ENTRY1	8 (21%)	9 (25%)	4 (24%)
ENTRY2	23 (61%)	23 (64%)	9 (53%)
IMMUNE	22 (58%)	21 (58%)	12 (71%)

Figures M4-M6 are maps showing the status of each regulation (rate regulation, entry restrictions, and antitrust immunity) in each state in the continental U.S. in the spring of 1987.

STATE LISTING FOR FIGURE M4

RATE REGULATION BY STATE, 1987

States that have strict rate regulation:

AL, CA, GA, IL, LA, MI, MS, MO, NE, NV,
NM, NC, OK, OR, PA, RI, SC, TX, WA, WV

States that do not have strict rate regulation:

AR, CO, CT, ID, IN, IA, KS, KY, MD, MA,
MN, NH, NY, ND, OH, SD, TN, UT, VA

States not included in analysis:

AZ, DE, FL, ME, MT, NJ, VT, WI, WY

STATE LISTING FOR FIGURE M5

ENTRY REGULATION BY STATE, 1987

States that impose very strict entry requirements:

AL, LA, NC, OH, OK, OR, TN, TX, WA

States that impose somewhat strict entry requirements:

AR, CO, CT, GA, IL, IN, IA, KY, MA, MI, MN, MS, MO, NE, NV, NH, NM, ND, PA, RI, SD, VA, WV

States with relatively low entry requirements:

CA, ID, KS, MD, NY, SC, UT

States not included in analysis:

AZ, DE, FL, ME, MT, NJ, VT, WI, WY

STATE LISTING FOR FIGURE M6

ANTITRUST IMMUNITY BY STATE, 1987

States that provide antitrust immunity to motor carriers:

CA, GA, ID, IL, KS, KY, MA, MI, MN, MO, NE, NV, NM, NY, NC, OK, OR, PA, RI, SC, TX, VA, WV

States that do not provide antitrust immunity:

AL, AR, CO, CT, IN, IA, LA, MD, MS, NH, ND, OH, SD, TN, UT, WA

States not included in analysis:

AZ, DE, FL, ME, MT, NJ, VT, WI, WY

Our aim is to estimate the independent effect on intrastate trucking rates from each of these four regulatory variables. In other words, we seek to estimate how trucking rates change when a particular regulation changes, holding constant the status of the other regulations included in the analysis. In reviewing our regulation

[15] We note, however, that we do not have to qualify similarly the (continued…)

The other regulatory variables are not as highly correlated, and we conclude that the variation is sufficient that we need not qualify the empirical results in the manner described in the previous paragraph. With respect to strict rate regulation (RATEREG) and antitrust

[15](…continued)
estimated relationship between trucking rates and entry controls because a number of states that impose entry requirements (either somewhat or very strict) do not also impose strict rate regulation.

1. Direct Hypotheses

We expect a positive relationship between trucking rates and the extent to which state regulators are involved in establishing and maintaining a particular tariff structure. In principle, active rate regulation by a state could contribute to lower trucking rates. This could arise *if* the trucking industry possessed characteristics conducive to noncompetitive pricing, *e.g.*, significant economies of scale and significant sunk costs. The general academic consensus on this issue, however, is that this is not the case. (See, for example, Keeler (1989).) We therefore hypothesize that rates will be higher in states that actively regulate trucking rates.

We also predict a positive relationship between trucking rates and the severity of entry regulations. At the federal level, the passage of the MCA in 1980 and subsequent interpretations by the Interstate Commerce Commission made entry into new routes by existing carriers and by new carriers much easier, leading to significantly lower trucking rates. (Winston *et al*. (1990) and Ying and Keeler (1991).) Moreover, given experiences at the federal level, we expect this relationship to be especially strong in states where incumbent carriers can effectively deter or delay new entry by protesting prospective entrants' applications for operating authority. (U.S. Department of Transportation (1979), pp. 5-6)

Finally, as mentioned earlier, it is not possible to predict the relationship between trucking rates and the provision of antitrust immunity for rate bureaus. On the one hand, immunity from the antitrust laws could raise rates by facilitating coordination among the rate bureau members. On the other hand, immunity might be necessary to foster the efficient exchange of information among the bureaus' members, and to promote the efficient use of existing capacity.

2. Interactive Hypotheses

We also examine somewhat more complex hypotheses to allow for interactions among the three types of regulations. First, even if on average there is a positive relationship between trucking rates and antitrust immunity for rate bureaus, it could be diminished, perhaps eliminated, in states where entry is largely unobstructed. The argument here is straightforward: attempts by rate bureaus to raise rates behind the shield of antitrust immunity would attract entry (absent regulatory barriers), thereby defeating the attempted rate increase. Consequently, we hypothesize that the relationship between trucking rates and antitrust immunity will be stronger (weaker) in states with strict (low) entry requirements. Similarly, we hypothesize that the relationship between trucking rates and entry restrictions will be stronger (weaker) in states that grant (do not grant) antitrust immunity to rate bureaus. We test these hypotheses by analyzing only those observations from states with strict entry requirements (or from states that grant antitrust immunity). We expect the *combination* of antitrust immunity and strict entry requirements to contribute to significantly higher trucking rates.[16]

Second, we consider whether the relationship between antitrust immunity and trucking rates is different in states with strict rate regulation than in those without strict rate regulation. We hypothesize that the combination of antitrust immunity and strict rate regulation could facilitate collusion among the motor carriers operating in a state.

