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Regulation and Competition in the Motor Transportation Industry

Richard F. Hoogerwerf
Butler University

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REGULATION AND COMPETITION
IN THE MOTOR TRANSPORTATION INDUSTRY

Richard F. Hoogerwerf
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Chapter 1

THE SCOPE OF THIS THESIS

The Field of Study

There is a great deal of emotion in the literature surrounding the subject of motor carrier regulation (2)(11)(13)(19)(29). This is understandable when it is kept in mind that powerful interests have great stakes in the outcome of the debate. An attempt will be made in this thesis to wade through the emotional rhetoric and examine a major area of regulatory concern to the industry today; the impact of regulatory constraints on competition (16, 17-18).

Congress has long recognized the critical impact of commercial transportation on both the efficient accomplishment of governmental activities and the continued economic development of the nation. In the 1920's and early 1930's, some lawmakers became convinced that unbridled competition in the motor transportation industry would result in the development of discriminatory activities similar to those practiced by railroads in the late 19th century (19, 213-215). If this were to happen, major economic dislocations could occur in the economy. The transport needs of the government could be jeopardized and transportation services to the public could be sporadic and undependable.

When some motor carriers were discovered engaging in
discriminatory activities, pro-regulators acted. The continuing congressional concern about transport and the empirical evidence of abuses by some motor carriers resulted in passage of the Motor Carrier Act of 1935. This law eventually placed most commercial motor carriers engaged in interstate commerce under the regulatory supervision of the Interstate Commerce Commission (I.C.C.). This thesis stems from scepticism concerning the economic justification for the type of motor transport regulatory system which has evolved over these past 41 years.

Overview of the Thesis

Evidence exists today which indicates that our present motor carrier regulatory system, rather than "protect the public interest", might actually inhibit the efficient provision of transportation services to the economy. Accepting such a view of the regulated motor transport market as valid, this thesis could serve as a model from which legislators might begin to re-write our motor carrier act. It is assumed throughout this work that such an undertaking is well overdue. The possible use of this thesis for such a purpose is its primary justification for existence.

In order to serve as a basis for such a legislative revision, the model and recommendations contained herein should be designed to maximize the potential benefits which might accrue to the industry and the shipping public. The philosophical bias flowing throughout this work is the conviction
that this maximization of benefits could best be realized through increased competition among firms, coupled with the minimization, through reduced regulation, of any economic threats to the stability of the national transportation system. Thus, the attempt is made in the model to be presented to provide for an increased level of industry competition while retaining those essential elements of regulation upon which the national transportation policy was originally based.

The approach taken in this work is one of review, description, analysis, model-building and commentary. The current regulatory issues of concern to the motor transportation industry are reviewed in chapter 2. The market structure is described in chapter 3, followed by an analysis of price and output determination in chapter 4. The framework for a new approach to price determination in this industry is developed in chapters 5 and 6. The model presented is intended to replace many of the regulatory procedures in use today. Chapter 7 contains comments on the relevance to the industry of the model constructed in chapters 5 and 6, to include a discussion of its probable impact upon several of the most perplexing problems facing regulators today. The appendix was added to enhance the reader's understanding of the extent to which present-day regulated motor transport rate structures fail to represent rational and economically justifiable charges for services rendered.

This thesis will not continue in the modern trend of regulatory literature—that is, resorting to emotionalism and allegations aimed at removing regulation from the trans-
port industry (16). Nor is its purpose to justify the continued existence of the Interstate Commerce Commission. Rather, the admittedly ambitious goal of this work is to present what is felt to be a much-needed new format for regulation in this field—one based upon the ideals of economic theory, the tenets of national transportation policy, and the restraints of present-day market realities. With this goal in mind, every attempt will be made to announce assumptions, identify opinions, and employ rigid economic analysis whenever possible.

Notes

1. These references will give the reader a "feel" for the near-hysterical tone of regulators and non-regulators alike when discussing the regulation issue.

Economists and other social scientists have placed much emphasis recently on re-examining economic regulation. No longer is governmental supervision assumed to be the alternative to actual or potential market abuses (16). A brief review of the current state of the debate surrounding the costs and benefits of regulation is appropriate. This chapter will form a frame of reference from which the reader can gain a proper perspective of the relevant issues.

Pro-Regulation: Assumptions and Policies

Regulators assume that the market for the transportation of goods by truck has the potential, without regulation, of developing into an oligopolistic structure. The scenario under which this is assumed to occur runs generally along the following lines (17, 140-143):

With free entry and exit of firms, competitive pricing, and the freedom to make all supply decisions granted to firms, the larger firms with their superior financial assets would soon come to dominate the market. Able to sustain losses beyond the short run, they would begin to provide transport services without covering full costs. Other established firms,
unable to compete in this environment, would leave the market.

These larger "predatory" firms would thereby gain major market shares accompanied by "excessive" market power. This "predatory pricing" situation would naturally lead to all of the classic symptoms of a highly concentrated market; rates would be increased, services would be withdrawn from the less profitable shipments (i.e., those from small towns or those of low-density/low-value), and a general deterioration of the reliability and efficiency of our transportation system would ensue.2

It is obvious from this scenario that the commission places little faith in the ability of non-price competition to prevent the development of market concentration. Quality of service appears to have been assumed as "given". Product (service) differentiation is obviously not considered. Price appears to be the only competitive variable of concern to the commission.

Regardless, industry stability—that is, the capability of the industry to supply a constant, reliable and adequate amount of transport, has always been of primary concern to the I.C.C. The regulatory result of the fear of a growth in market concentration and the desire to ensure a reliable transport supply, has been the imposition of three major regulatory policies, all of which tend to perpetuate the existing market structure.

1. **Market Entry is Restricted.** Prior to operating as a common carrier in interstate commerce,3 a firm must receive from the I.C.C. a "Certificate of Public Convenience and
Necessity" (16, 58). In order to be granted the certificate, the prospective market entrant must submit evidence to the I.C.C. showing that he is ".....fit, willing, and able to properly perform the service proposed....." and, that the service proposed ".....is or will be required by the present or future public convenience and necessity....." (16, 15).  