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[16] One might hypothesize further that the positive effect on rates from combining strict entry requirements and antitrust immunity would be weaker in states with strict rate regulation. This might arise because strict rate regulation already exerts a positive effect on rates, thereby limiting the additional impact from including strict entry requirements and antitrust immunity. Testing for this effect would require segmenting the data even further. We are prohibited from doing so, however, because of the degree of collinearity among our regulatory variables.

Incentives to reduce rates could be dampened considerably in states where truckers can legally meet to discuss rates and other matters, and where rates cannot be reduced without regulatory approval. Under this hypothesis, the relationship between antitrust immunity and trucking rates would be stronger in states that also strictly regulated trucking rates.

Finally, we consider whether the relationship between entry regulations and trucking rates is different in states that regulate rates strictly. Two competing hypotheses exist here. First, it might be the case that states with both strict rate regulation and strict entry controls (as opposed to one or the other) are ones in which the state legislature and regulators are particularly sensitive to incumbent truckers' concerns that deregulation of rates and entry would diminish their ability to serve shippers profitably. If this view of regulation holds, the combination of these two regulations would facilitate collusion among the incumbent carriers and lead to higher trucking rates. Under this view, we would expect the positive relationship between entry restrictions and trucking rates to be even stronger in states that also regulate rates strictly. On the other hand, free entry might not reduce rates in states with strict rate regulation. Instead, it could be the case that firms enter until industry profits are zero, resulting in an inefficient use of capacity as any supra-competitive profits are competed away on other margins.[17] Under this alternative line of reasoning, the positive relationship between trucking rates and strict rate regulation would not be stronger in states that also strictly regulate entry. Similarly, this view would imply that the positive relationship between entry restrictions and rates would not be stronger in states that also regulate rates strictly.

[17] Douglas and Miller (1974) discuss this effect in the context of the regulated airline industry.

B. Estimation Approach

Estimating the relationship between state motor carrier regulations and intrastate trucking rates is conceptually straightforward: regress intrastate rates from a number of states (the dependent variable) on a series of regulatory variables and other variables likely to affect trucking rates (collectively, the independent variables). Prior to combining into one analysis the rate and regulation variables from a number of states, we reviewed carefully the pattern of rates on file in each of the states. This review indicated that within a particular state for a particular weight category there is a strong statistical relationship between the filed rate and the distance of the route. In other words, the rates for a particular weight category within a particular state can be largely explained by the following simple formula:

(1) $$R_{ijk} = \alpha_{jk} + \beta_{jk} * M_{ijk} + u_{ijk}$$

where,

R_{ijk}	=	the log of the rate for route i, weight j, state k
M_{ijk}	=	the log of mileage for route i, weight j, state k
u_{ijk}	=	error term with mean 0 and variance σ^2
α_{jk}, β_{jk}	=	state-specific parameters subject to estimation for weight j and state k.

We ran equation (1) separately for each of the states and each of the weights included in our dataset. This involved 88 separate regressions: 37 for the less than 500 pound category, 35 for the 2000 pound category, and 16 for the 20000 pound category. Of these 88 regressions, fully 50 (57%) had R^2s greater than 0.95 and only 12 (14%) had R^2s less than 0.80.

These findings indicated that the rates within a state for a particular weight class tended to follow closely the simple formula depicted in equation (1).[18] We also noted that the formulas across states varied significantly.[19] We concluded that a properly specified empirical model would account for the observed within-state regularities. Thus, we chose not to combine the data from the various states and regress trucking rates on a constant, the distance of the route, and a series of regulatory variables. Doing so would force the constant term and the elasticity of trucking rates with respect to distance to be the same across states, restrictions that do not appear appropriate.

We proceeded as follows. As shown in equation (1), each state "formula" relating rates to mileage contains two parameters: a constant term (α) and the elasticity of rates with respect to mileage (β). We hypothesized that each state's "formula" depended on the cost conditions particular to that state, and on the state's motor carrier regulations. Thus, we modify equation (1) by interacting α and β with variables that control for state-specific cost conditions and regulations. Note that this specification is as general as possible: We permit regulations to affect both a state's constant term (

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[18] In a separate set of analyses, we included as independent variables the populations of the origin and the destination cities, and the population densities of the counties lying between these cities. Including these variables did not increase significantly the explanatory power of the state-specific regressions, and had no meaningful affect on the estimated relationships between intrastate trucking rates and state trucking regulations.

[19] States with a relatively large constant term (α) tend to have a relatively small elasticity with respect to mileage (β) and vice versa.

[20] While we have some *a priori* expectations concerning the

(continued…)

Based on the preceding discussion, the equation we estimate is:

(2) $$R_{ijk} = \alpha_0 + \alpha_1 * INDEX_k + \boldsymbol{\alpha_2} * \mathbf{REG_k} + \beta_0 * M_{ijk} + \beta_1 * M_{ijk} * INDEX_k + \beta * M$$

[20](…continued)
direction of the relationships between trucking rates and various regulations, we have none concerning whether these relationships are sensitive to the distance of the route.

well as intrastate ones. All interstate rates are subject to a common regulatory structure -- the 1980 MCA. Thus, holding distance constant, variations in interstate rates cannot be due to regulatory differences; they must be due instead to differences in local cost conditions, such as labor and fuel costs, congestion costs, and topographical features. We therefore used the interstate rate information to construct a set of state-specific indices reflecting each state's cost conditions.

To compute a particular state's cost index we proceeded as follows. We identified all of the interstate routes in our data that either originated or terminated in the state. Then, for each state, we ran a simple regression akin to equation (1) above: the dependent variable was the log of the interstate rate, and the independent variables were a constant and the log of mileage. The two coefficients generated by such a regression provide a measure of the cost conditions particular to that state; states with higher costs would have larger coefficients. Creating a state specific cost index involved two additional steps. First, we used these coefficients to predict the log of an interstate rate for a route of a distance equal to the average intrastate route in the state. Naturally, states with shorter routes would have lower predicted rates than states with longer ones. To create an index that could be compared across states, we divided each state's predicted rate by the length of the state's average intrastate rate. This normalizes the predicted interstate rate to a "per mile" equivalent (expressed in logs), permitting one to compare meaningfully the index from a small state to one from a larger one.

Prior to presenting the empirical results, we note that our empirical specification in equation (2) treats state-level regulations as exogenous variables. Such an approach would not be proper if regulations and prices are determined simultaneously. It could be the case that the level of prices affects the regulations that exist as well as

vice versa. If this were the case, then equation 2 would suffer from specification error and the estimated coefficients would be biased.[21]

We believe treating state-level regulations as exogenous does not introduce simultaneity bias for two reasons. First, the troublesome bias discussed above would arise in the following circumstances: suppose that states without regulation contain only a few trucking firms who could effectively collude to raise prices ten percent above competitive levels. Now assume that state regulation in the public interest would only be partially successful, lowering prices to five percent above competitive levels. A naive regression model of this situation could show that regulation raised prices five percent, when in fact it had the opposite effect.

We do not believe that the situations we are examining fit the above circumstances. In that scenario, trucking firms that operate intrastate trucking routes could be expected to oppose state regulation. For the most part, however, intrastate trucking firms support economic regulation, claiming various efficiency grounds. This fact, combined with the generally unconcentrated structure of the industry, lead us to conclude that this type of bias is not a problem here.

Second, our data stem from a cross-section of rates for the spring of 1987.[22] Simultaneity bias would not exist if the regulations

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[21] Several recent studies of state-level regulations have attempted to correct for the possible simultaneity between prices and regulation. See, for instance, Mathios and Rogers (1989) and Lanning, Morrisey, and Ohsfeldt (1991). For a discussion of recent empirical studies of regulation, see Joskow and Rose (1989) and Klevorick (1991).

[22] The cross-section nature of our data differs from the time-series data utilized by Lanning *et al*. (1991) in their study of hospital regulations. There, the regulations of interest were imposed in the midst of the time period covered by the data, making endogeneity a

(continued…)

[22](…continued)
serious concern.

[23] States first implemented motor carrier regulations in the first three decades of this century, and most states amended their regulations to make them consistent with the 1935 Motor Carrier Act.

and profit margins induced truckers to compromise on safety. Throughout 1986 and 1987, motor carrier regulation continued to be debated in California. Still, the April 1986 decisions by the CAPUC were implemented in May 1986, and should have been reflected in the 1987 rates. Thus, we believe it is reasonable to interpret the California regulations as exogenous.

The Baker survey does not provide details on the regulatory and legislative changes that reportedly occurred in Colorado in 1986. Our review of the trade press failed to uncover any mention of any changes. In addition, the description of Colorado's state motor carrier laws and regulations compiled annually by the National Association of Regulatory Utility Commissioners was identical for the period 1985-1987. Thus, we assume that any changes in Colorado in 1986 were not substantial.

Georgia enacted legislation in 1985 intended to relax its entry requirements for intrastate truckers; this law went into effect on January 1, 1986. The new, more "relaxed", law, however, still required prospective entrants to establish that their entry would fulfill an important public need. While this change could facilitate entry (it is potentially less burdensome than having to show that existing carriers cannot provide adequate service), in our parlance it still qualifies as "somewhat strict" entry requirements. Thus, the change in Georgia does not appear to be a significant one. Further, given its enactment date of January 1, 1986, we believe that the effects of the changes in Georgia's regulatory regime would be incorporated into rates by the spring of 1987.

Finally, the 1987 Baker survey indicates that in 1986 Utah passed a law similar to the 1980 MCA, and that in 1987 the Utah legislature did not consider further trucking deregulation. As in the other states, we assume that these facts support our contention that the effects of the 1986 changes would have been reflected in 1987 rates.

We conclude, therefore, that the cross-section nature of our study and the relative fixity of state-level regulations concerning the motor carrier industry, permits us to treat state-level motor carrier regulations as exogenous variables.

C. Estimation Results

We estimated equation 2 separately for each of the three weight classes in our data: less than 500 pounds; 2000 pounds; and 20000 pounds. Initially, all four of the regulatory variables were included as independent variables. To examine whether the effect of a particular regulation depends on the status of the other regulations, we also estimated equation 2 for subsets of the data, determined by the status of a particular regulatory variable. For example, we limited the analysis to those observations where entry regulations are strict.[25] From this analysis we can learn whether the relationship between trucking rates and a particular regulation depends on the status of other regulations.[26]

Table 3 lists the dependent and independent variables included in the analysis; the dependent variable is the log of the intrastate rate. Table 4 contains the means and standard deviations for these variables for each of the three weight categories analyzed.