The compilation of such evidence can be an arduous and expensive task (29).  

During 1974, the commission granted certificates "in whole or in part" to 82.1% of the cases heard (15, 15). Measurement of the impact of this statistic is beyond the scope of this thesis. However, it is assumed that the combination of the cost involved in certificate application, the denials of authority issued by the I.C.C. and the psychological impact upon prospective common carrier owners of the very existence of certificate requirements, does indeed constitute a very real restraint on market entry.  

This policy was established to prevent the rapid influx of new firms which could, according to the I.C.C., contribute to a constantly changing market structure and a great deal of waste and inefficiency. Rapid entry by inexperienced firms would result in the encroachment by these newcomers upon the market of established, reliable carriers. The result of this action could be a diminution of the income levels of both old and new firms, causing both to exit from the market. This would lead to undependable transport supply and excessive waste of capital resources. The emphasis placed upon the maintenance of the market status quo by this policy is quite
2. **Market Shares are Controlled.** The I.C.C. holds that "...an existing carrier generally should be accorded the opportunity to transport all of the traffic it can handle adequately, economically, and efficiently within the scope of its authority before a new competitor is introduced into the field...." (15, 16). For this reason, certificates are issued with authority to transport specific goods over specified routes. While not granting absolute monopolies, this policy does effectively prevent potential competitors from encroaching upon the market of all but the most inefficient of firms.

This policy augments the force of the restrictions which are placed upon entry. In addition, it serves to protect against the growth of concentration. Before a market "predator" could begin his potential discriminatory pricing activities, he would require access to the relevant market. This policy places imposing obstacles in the way of such access.

3. **Price Determination (Rate-Making) is Subject to I.C.C. Approval and Control.** The I.C.C. has repeatedly emphasized its concern for rate structure stability (17, 146-147). Leaving price determination in the hands of suppliers, subject only to demand constraints, could initiate the market concentration cycle described above. With this in mind, the commission requires that carriers cover all costs on each shipment (17, 141). Such costs include the variable costs incurred in the shipment, a proportional share of total fixed costs, and a "reasonable" margin for profit. With this con-
centration on the compensativeness of rates, the use of "cost-
plus" pricing in rate-making is required (this topic will be
discussed at length in chapter 4 of this thesis).

These policies and regulations are regularly critiqued
in the literature by those who would have the industry de-
regulated, those who favor at least re-regulation to allow
more economic freedom for market participants, and those who
favor the status quo.

Anti-Regulation:
Allegations and Recommendations

The arguments against regulation of transportation cen-
ter primarily around five major issues; 1) regulatory-induced
costs; 2) restraints of competition; 3) rate effects; 4) man-
age ment impact; and, 5) the effects of regulation on private
carriers (16, 16-34).

A comprehensive discussion of any of these issues could
be handled thoroughly only on the scale of a major presenta-
tion. Such an approach is beyond the scope of this thesis,
and is unnecessary for the reader's understanding of the fol-
lowing chapters. Therefore, some of the specific allegations
of de-regulators are stated without amplification, to provide
the reader with some idea of the content of the major recur-
rning complaints about motor carrier regulation. 10

There have been many estimates of the costs resulting
from regulation, some of which range into the billions of
dollars. The logic of regulating an industry with thousands
of firms is repeatedly questioned by de-regulators. Rates,
say I.C.C. opponents, are kept artificially high, resulting in a great deal of subsidization of carriers and cross-subsidization of shippers. Incentives have allegedly been removed by regulation, leaving few options for carrier management and causing the industry to fall far short of realizing its dynamic performance potential. The growth of private carriage (transportation of the owner's goods in his own trucks) would probably be less rapid if regulated carriers could supply the demand at a reasonable cost.

In a September 1, 1976 letter to shareholders, James P. Herring, Chairman of the Board of The Kroeger Company, cites the following as evidence of regulation's impact on his non-regulated trucking operations:

.....there are barriers to efficiency, some the result of unnecessary government regulations.....which add to the cost of operation but not to the service available or to the quality of the food.....such as prohibitions on backhaul which artificially increase the cost of distribution (e.g., because of governmental regulations, a Kroeger truck in some instances is not allowed to pick up products at a supplier's warehouse even though traveling empty directly past it on the way back to the Kroeger warehouse).....

Who is right? The debate shows signs of continuing ad infinitum. De-regulators present a convincing argument, while regulators have the law, tradition and the fear of the de-regulated unknown on their side.

Who is Right?

The "National Transportation Policy" provides the basis for the I.C.C.'s mandate to regulate. The language of the policy might shed some much-needed light on the legislative
basis for the regulatory policies which we have reviewed as issues. The policy states in part:  

It is hereby declared to be the national transportation policy of the Congress to provide for fair and impartial regulation of all modes of transportation.....to recognize and preserve the inherent advantages of each; to promote safe, adequate, economical and efficient service and foster sound economic conditions in transportation services, without unjust discriminations, undue preferences or advantages, or unfair or destructive competitive practices;.....all to the end of developing, coordinating, and preserving a national transportation system.....adequate to meet the needs of the commerce of the United States, of the Postal Service, and of the national defense.....

The subjective tone of this policy must of course be interpreted by regulators before the policy can be implemented. The I.C.C. holds that in its interpretation and implementation of the policy, it has promoted private enterprise, maintained industry efficiency and stability, encouraged incentive and, thereby, protected the public interest (14, 6)(15, 1-2). However, the commission has come under fire in the 1970's from many directions (with the notable exception of the firms it regulates) (2)(19)(22)(29). A recent report of the Oversight and Investigations Subcommittee of the House Committee on Interstate and Foreign Commerce expressed the opinion that the public interest is at best misinterpreted by the I.C.C., and that the commission ".....remains mired in confusion over its appropriate regulatory function....."(22) (26).