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[25] That is, we ran the regression only on those observations where ENTRY1 or ENTRY2 equals one, and dropped ENTRY1 and ENTRY2 as independent variables.

[26] An alternative approach to assessing the magnitude of such interaction effects among the regulatory variables would be to add to equation (2) a series of additional independent variables that interact the various regulatory variables with each other. This approach yields results qualitatively and quantitatively very similar to those reported below.

Table 3

Variables included in the regression analysis

Variable	Variable description
LRATE	Log of the intrastate rate, which is expressed in cents per hundred weight for a shipment of a particular weight on a particular route
LMILES	Log of the route's distance, in miles
LINDEX	Local Cost index -- estimate of the log of the per mile cost of a typical interstate shipment that either originates or terminates in the state
RATEREG	dummy variable equal to one if the state strictly regulates motor carrier rates; zero otherwise;
ENTRY1	dummy variable equal to one if the state has strict entry requirements and if protests by incumbent carriers against applications for new entry are very effective; zero otherwise;
ENTRY2	dummy variable equal to one if the state has strict entry requirements and if protests by incumbent carriers against applications for new entry are somewhat effective; zero otherwise;
IMMUNE	dummy variable equal to one if the state grants rate bureaus antitrust immunity; zero otherwise;
M_LINDEX	LMILES times LINDEX
M_RATEREG	LMILES times RATEREG
M_ENTRY1	LMILES times ENTRY1
M_ENTRY2	LMILES times ENTRY2
M_IMMUNE	LMILES times IMMUNE

Table 4

Means and Standard Deviations of Variables Included in the Regression Analysis
(various weight categories)

	WEIGHT CATEGORY					
	< 500 pounds (n = 673)		2000 pounds (n = 644)		20000 pounds (n = 290)	
Variable	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
LRATE	7.132	0.348	6.637	0.343	5.655	0.513
LMILES	5.095	0.675	5.101	0.684	5.246	0.662
LINDEX	2.176	0.317	1.606	0.302	0.665	0.276
RATEREG	0.489	0.500	0.475	0.500	0.634	0.482
ENTRY1	0.220	0.414	0.258	0.438	0.248	0.433
ENTRY2	0.608	0.489	0.636	0.482	0.538	0.499
IMMUNE	0.574	0.495	0.564	0.496	0.662	0.474
M_LINDEX	10.949	1.288	8.063	1.167	3.389	1.089
M_RATEREG	2.549	2.650	2.487	2.659	3.448	2.648
M_ENTRY1	1.161	2.201	1.383	2.365	1.332	2.338
M_ENTRY2	3.034	2.498	3.162	2.468	2.784	2.622
M_IMMUNE	2.970	2.614	2.928	2.630	3.611	2.612

Tables R1 - R3 contain the regression results for the less than

Table R1:Regression Coefficients
Dependent Variable: Log of intrastate rate
WEIGHT: less than 500 pounds

(1)	(2)	(3)	(4)
ALL		ENTRY1 = 1 or	

Table R2: Regression Coefficients
Dependent Variable: Log of intrastate rate
WEIGHT: 2000 pounds

	(1) ALL OBS.	(2) RATEREG = 1	(3) ENTRY1 = 1 or ENTRY2 = 1	(4) IMMUNE = 1
LMILES	0.252***	0.481***	0.444***	0.502***
	(0.089)	(0.111)	(0.064)	(0.091)
LINDEX	0.273	0.744***	0.332**	0.607***
	(0.204)	(0.208)	(0.166)	(0.214)
RATEREG	-0.102	---	-0.502**	-0.772***
	(0.227)		(0.219)	(0.279)
ENTRY1	-0.940***	-0.346	---	0.448
	(0.325)	(0.269)		(0.502)
ENTRY2	-0.545**	DD	---	1.163***
	(0.223)			(0.419)
IMMUNE	0.435**	-0.323	0.907***	---
	(0.207)	(0.367)	(0.217)	
M_LINDEX	0.002	-0.109**	-0.011	-0.068
	(0.042)	(0.045)	(0.035)	(0.045)
M_RATEREG	0.040	---	0.118***	0.162***
	(0.044)		(0.043)	(0.056)
M_ENTRY1	0.218***	0.071	---	-0.037
	(0.063)	(0.050)		(0.095)
M_ENTRY2	0.143***	DD	---	-0.169**
	(0.044)			(0.080)
M_IMMUNE	-0.062	0.074	-0.153***	---
	(0.041)	(0.070)	(0.043)	
CONSTANT	4.613***	3.906***	3.826***	3.399***
	(0.445)	(0.549)	(0.316)	(0.468)
Mean Dep Var	6.636	6.768	6.661	6.719
Adj. R^2	0.565	0.558	0.565	0.573
No. of obs.	644	306	574	363

DD : variable dropped due to perfect collinearity.
Standard errors in parentheses.
*** (**) (*) denotes significance at the 1 (5) (10) percent level.