When "backed into a corner" by de-regulators, I.C.C. spokesmen fall back on the claim that the United States has, by almost any measure, the most responsive and efficient transport system in the world (15, 1). The implicit assump-
tion is, of course, that this excellent system has evolved only because of regulation. Few would argue that our motor transportation system is not among the best in the world. If such is the case, and transport regulation is a matter of national policy, why all the rhetoric? Shouldn't we be satisfied with "the best"?

In order to ensure that the nation "gets the most" from its transport system, the industry and the regulatory framework within which it operates must be continuously and objectively evaluated using economic analysis and rational political thought. At any given time, our approach to providing for the transportation needs of the nation can only be assumed to constitute the best of all existing systems, not the best of all possible systems.

There is no reason why the current "best" system should be accepted solely on the basis of its comparative superiority to other existing systems. If an economic optimum can be defined for a national transportation system, it should be used as the basis for comparison with our current system. Such an economic optimum might be considered to be that system under which all transport demanded is supplied, while all firms are of an optimal size, and all operate at the minimum point on their long run average cost curve.

It should not matter that such an optimum might be impossible to achieve. The more important point is that any regulatory policy revision which can move the present system closer to that optimal position will have improved upon the current version of "the best". The essence of the regulatory
debate today is essentially the disagreement over the type and degree of regulation (or lack of regulation) which will serve this end.

Who is right, regulator or de-regulator? That is probably the wrong question. More productive questions would be; "Does our national transportation policy reflect what we really can expect from the transport system?" If so; "Can we improve our present regulated system in keeping with the guidelines of the accepted policy?" To answer these questions, a comprehensive review of the current market structure must first be conducted. This task is taken up in the following chapter.

Notes

1. "Regulators", in the context used here, include those in the business of regulation (those who actually impose policy) and those who support its continuance. Most notable among the latter group are the majority of regulated firms. Their enthusiastic support of the I.C.C. is sometimes pointed to in the literature as implicit evidence of industry "protectionism" engaged in by the commission (26).

2. A similar pro-regulation scenario explained to the author by an I.C.C. official leads to the same outcome for the market, but the "larger firms" are replaced by giant financial conglomerates. Capitalizing on their extensive financial base, they price others out of the market by artificially depressing prices.

3. A common carrier is ".....any person which holds itself out to the general public to engage in the transportation by motor vehicle in interstate and foreign commerce of passengers or property.....for compensation....." (17, 5).

4. The issuance of a certificate is decided by "the degree to which a proposed service will serve a public need... whether this need can or will be served by existing carriers; and, whether this need can be met by the applicant.....without endangering or impairing the operations of existing carriers..." 49 U.S.C. § 207(a).
5. The following quote from an interview contained in an editorial in the October 9, 1974 Lincoln, Nebraska Journal paints a somber picture for certificate applicants; "If I go and apply for a certificate, the first one that hits you is the railroads. Then every trucker comes in and claims that he can provide the service." "Further", adds the Journal, "the applicant has to dig up $5000 to $6000 to pay for a lawyer."

6. The evidential requirements for obtaining a certificate can indeed be complex. During 1974, a certificate was denied to the Acme Cartage Company because it failed to "...(1) indicate the volume of shipments, (2) specify the portion of shipments which would be tendered to applicant, (3) indicate the carriers which the shippers are presently using in these operations, or (4) submit information concerning service deficiencies by these carriers....." (14, 40).

7. The control of basic supply decisions is therefore ultimately retained by the commission as a result of its fears of the development of predatory competition.

8. A competitor could petition "in the public interest" for competing operating rights over a route belonging to an inefficient firm, if evidence could be presented showing the lack of ability on the part of the existing carrier to "adequately, economically and efficiently handle the traffic."

9. The fact that carriers do not comply with this rule led to the analysis to be presented in the appendix to this thesis.

10. The following paragraph is essentially a much-abbreviated summary of Martha Johnson's recently published literature review (16).

The transport market is populated by a proliferation of firms. Regulated interstate, quasi-public, non-regulated intrastate, and private non-regulated firms all operate in various modes; rail, motor vehicle, water, air and pipeline services. This thesis concentrates on a very narrow market sector; the transportation of general freight by motor common carriers in interstate commerce.

The Product

The product of the general freight transportation market is the furnishing of a service; the transport of virtually anything, anywhere. Common carriers of general freight are normally grouped together in the literature and are assumed to provide an essentially homogeneous service (3). However, shippers demand transportation of goods in the form in which they are produced and packaged. Twenty small shipments will not substitute for one large shipment if it consists of an assembled 15-ton machine. The service can be clearly differentiated by shipment weight categories.

Shipments are categorized for rate-making purposes in various ways; by weight, volume, value, density, etc. (17, 140-149). Due to the very different requirements for moving
the various categories of shipments, common carriers of freight actually provide several well-differentiated services.

The most common shipment division in the industry is that of weight. The standard overall weight categories for shipments are: Truckload (TL) and Less-than-truckload (LTL). The LTL group is normally broken down into several sub-categories. As a general rule, a small shipment will have a higher unit cost to move a given distance than will a large shipment (17, 151). This is due to the increased handling, scheduling and terminal expenses associated with small shipments. These differences clearly result in the separation of shipments by weight into differentiated services.

Even though a shipment's rate depends heavily upon other criteria, the weight classifications provide a simple system for differentiating services (17, 141-142). When shipments are addressed in this thesis, the standard weight classifications will be used in preference to other possible systems. Two reasons exist for choosing this approach. First, standard weight categories are used in the industry for many purposes, most notably for presentation to the I.C.C. of revenue-need and rate-adjustment statistics (10)(20). Second, categorizing shipments by weight cuts across the differences in other category characteristics (i.e., value, density, volume, etc.). This allows for standardization among firms of the analysis to be conducted. The "type" of shipment thus becomes less important to the analyst than shipment weight, allowing for simplification of the analytical presentation.

Ignoring other shipment characteristics is no small sim-
plification. The reader should keep in mind that these shipment characteristics have a great deal to do with the cost of moving an item, and thus with the rate charged. However, this categorizing technique will not appreciably affect the results of the analysis conducted in this thesis. The approach taken in the following chapters could just as easily have used any other categorizing system if data were available in that form.

The Buyers, The Sellers and Industry Concentration

Anyone can ship by common carrier. The number of potential customers (buyers) using common carrier services is essentially unlimited. The customers of primary concern to regulators are manufacturers, towns, farms and the government. If these are provided with adequate transportation, the business of national economic growth can continue unfettered by transportation constraints.

Carriers (the "sellers") are categorized into "classes" based upon their annual operating revenues. Class I includes carriers with annual revenues in excess of $3 million. Class II revenues fall between $3 million and $500,000 annually, with Class III carriers earning less than $500,000. As of June 30, 1975, there were 885 Class I, 2,670 Class II and 12,450 Class III carriers in operation (14, 120).

Regulated firms earned an estimated $22.4 billion in operating revenues and hauled an estimated 218 billion ton-miles in 1974. They are headquartered in all 50 states and the District of Colombia (1, 1).
This very brief overview of industry buyers and sellers clearly indicates the competitive potential of this industry. There are obviously "many buyers and sellers". During the research conducted, no firm was found to control a large enough market share to allow it to effect the market price (rate). No mathematical measure of industry concentration was computed. However, due to the large number of carriers in each class and the lack of any dominant firm, the assumption will be made throughout this analysis that concentration is not currently a problem in the industry.

This well-populated market structure could be due to the effectiveness of regulation, or (more probably) to the very nature of the service provided; i.e., a lack of overwhelming economies of scale in freight transportation. Regardless, this clearly is not a highly concentrated industry. There are no visible oligopolistic characteristics present in the current market structure.

Price Administration: Rate Bureaus

Rate bureaus are organizations which engage in collective rate-making for their member firms. They publish rates which remain in effect for their members until the next rate publication, or until they are dis-allowed by the I.C.C. These rates are submitted to the I.C.C. for approval prior to taking effect. Individual carriers have the right to publish separate rates, even if they subscribe to the rate bureau services. In practice, however, they rarely act on this option (17, 177-179).
There are currently over 100 motor carrier rate bureaus in existence (14, 120). They operate under an antitrust exemption for price-collusion (collective rate-making) granted under Section 5.a. of the Interstate Commerce Act (17, 178). The rationale for legalizing their activities is based upon one of the requirements of the national transportation policy; that a simple, easily understood rate system be used to enhance the effectiveness of the transport system and the ease with which the public can gain price information.

By collating rate data and publishing them in a usable form for a number of carriers, rate bureaus simplify the rate-making and rate-publishing processes greatly. Because of this function, they are often credited by carriers and regulators with providing a standardized, non-discriminatory, non-preferential and economically sound rate structure (17, 179). Whether the bureaus deserve credit for such an accomplishment depends upon one's opinion of the nature of the present bureau-created rate structure.

There are literally endless possibilities for creating rates and tariffs under the present rate system. Each commodity type has a rate for shipment between every possible origin and destination. Rates depend upon shipment characteristics such as weight, density, value, etc. The combinations and permutations possible under this arrangement have created an exceedingly complex rate structure. This topic will be taken up again in the following chapter in the detailed discussion of price and output determination in this market, where some rate structure distortions will also be uncovered.
The Current Level of Competition

The level of competition present in the industry today must of regulatory necessity be primarily of a non-price variety. Rates are collectively published by rate bureaus for the large majority of firms. Even though rate differentials do exist, the quality of service provided to shippers appears to be the most important competitive variable in the industry. Regardless, carriers attempting to engage in active price competition (openly) would risk intervention by the I.C.C.

Advertising appears to play a very small role in the non-price competition between firms. The major advertising expenditures appear to be in the "selling" of regulated trucking to the public by common carrier supporting organizations such as the American Trucking Associations, Inc.

This very brief description of the market for interstate transport of general freight by motor truck was not meant to be more than a cursory overview. The attempt has been made simply to acquaint the reader with the general structure of the market. Of primary concern to the topic of this thesis is the method by which the industry arrives at its determination of price (rate) and output, a subject to which we now turn in chapter 4.

Notes

1. During an interview with a private trucking manager, the author was assured that several rates were available from common carriers for any transport desired. However, these rate differentials were a direct reflection of the quality of service provided.
Chapter 3 painted a picture of a potentially competitive market in interstate motor transportation. There appears to be some degree of product differentiation. This, coupled with the large number of firms in the market, would lead the analyst to suspect that this industry exists in a monopolistically competitive market. If such is the case, the price and output determination mechanism of the market should be easily predictable from the theory of the firm in monopolistic competition. However, as we shall see in this chapter, no such "easy" predictions are possible.

The imposition of regulation upon this market has made the calculation of price, output and rate-of-return a complex yet somewhat simplistic chore for both the economist and the manager of a common carrier. This chapter explores the nature of price and output determination in this market, in an attempt to highlight the variance between the theory (posed by the I.C.C.) and the actual market outcome of the regulatory approach to market operations.

The Regulatory Theory of Price/Output Determination:
Cost-Plus Pricing

Market shares are effectively granted to firms by the issuance of certificates of public convenience and necessity
Carriers are expected in turn to serve the shipping public indiscriminately by supplying the level of transportation demanded in line with their capabilities under the provisions of their operating rights (17, 143). In order to insure that the supply remains stable, the I.C.C. would like to provide carriers with a financial posture which allows their survival in the market. Given this goal of market stability and recognizing the overwhelming impact of the rate structure on a carrier's financial condition, the commission has deemed it essential that all rates be compensatory.

"Cost-plus" pricing is the I.C.C.'s prescription for ensuring that rates remain compensatory. Rates must return to the carrier "...cost plus a fair share of the transportation burden and a reasonable profit...." (17, 139-141). In order to ensure compliance with this policy, carriers are required to compute their operating expenses, add to this figure a portion of fixed costs and a "reasonable" profit margin, and set their rates based upon the resultant projected revenue needs. Rates are therefore determined by operating expenses, which are in turn a function of demand, carrier efficiency, the price of factor inputs and the regulatory operating rules and regulations.