Table R3:Regression Coefficients
Dependent Variable: Log of intrastate rate
WEIGHT: 20000 pounds

	(1) ALL OBS.	(2) RATEREG = 1	(3) ENTRY1 = 1 or ENTRY2 = 1	(4) IMMUNE = 1
LMILES	-0.221	1.569***	0.166	1.832***
	(0.137)	(0.344)	(0.124)	(0.368)
LINDEX	-2.260***	13.677***	-2.714***	12.774***
	(0.640)	(2.920)	(0.630)	(2.992)
RATEREG	0.151	---	-0.517	1.278**
	(0.471)		(0.628)	(0.628)
ENTRY1	-2.463***	-1.474	---	-2.749***
	(0.482)	(0.925)		(0.872)
ENTRY2	-1.847***	0.630	---	-0.246
	(0.328)	(0.842)		(0.680)
IMMUNE	-1.246**	-0.544	0.075	---
	(0.520)	(0.585)	(0.613)	
M_LINDEX	0.449***	-1.976***	0.588***	-2.097***
	(0.126)	(0.539)	(0.135)	(0.544)
M_RATEREG	0.024	---	0.159	-0.190
	(0.089)		(0.121)	(0.116)
M_ENTRY1	0.474***	0.301*	---	0.521***
	(0.090)	(0.161)		(0.156)
M_ENTRY2	0.340***	-0.074	---	0.069
	(0.062)	(0.143)		(0.119)
M_IMMUNE	0.230	0.098	-0.035	---
	(0.099)	(0.112)	(0.117)	
CONSTANT	6.637	-4.561**	4.441***	-5.248**
	(0.726)	(1.896)	(0.653)	(2.031)
Mean Dep Var	5.655	5.851	5.664	5.777
Adj. R^2	0.676	0.742	0.680	0.585
No. of obs.	290	184	228	192

Standard errors in parentheses.
*** (**) (*) denotes significance at the 1 (5) (10) percent level.

Two issues arise in using the results in Tables R1 - R3 to generate estimates of the relationships between trucking regulations and trucking rates. First, the dependent variable is the log of the intrastate rate, and the regulatory variables are 0-1 dummy variables. In such circumstances, the expression for the percentage change in the dependent variable associated with the dummy variable is $e^{\beta} - 1$, where β is the estimated coefficient on the dummy variable. Second, in our empirical specification, the relationship between trucking regulations and trucking rates is a function of mileage, which means that there is no single value for the relationship between a regulation and trucking rates. Rather, the relationship will depend on the length of the route.[27]

We use the results from the regressions to examine the relationships between various trucking regulations and trucking rates. The results from the two LTL regressions are very similar, but differ somewhat from those from the TL regression. We therefore first discuss the LTL results and then move on to the TL results.

1. LTL Regressions (weight = < 500 and 2000 pounds)

As explained above, in our specification the relationship between trucking rates and a particular regulation is a function of the distance of the route. Two coefficients from the regression results must be combined to generate estimates of the relationships between trucking rates and trucking regulations. Tables E1 and E2 contain the estimated percentage changes in trucking rates associated with various

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[27] Suppose one were interested in the percentage difference in trucking rates in states that strictly regulate trucking rates compared to rates in states that do not strictly regulate trucking rates, for a shipment of less than 500 pounds on a 200 mile route. Looking at column (1) of Table R1, one would first add the coefficient on the variable RATEREG to the product of the log of 200 times the coefficient on the variable M_RATEREG. The value of this expression is: -0.301 + log(200) * 0.068 = 0.0593. The percentage increase in trucking rates associated with the presence of strict rate regulation for a less than 500 pound shipment on a 200 mile route would then be $e^{.0593} - 1 = .0611$, or 6.11 percent.

state-level motor carrier regulations for the two LTL weights. Each of these tables provides the estimated relationship between regulations and rates for three different mileages - the 25th percentile mileage of the routes included in the analysis, the median mileage, and the 75th percentile mileage.[28]

[28] Tables E1 and E2 rely on column (1) from the regression results. Thus, they represent the average relationship between trucking rates and the various trucking regulations, holding the other regulations constant. Later, we will present and discuss results based on columns (2) through (4) of the regression results, which permit the relationship between a regulation and rates to depend on which other regulations pertain in the state.

Table E1

Average Percentage Change in Intrastate Trucking Rates Associated with Various Motor Carrier Regulations

	WEIGHT = less than 500 pounds		
	25th Percentile Mileage (110)	Median Mileage (178)	75th Percentile Mileage (271)
Regulation			
Strict Rate Regulation (RATEREG = 1)	1.72% (3.23)	5.09%* (2.66)	8.12%** (3.47)
Very Strict Entry Regul. (ENTRY1 = 1)	19.54%*** (5.14)	24.55%*** (3.93)	29.10%*** (4.49)
Somewhat Strict Entry Regul. (ENTRY2 = 1)	24.43%*** (3.44)	31.78%*** (3.13)	38.55%*** (3.81)
Antitrust Immunity for Rate Bureaus (IMMUNE = 1)	19.58%*** (3.05)	18.10%*** (2.65)	16.83%*** (3.63)

Standard errors in parentheses.
*** (**) (*) denotes significance at the 1 (5) (10) percent level.
Source: Calculated from results of regression (1), Table R1

Table E2

Average Percentage Change in Intrastate Trucking Rates Associated with Various Motor Carrier Regulations