The formal measure of an appropriate rate is depicted in a firm's "operating ratio" (the letter \( A \) will be used in this thesis to signify a firm's actual operating ratio). This ratio is calculated by dividing operating expenses (\( E \)) by operating revenue (\( R \)); \( A = \frac{E}{R} \). At any level of output, a
carrier's revenue (and hence its rate structure) should be set at a level where each shipment returns variable costs, a proportionate share of total fixed costs, and a "fair" measure for profit. If the appropriate operating ratio is maintained (according to I.C.C. theory), carriers would earn a rate-of-return to investment in transportation operations which would eliminate excess (economic) profits, adequately compensate for risk, and eliminate predatory competition (17, 139).

The I.C.C. holds that an operating ratio of .93 will normally produce these results (the letter D will be used in this thesis to signify the I.C.C.'s desired operating ratio; \( D = .93 = E:R \)). Thus, operating revenues, and therefore rates, are to be set at a level so that operating expenses equal 93% of operating revenues. Using these pricing constraints and financial relationships, we arrive at the formula; \( E = AVC + x(TFC) \); where \( x \) = the proportionate share of fixed costs attributed to a particular shipment. Revenue is then computed; \( R = \frac{1}{D}[AVC + x(TFC)] = \frac{E}{D} \).

Figure 1 depicts the theoretical price determination mechanism when firms set rates based upon an operating ratio. The price charged (rate) is reflected on the vertical axis while output (in ton-miles hauled) is measured on the horizontal axis.\(^3\)

In analyzing the dynamics of such a system, we begin in figure 1 with a firm whose operating expenses (E) at various output levels are reflected by \( E_1 \), which is the hypothetical ATC curve of this firm, less profit. As noted above, an oper-
Figure 1. Price Determination Under I.C.C. Cost-Plus Theory
ating ratio of $D = 0.93$ has been set by the I.C.C. as a gen-
eral target at which firms are instructed to aim when setting
rates. In figure 1, $ATC_1$ is derived from $E_1$ by application
of our revenue formula: $R = \frac{E}{D}$. With $D = 0.93$, $R$ at any level
of output will be equal to; $R = \frac{E}{0.93} = 1.0753E$. Rates are set
at a level which returns operating revenues to the firm which
exceed operating expenses by 7.53%. Alternatively, the car-
rier will gain a return of just over 7¢ on each revenue dol-
lar.

Rates, under this pricing system, must be set equal to
$ATC$ at all output levels. The $ATC$ curve thus becomes the
firm's supply curve. It represents the price which will be
charged at any level of output demanded. Demand in the
transport market is assumed to be naturally rather price-
inelastic. Products must be delivered to market or producers
will be faced with the inability to sell their goods (forced,
unintended inventory investment). This market characteristic
is depicted in figure 1 by the steep hypothetical demand
curve, $D$. Using curves $D$ and $S_1 = ATC_1$, price and output are
determined in the normal manner. Price = $P_1$ and quantity = $Q_1$.

The shift to $S_2 = ATC_2$ represents the effect on market
price and output of an autonomous rise in carrier operating
expenses (such as, for example, a negotiated wage increase).
Price will automatically rise to $P_2$ with output falling to
$Q_2$.

Carriers are thus theoretically guaranteed a return at
whatever level of output their particular market demands. To
demonstrate this fact, note that portion of the supply = ATC curve which is downward sloping. In this entire range, decreased output calls forth higher rates, while increased output results in lower rates. Firms can operate in this range at the resulting rates beyond the short run because of their unique rate-making system and their essentially captive market.

Customers cannot easily be competed away through price competition. Would-be competitors must first obtain the necessary operating rights. Carriers also cannot quickly expand output and thus move down their ATC curve because of the regulatory constraints on their market shares.

One cause of the recent growth of private carriers, a trend which has regulators concerned, can be partly attributed to the rate-making system. This situation is depicted in figure 2. As carrier ATC rises to ATC₂, price is driven up (a) to P₂ and output falls to Q₂. At some price less than P₂, we assume that a major shipper has decided that using common carriers no longer provides him with affordable transportation. He therefore buys his own fleet of trucks to haul his goods to market. This results in a demand shift (b) to D₂, causing a further rise in price to P₃, with the accompanying reduction in output to Q₃.

At this point, the carrier is operating well above the minimum point on its S = ATC curve and is charging its remaining customers (who, we assume, cannot afford to invest in private transportation) a higher rate. This problem will be discussed again in chapters 5 and 6, where solutions are
Figure 2. Cost-Push Demand Shift Under I.C.C. Cost-Plus Price Determination
offered to problems such as these in the rate and market structures of this industry.

The Operating Ratio And Rates-of-Return

According to the I.C.C.'s theory of price determination, a motor carrier's level of total investment is essentially irrelevant in rate-making. Rate-of-return to total capital investment is purposely ignored in judging the appropriateness of a rate (17, 139). The rationale for de-emphasizing return to capital is based upon the capital structure of the industry and the nature of common carrier subsidiary activities.

Investment is normally a small portion of total costs for common carriers. The principal risk is therefore attached to major expense items; those deriving from transportation operations. Also, carriers are often engaged in subsidiary activities largely unrelated to their transport operations. Income and losses from these ventures are not the concern of the I.C.C. Rates-of-return to total capital investment are therefore used primarily to evaluate the financial condition of carriers, not to establish appropriate rate and tariff structures (17, 139-140).

The commission also asserts that if carriers maintain their operating ratios at or near .93 ($\frac{E}{K} = .93$), they will enjoy reasonable rates-of-return on their strictly transportation-related investment (that investment included in working capital and operating property) (17, 139).

The operating ratio is a direct measure of the dollar
return from rates charged for transportation. If the above I.C.C. appraisals of the rate structure relevance of the two measures of rate-of-return are correct, there should be little correlation between the operating ratio \((A)\) and rate-of-return to total capital investment \((r_K)\). The low ratio of investment to total cost, and the income distortions caused by subsidiary operations will greatly weaken any correlation between these variables. Likewise, there should be a strong correlation between the operating ratio \((A)\) and rate-of-return to transportation investment \((r_T)\). If this relationship is strong, analysis of a carrier's operating ratio will reveal much about the appropriateness and compensativeness of its rate structure.

The relative strength of these correlations should be tested to determine the validity of the I.C.C.'s concern (or lack of concern) about rates-of-return. After all, the return symbolizes the economic reason for a carrier being in business. It also impacts most heavily upon the ability of the carrier to obtain future financing through investment sources. If rates-of-return are inordinately low due to I.C.C. misinterpretation of the impact of rates upon them, risk will exceed return in the industry and investment will not be forthcoming.

For purposes of testing the strength of possible correlations between the operating ratio and our two measures of rate-of-return, relevant data for 30 common carriers of general freight were sampled. Table 4.1 contains the 1974 operating ratios and rates-of-return for selected carriers which
### TABLE 4.1

Operating Ratios and Rates-of-Return
For Selected Central States Carriers, 1974

<table>
<thead>
<tr>
<th>CARRIER</th>
<th>A²</th>
<th>r²</th>
<th>rk²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Express Inc.</td>
<td>.762</td>
<td>102.1</td>
<td>49.6</td>
</tr>
<tr>
<td>C.C.C. Highway</td>
<td>.841</td>
<td>58.7</td>
<td>21.7</td>
</tr>
<tr>
<td>Express Freight Lines</td>
<td>.869</td>
<td>29.7</td>
<td>16.2</td>
</tr>
<tr>
<td>Yellow Freight System</td>
<td>.875</td>
<td>35.9</td>
<td>16.5</td>
</tr>
<tr>
<td>Lyons Transportation</td>
<td>.880</td>
<td>26.4</td>
<td>11.1</td>
</tr>
<tr>
<td>A-H Truck Lines</td>
<td>.885</td>
<td>43.9</td>
<td>34.0</td>
</tr>
<tr>
<td>Daum Overnite Express</td>
<td>.892</td>
<td>16.8</td>
<td>11.5</td>
</tr>
<tr>
<td>Commercial Motor Freight (Ohio)</td>
<td>.906</td>
<td>42.8</td>
<td>4.4</td>
</tr>
<tr>
<td>Arkansas-Best Freight System</td>
<td>.916</td>
<td>42.9</td>
<td>21.4</td>
</tr>
<tr>
<td>Churchill Truck Lines</td>
<td>.919</td>
<td>37.5</td>
<td>19.4</td>
</tr>
<tr>
<td>Consolidated Freight Ways</td>
<td>.921</td>
<td>19.7</td>
<td>14.7</td>
</tr>
<tr>
<td>Anderson Motor Service</td>
<td>.932</td>
<td>24.8</td>
<td>12.7</td>
</tr>
<tr>
<td>O K Trucking</td>
<td>.939</td>
<td>14.5</td>
<td>7.1</td>
</tr>
<tr>
<td>Jones Transfer</td>
<td>.942</td>
<td>14.1</td>
<td>7.3</td>
</tr>
<tr>
<td>Eazor Express</td>
<td>.948</td>
<td>22.5</td>
<td>12.3</td>
</tr>
<tr>
<td>Carolina Freight Carriers</td>
<td>.953</td>
<td>12.7</td>
<td>8.0</td>
</tr>
<tr>
<td>Commercial Motor Freight (Indiana)</td>
<td>.957</td>
<td>19.2</td>
<td>9.1</td>
</tr>
<tr>
<td>Terminal Transport</td>
<td>.961</td>
<td>12.0</td>
<td>5.6</td>
</tr>
<tr>
<td>Rooks Transfer Line</td>
<td>.967</td>
<td>20.6</td>
<td>10.3</td>
</tr>
<tr>
<td>Clairmont Transfer Company</td>
<td>.970</td>
<td>12.1</td>
<td>1.8</td>
</tr>
<tr>
<td>Warner &amp; Smith Motors</td>
<td>.978</td>
<td>19.4</td>
<td>11.0</td>
</tr>
<tr>
<td>Gateway Transportation</td>
<td>.981</td>
<td>6.8</td>
<td>1.5</td>
</tr>
<tr>
<td>Chippewa Motor Freight</td>
<td>.985</td>
<td>5.7</td>
<td>6.4</td>
</tr>
<tr>
<td>Consolidated Forwarding</td>
<td>.990</td>
<td>4.6</td>
<td>-7.9</td>
</tr>
<tr>
<td>Hajek Trucking</td>
<td>.995</td>
<td>18.1</td>
<td>15.1</td>
</tr>
<tr>
<td>Central Transport</td>
<td>1.006</td>
<td>-8.6</td>
<td>0.4</td>
</tr>
<tr>
<td>Western Transportation</td>
<td>1.013</td>
<td>-9.5</td>
<td>-2.9</td>
</tr>
<tr>
<td>South Bend Freight Lines</td>
<td>1.022</td>
<td>-49.5</td>
<td>-43.7</td>
</tr>
<tr>
<td>B. N. Transport</td>
<td>1.041</td>
<td>-14.4</td>
<td>-6.7</td>
</tr>
<tr>
<td>PIC-Walsh Freight</td>
<td>1.054</td>
<td>-38.8</td>
<td>49.7</td>
</tr>
<tr>
<td>TOTALS (Averages)</td>
<td>.926</td>
<td>22.9</td>
<td>12.0</td>
</tr>
</tbody>
</table>

1Carriers were selected to include the full range of A observed within the CSMPFB group.

2Operating Ratio: E ÷ R.

3Rate-of-return to "Investment in Transportation" = Net Operating Income ÷ (Net Operating Property + Net Working Capital).