	WEIGHT = 2000 pounds		
	25th Percentile Mileage (110)	Median Mileage (181)	75th Percentile Mileage (277)
Regulation			
Strict Rate Regulation (RATEREG = 1)	9.10%*** (2.94)	11.32%*** (2.53)	13.24%*** (3.50)
Very Strict Entry Regul. (ENTRY1 = 1)	8.58% (5.05)	21.00%*** (4.27)	32.69%*** (5.24)
Somewhat Strict Entry Regul. (ENTRY2 = 1)	13.77%*** (3.57)	22.18%*** (3.53)	29.84%*** (4.47)
Antitrust Immunity for Rate Bureaus (IMMUNE = 1)	15.55%*** (2.59)	12.05%*** (2.38)	9.15%*** (3.36)

Standard errors in parentheses.
*** (**) (*) denotes significance at the 1 (5) (10) percent level.
Source: Calculated from results of regression (1), Table R2

Tables E1 and E2 indicate that the four regulatory variables are positively and statistically significantly related to LTL trucking rates, with entry restrictions having the largest effect. These findings are consistent with our *a priori* expectations.

Looking at the median length route, very strict entry requirements raise LTL trucking rates between 21 and 25 percent, and somewhat strict entry requirements raise LTL rates between 22 and 32

[29] We had expected ENTRY1 to increase trucking rates more than ENTRY2 because ENTRY1 represents more stringent entry requirements. We found, however, the opposite pattern for the median length route: ENTRY2 increased trucking rates more than ENTRY1. At the median mileages, however, the differences are not statistically significant in the 2000 pound analysis, though they are significant at the 10% level in the less than 500 pound analysis.

[30] Although all of the estimated relationships are positive, 2 of the 24 coefficients presented in Tables E1 and E2 are not significant at standard levels.

rates increases with mileage.[31] Two explanations can be offered to explain this result. First, in a given state, obtaining authority to serve a longer route may be more difficult than obtaining authority to serve a shorter one. This might arise because relatively longer routes typically include a number of shorter routes along the way. Thus, a motor carrier requesting authority to serve a relatively longer route may need to engage in more complex discussions with the regulatory agency, and may be more likely to confront protests by incumbent carriers seeking to delay or prevent the granting of the authority. Second, the shorter routes in our sample tend to arise in relatively smaller states, *i.e.*, ones that can be served relatively easily with interstate shipments from neighboring states. Consequently, restricting entry into relatively short intrastate routes may tend to have a relatively smaller impact on rates than restricting entry into relatively long ones, where interstate shipments do not provide as viable a competitive threat.

Next, we examine whether the relationship between a particular regulation and trucking rates depends on the status of the other regulations. For this, we use the results from columns (2) - (4) of Tables R1 and R2. As before, the relationship between a particular regulation and trucking rates is a function of mileage, so the coefficients in the regression tables by themselves do not provide sufficient information to determine these relationships.

We use the coefficients from the regression tables to compute the percentage changes in trucking rates associated with various regulations depending on the status of the other regulations; the results are contained in Tables S1 and S2.

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[31] Note the positive significant coefficient on M_ENTRY2 in the less than 500 pound regression, and the positive significant coefficients on M_ENTRY1 and M_ENTRY2 in the 2000 pound regression.

Table S1

Percentage Change in Intrastate Trucking Rates Associated with Various Motor Carrier Regulations Depending on the Status of Other Regulations

	WEIGHT = less than 500 pounds (mileage = median mileage of 178 miles)		
	RATEREG = 1 (n = 329)	ENTRY1 = 1 or ENTRY2 = 1 (n = 557)	IMMUNE = 1 (n = 386)
Regulation			
Strict Rate Regulation (RATEREG = 1)	----	14.26%*** (2.99)	-4.84% (3.13)
Very Strict Entry Regul. (ENTRY1 = 1)	60.24%*** (4.27)	----	36.41%*** (4.46)
Somewhat Strict Entry Regul. (ENTRY2 = 1)	76.49%*** (3.96)	----	54.83%*** (3.58)
Antitrust Immunity for Rate Bureaus (IMMUNE = 1)	7.62%** (3.11)	17.50%*** (2.71)	----

Standard errors in parentheses.
*** (**) (*) denotes significance at the 1 (5) (10) percent level.
Source: Calculated from regressions (2), (3), and (4) in Table R1

Table S2

Percentage Change in Intrastate Trucking Rates Associated with Various Motor Carrier Regulations Depending on the Status of Other Regulations

WEIGHT = 2000 pounds
(mileage = median mileage of 181 miles)

	RATEREG = 1 (n = 306)	ENTRY1 = 1 or ENTRY2 = 1 (n = 574)	IMMUNE = 1 (n = 363)
Regulation			
Strict Rate Regulation (RATEREG = 1)	----	11.59%*** (2.51)	7.30%** (3.51)
Very Strict Entry Regul. (ENTRY1 = 1)	2.22% (2.78)	----	29.46%*** (5.55)
Somewhat Strict Entry Regul. (ENTRY2 = 1)	n/a	----	32.92%*** (4.64)
Antitrust Immunity for Rate Bureaus (IMMUNE = 1)	6.52%** (3.11)	11.84%*** (2.29)	----

Standard errors in parentheses.
*** (**) (*) denotes significance at the 1 (5) (10) percent level.

The basic message from Tables S1 and S2 is that interaction effects are important in determining the magnitude of a regulation's relationship with trucking rates, but they do not alter the basic finding that each of these regulations tends to be associated with higher trucking rates. Particularly noteworthy is the increase in the effect on rates from entry regulations when the analysis is limited to states where rate bureaus are provided antitrust immunity (IMMUNE = 1). In the LTL analyses, the percentage increase in rates when strict entry controls exist increases to the neighborhood of 30 to 55 percent when the analysis is limited to such states. This result squares with expectations: the positive effect of entry regulation on rates is even more pronounced when rate bureaus provide immunity for jointly coordinated activities.

To examine whether the generally positive relationship between strict entry regulations and trucking rates also held in states that did not offer antitrust immunity to rate bureaus, we conducted (but do not report the results here) a separate analysis for states that did not offer antitrust immunity for rate bureaus (*i.e.*, states in which IMMUNE = 0). In this analysis, the relationship between trucking rates and entry controls remained positive and statistically different from zero at the median mileage distances. From these results we conclude that strict entry restrictions, by themselves, contribute to higher trucking rates, and that this positive effect is strengthened when entry controls are combined with the provision of antitrust immunity for rate bureaus.

In a similar vein, Tables S1 and S2 indicate that the positive relationship between antitrust immunity and trucking rates is greater in those states where entry regulations are very or somewhat strict (ENTRY1 = 1 or ENTRY2 = 1). This confirms that the generally positive relationship between antitrust immunity and trucking rates is driven by states that combine antitrust immunity with strict entry requirements.

[32] We find it interesting that practically every state with strict rate regulation also had strict entry controls. Of the 20 states with strict rate regulation, 18 also had somewhat or very strict entry restrictions. In fact, in the 2000 pound analysis, *every* state with strict rate regulation (RATEREG = 1) also had either very or somewhat strict entry restrictions (ENTRY1 = 1 or ENTRY2 = 1).

[33] Recall that we discounted the intrastate rates according to the discounts typically offered by carriers in the statef 9 T

grant antitrust immunity to rate bureaus; in such states, strict entry requirements drive up intrastate trucking rates in the neighborhood of 30 percent to 55 percent. In the less than 500 pound analysis, we also

[34] In the 2000 pound analysis, collinearity among the regulatory variables prevented determining how entry regulations affected rates in states that also strictly regulate their rates.

[35] As a check on these findings given the possible endogeneity between trucking rates and trucking regulations, we conducted the statistical analysis after deleting observations from the four states where trucking regulations changed in 1986 (CA, CO, GA, UT). In the LTL analysis, the basic findings discussed above were not altered when these four states were deleted.

Table E3 contains the average percentage change in 20000 pound trucking rates associated with particular regulations for three mileage levels; these figures rely on the coefficients from the first column of Table R3. The results from the TL analysis (20000 pounds) differ somewhat from those discussed above for the LTL regressions.

Perhaps the most surprising result from Table E3 is that the positive relationship between entry restrictions and trucking rates that was so evident in the LTL analysis is not present in this TL analysis. At the median mileage distance, neither of the two entry regulation variables have a statistically significant relationship with trucking rates. In fact, the relationship between trucking rates and entry restrictions is negative at short distances, and becomes positive only for relatively longer routes. Note, however, that the (unexpected) negative relationship between entry restrictions and rates arises on short, TL routes -- ones that would appear to be the exception rather than the rule in most trucking markets. Thus, we do not believe that these findings weaken significantly the general finding from the LTL regressions, and from the results from relatively long TL routes, that entry restrictions tend to increase trucking rates.

The first row of Table E3 indicates that TL trucking rates are significantly higher -- over 30 percent -- in states that strictly regulate trucking rates, and that this relationship is insensitive to the distance of the route. This latter finding is consistent with that found in the LTL analysis that strict rate regulation tends to contribute to higher trucking rates.

Table E3

Average Percentage Change in Intrastate Trucking Rates Associated with Various Motor Carrier Regulations

	WEIGHT = 20000 pounds		
	25th Percentile Mileage (137)	Median Mileage (214)	75th Percentile Mileage (304)
Regulation			
Strict Rate Regulation (RATEREG = 1)	31.15%*** (5.70)	32.58%*** (4.64)	33.72%*** (5.90)
Very Strict Entry Regul. (ENTRY1 = 1)	-12.22%* (7.03)	8.44% (6.05)	28.07%*** (6.70)
Somewhat Strict Entry Regul. (ENTRY2 = 1)	-15.94%*** (5.37)	-2.18% (5.11)	10.22 (5.89)
Antitrust Immunity for Rate Bureaus (IMMUNE = 1)	-10.68%** (5.57)	-1.02% (5.01)	7.31% (6.93)

Standard errors in parentheses.
*** (**) (*) denotes significance at the 1 (5) (10) percent level.
Source: Calculated from results of regression (1), Table R3

[36] As in the LTL analysis, we reran the TL regressions using undiscounted rate data. Two significant differences emerged from those reported in the text: the positive relationship between rate regulation and TL rates diminished in magnitude (though it remained statistically significant) and the relationship between TL rates and entry restrictions became negative and significant. We conclude from these results, as we did from the LTL ones, that relying on undiscounted rate data could lead to incorrect inferences concerning the relationships between trucking rates and regulations.

because any efficiencies should be more likely to arise in LTL shipments, not TL ones, and the LTL analysis consistently concluded that antitrust immunity was associated with increased trucking rates.[37]

[37] As in the LTL analysis, we reran the TL regressions after deleting observations from the states where were trucking regulations were changed in 1986. After deleting these observations, the relationship between entry restrictions and trucking rates was either insignificantly different from zero or negative, the positive relationship between strict rate regulation and rates increased in magnitude, and the relationship between trucking rates and the provision of antitrust immunity remained insignificantly different from zero. The only puzzling aspect of these findings is the sometimes negative relationship between entry restrictions and shipping rates. As noted in the text, we place less weight in the findings from the TL analysis than in those from the LTL analyses.