4Rate-of-return to capital = Net Income(Loss) ÷ (Shareholders equity less intangibles + Long term debt).

Source: Ratios and rates computed by the author from balance sheet summaries contained in; Central States Motor Freight Bureau, Inc., Evidential Submission in Support of Proposed Increases in Rates and Charges.
are members of the Central States Motor Freight Bureau (CSMF) (10). The operating ratios range from .762 to 1.054. These firms were chosen non-randomly by the author to represent the full spread of operating ratios observed among the CSMFB members.

Rate-of-Return to total capital is defined as (23, 18):

$$r_K = \frac{\text{Net Income (Loss)}}{\text{Shareholder's Equity Less Intangibles} + \text{Long Term Debt}}$$

Rate-of-Return to transportation investment is defined as (23, 18):

$$r_T = \frac{\text{(Net Operating Income)}}{\text{Net Operating Property} + \text{Net Working Capital}}$$

In attempting to uncover relationships between A (the independent variable) and rT or rK (dependent variables), least squares regression analysis was used to arrive at a regression line of the form: $Y = a + bX$. Pearson’s “R” was computed as the measure of correlation (12, 394-395).

Very little correlation ($r^2 = .291$) was found to exist between operating ratio and rate-of-return to total capital investment (A versus rK). This is consistent with the I.C.C. view that transport operations and total investment are essentially unrelated in this industry. It may well be that the contributions to profit generated by subsidiary carrier operations (non-transport operations) cause this phenomenon. Investigation of the actual cause if beyond the scope of this thesis. Regardless, the use of rK as a guide to carrier revenue need determination (rate levels) must be rejected based upon our findings. rK appears to be a poor indicator of the profitability of carrier transportation activities. By exten-
sion, it would also be misleading in revenue considerations.

A relatively strong correlation ($r^2 = .882$) was found to exist between operating ratio and rate-of-return to investment in transportation ($A$ versus $rT$), indicating that approximately 88% of a change in $rT$ can be explained by $A$. A linear regression line was obtained: $rT = 4.613 - 4.7(A)$. Since there appears to be a strong correlation between $A$ and $rT$, analysis of a firm's operating ratio can be made to shed much light upon its profitability and the appropriateness of its rate structure.

The I.C.C. claim for the predictive power of the operating ratio goes much farther than this modest use however. The commission's desired operating ratio ($D = .93$) is said to afford carriers a reasonable rate-of-return to transportation investment ($rT$). If this is so, this desired operating ratio could logically be used as a specific guide to revenue need determination for common carriers. They would simply set rates at a level which ensured that their operating expenses ($E$) remained near or at 93% of revenues ($A = \frac{E}{R}$), and would thus receive a reasonable rate-of-return.

Does $A = D = .93$ result in a "reasonable" rate-of-return? What constitutes a reasonable return? A transport economist who is heavily involved in this sector performed a comprehensive risk analysis of the industry (24, 33). He states that common carriers of general freight, in order to receive a fair return in comparison with other non-regulated industries of comparable risk, should attain an operating ratio of .926, which should result in a rate-of-return to investment in
transportation (rt) of approximately 23% before interest and taxes.

A glance at the TOTALS line of table 4.1 will reveal that these estimates, for our sample firms, are very close to 1974 reality. Substituting this rate-of-return into our regression equation and solving for A yields: \( rt = 4.613 - 4.7(A); .23 = 4.613 - 4.7(A); \) (re-arranging terms) \( A = (4.613 - .23) ÷ 4.7 = .93. \) This result agrees with the I.C.C. desired operating ratio \( (D = .93). \)

Given the correlation discovered between A, D and rt, and the findings of the risk analysis referred to above, \( A = D = .93 \) will be used throughout the remainder of this thesis as an important variable in revenue need determination (rate-making) for common carriers.

Price and Output Determination In Practice:
Operating Expenses and Cost-Push Rate Increases

We have seen that cost-plus pricing based upon an operating ratio of .93 is the price and output system desired by the regulators of this industry. Setting rates in line with this system should result in compensatory rates for all shipments, a stable, fair rate-of-return for carriers, and the protection of shippers from the market abuses most feared by regulators. We should next ask how this theory compares with the industry reality of today.

In practice, the majority of firms do not maintain their operating ratios near \( A = D = .93. \) A sampling of any of the standard statistical sources will show carriers' oper-
at ratios ranging generally from .75 to 1.20 (3). These deviations from the I.C.C. recommended ratio of .93 occur for a variety of reasons.

The commission does not guarantee a firm the "right" to operate at \( A = D = .93 \), nor does it require firms to do so. As we shall see, much of a firm's operating ratio depends on its relative efficiency. A further complication arises from the collective nature of rates. Rate bureaus prepare standardized rates for their subscribers to follow. These cannot be quickly adjusted to meet routine expense variations due to the requirement for at least tacit I.C.C. approval of rate changes. Firms with fixed rates in the short run while their costs vary daily will rarely operate at any one operating ratio for long.

The current price determination mechanism of the industry revolves around the element of greatest risk to a common carrier; operating expenses. Most firms must closely monitor expense items on a daily basis because of the unstable profit margins under which they operate. There is little doubt that carriers attempt to hold down operating expenses, but in the long run there is little incentive to do so. An escape from cost-push pressures is available in the form of rate increases.

Actively seeking the maintenance of a stable and responsive transportation system, it would be difficult for regulators to disapprove a rate increase proposal which was based upon reliable financial records. Of course, increased expenses are not difficult to justify in this day of rising prices.
They are, in fact, the normal justification used when rate increases are requested from the I.C.C. (10)(23)(25)(27).

Under this rate-making system, it would be surprising indeed if a manager's emphasis did not fall on increasing revenues rather than on decreasing expenses (the difficult way out of a profit squeeze). Operating expenses weigh so heavily in the determination of rates that the goal of operational efficiency might well be subjugated to the firm's preoccupation with seeking compensatory rate adjustments from the I.C.C.