Table S3

Percentage Change in Intrastate Trucking Rates Associated with Various Motor Carrier Regulations Depending on the Status of Other Regulations

WEIGHT = 20000 pounds
(mileage = median mileage of 214 miles)

	RATEREG = 1 (n = 184)	ENTRY1 = 1 or ENTRY2 = 1 (n = 228)	IMMUNE = 1 (n = 192)
Regulation			
Strict Rate Regulation (RATEREG = 1)	----	40.07%*** (6.19)	29.26%*** (6.01)
Very Strict Entry Regul. (ENTRY1 = 1)	15.27% (9.96)	----	5.04% (8.98)
Somewhat Strict Entry Regul. (ENTRY2 = 1)	26.20%*** (9.51)	----	13.01%* (7.32)
Antitrust Immunity for Rate Bureaus (IMMUNE = 1)	-2.07% (4.78)	-10.82%** (5.49)	----

Standard errors in parentheses.
*** (**) (*) denotes significance at the 1 (5) (10) percent level.
Source: Calculated from regressions (2), (3), and (4) in Table R3

V. Conclusion

In this study, we have sought to disentangle the effects on trucking rates from various types of trucking regulation imposed at the state-level. To do so, we have characterized state-level regulations by a series of attributes, rather than merely a single 0-1 variable as in many regulation studies. While the empirical results vary to some extent depending on the particular weight category examined, some important regularities emerged from this analysis.

The LTL results strongly indicate that each of the regulations considered in this study -- rate regulation, entry regulation, and the provision of antitrust immunity for decisions made jointly -- are positively related to trucking rates. In other words, the familiar finding that trucking regulation increases trucking rates can apparently be extended to each of these three regulatory components. Given the prevalence of LTL shipments in intrastate trucking, deregulating even a portion of a state's regulatory apparatus would appear likely to benefit that state's consumers and shippers by lowering LTL shipping rates. In the TL sector, our analysis indicates that rate regulation increases rates considerably, but that the relationships between trucking rates and the other two types of regulations are less significant.

Both the LTL and TL results indicate that combining entry regulations with either strict rate regulation or state-level antitrust immunity contributes to significantly higher trucking rates. Based on this finding, we believe that significant reductions in trucking rates could occur if states with multiple forms of economic regulation started by loosening their restrictions on entry.

With respect to the regulation of trucking rates, our analysis reveals a positive relationship between trucking rates and regulations that strictly regulate them, and this positive effect tends to be enhanced in states that also restrict entry. These findings suggest that state legislators and regulators should give serious consideration to the argument that an unfettered market serves as an effective regulator of

[38] In the TL analysis, the positive relationship between trucking

APPENDIX A

The Baker Survey

The 1987 Baker survey covered a number of topics, including entry requirements, the extent to which the state regulates rates, whether the state permits motor carrier rate bureaus to operate in the state and, if so, whether the bureaus enjoy antitrust immunity. The survey is sent to several individuals in each state familiar with the relevant state laws and regulations. Once the initial responses are compiled, a preliminary table is distributed to the respondents for verification. Any comments on the preliminary table are incorporated into the final survey table.[39]

Because the Baker survey was sent to multiple individuals in each state, conflicting responses did occasionally arise.[40] To resolve these discrepancies, we reviewed the responses from the 1986 Baker survey. If only one response were listed in the final 1986 Baker survey, and if this response matched one of the responses listed in the final 1987 survey, and if the state did not alter its motor carrier

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[39] Mr. Baker describes the survey procedure as follows: "Generally, it consisted of distributing questionnaires to and seeking information from persons, agencies and organizations which are eminently qualified and have direct knowledge of the governing motor carrier laws, regulations and policies of the states. In addition, the committee conducts a constant review and study of the activities and policies of the legislatures and regulatory agencies of the respective states. Information from these sources was utilized to prepare a preliminary annual summary which was sent to the participants in this study for verification and any recommended changes."

[40] These conflicts were reported in the final survey table. This study uses the responses to four of the questions included in the Baker survey for each of thirty-nine states. Out of a total of 156 responses, the final 1987 survey reports 12 (7.7%) conflicts.

regulations between 1986 and 1987, then we assumed that the 1986 response also applied to 1987.

This approach resolved all of the discrepancies save one: the responses to the question regarding entry conditions in California. One respondent to the 1987 survey indicated that entry conditions in California in 1987 were relatively easy; the other respondent indicated that entry conditions were difficult. (The same conflicting responses arose in the 1986 survey.) We decided to characterize California's entry conditions as easy based on a 1988 Report on the California trucking industry submitted to the California Public Utilities Commission by its Strategic Planning Division. According to this report, "entry requirements have never been strict."[41]

[41] See California Public Utilities Commission (1988), page 11.

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