Added to the above operating ratio destabilizing factors is the fact that rates, in practice, are not actually compensatory. Some shipments move below cost and are subsidized by others. This cross-subsidization factor further causes the operating ratio to avoid pegging by the firm's rate structure. Since this rate structure subsidization element is in direct opposition to I.C.C. policies concerning the "required" compensatory nature of all rates, it deserves further examination at this point.

Grants in the Rate Structure

The extent to which common carrier rate structures contain degrees of subsidization can most effectively be discovered through the use of the analytical techniques peculiar to the field of "Grants Economics" (5). This approach will allow us to define, identify and measure the economic impact of the rate subsidies and cross-subsidies which take
the form of economic "grants".

An economic grant is best defined as "a one-way transfer of exchangeables, which in an accounting sense increases the net worth of the recipient and diminishes the net worth of the grantor" (5, 182). Rates paid by common carrier customers (the "shippers") which fall into this category can best be identified by comparing actual rates charged with those which would be charged if carriers in practice established their rates in accordance with the regulatory ideal: cost-plus pricing and the "desired" operating ratio.

A service (such as the provision of transport) and the money paid for this service are both "exchangeables". Any transport provided which does not return to the carrier the full costs incurred in providing the service (variable costs, a proportional share of fixed costs, and a "fair" profit), results by regulatory definition in a diminishing of the net worth of the carrier (the "grantor" in this case), and an increase in the net worth of the shipper (the "recipient" of the grant). The amount of the grant is the amount of the revenue shortfall. Likewise, if a shipper pays an amount greater than the full cost entailed in the transport he purchases, he becomes the "grantor" of the amount paid in excess of full costs to the "recipient" carrier. These types of economic grants abound in the rate structures of common carriers.

In order to determine the exact amount of any grant, we must have a valid measure of the correct "exchange price" (that rate devoid of all grant elements) with which to com-
pare the actual rate charged. According to the regulatory theory discussed in this chapter, that price would be one which yields revenues to the carrier which result in its operating ratio being set at .93 \( (A = \frac{E}{R} = .93) \). For each shipment type, this .93 operating ratio must be in effect to eliminate over or under-charging of shippers—-that is, to eliminate any economic grants in the rate structure.

Table 4.2 presents the projected 1976 operating ratios by shipment category for 300 common carriers of general freight. The two major shipment categories, "Truckload" (TL) and "Less-than-Truckload" (LTL) are included. The LTL category is also broken down into the standard industry weight classifications used by rate bureaus in their rate-making calculations.

Of greatest interest to us in this analysis is the OPERATING RATIO column. The most glaring "defect" in the statistics contained in this column is the lack of any operating ratio close to .93. The closest ratio to .93 is that for the 1000-1999 pounds category: .941. A simple computation shows that the revenues in this category were deficient by $7 million. Using the I.C.C. desired revenue equation presented previously, we see that with operating expenses of $576.8 million, the carriers "should" have received: \( R = \frac{E}{D} = \frac{576.8}{.93} = \$620.2 \) million. They actually received $613.2 million. We can conclude, therefore, that these carriers as a group effected a $7 million grant to shippers using the 1000-1999 pounds shipping category during 1976.

The category in which shippers became the heaviest gran-
### TABLE 4.2

<table>
<thead>
<tr>
<th>SHIPMENT CATEGORY</th>
<th>OPERATING REVENUE</th>
<th>OPERATING EXPENSE</th>
<th>OPERATING RATIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truckload</td>
<td>1022.1</td>
<td>992.0</td>
<td>.971</td>
</tr>
<tr>
<td>Less-Than-Truckload (Total):</td>
<td>4408.8</td>
<td>4328.3</td>
<td>.982</td>
</tr>
<tr>
<td>Minimum Charge</td>
<td>296.1</td>
<td>392.0</td>
<td>1.324</td>
</tr>
<tr>
<td>1-499 pounds</td>
<td>821.2</td>
<td>992.1</td>
<td>1.208</td>
</tr>
<tr>
<td>500-999 pounds</td>
<td>567.9</td>
<td>566.1</td>
<td>.997</td>
</tr>
<tr>
<td>1000-1999 pounds</td>
<td>613.2</td>
<td>576.8</td>
<td>.941</td>
</tr>
<tr>
<td>2000-4999 pounds</td>
<td>811.6</td>
<td>702.2</td>
<td>.865</td>
</tr>
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<td>5000-9999 pounds</td>
<td>532.6</td>
<td>436.1</td>
<td>.819</td>
</tr>
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<td>10,000 pounds</td>
<td>766.2</td>
<td>663.0</td>
<td>.865</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>5430.9</strong></td>
<td><strong>5320.3</strong></td>
<td><strong>.980</strong></td>
</tr>
</tbody>
</table>

Note: Revenue and expense figures in $ millions.

Source: Operating ratios computed by the author.

Financial data extracted from; The Eastern Central Motor Carriers Association, Inc., Statement of Evidence in Justification of General Increase (67 carriers); Rocky Mountain Motor Tariff Bureau, Inc., Evidential Case Justifying Increased Motor Carrier Rates and Charges in Rocky Mountain Territories (49 carriers); Midwest Motor Freight Bureau, Restructuring of Minimum Charges and LTL Class Rates Resulting in Net Reduction (97 carriers); and, Southern Motor Carriers Rate Conference, Inc., Increased Motor Carrier Rates and Charges From To and Within the South (87 carriers).
tors was the 5000-9999 pounds category. Carriers should have received \( R = \frac{E}{D} = \frac{436.1}{.93} = $468.9 \) million. In fact, their actual revenues of $532.6 million gained for them a grant from these shippers of $532.6 - 468.9 = $63.7 million.

A graphic presentation of the effects of these grants on the theoretical price determination mechanism is presented in figure 3. Hypothetical ATC curves for the Minimum Charge and 5000-9999 pounds categories have been plotted, along with hypothetical demand curves for each. Referring first to the minimum charge category, if the operating ratio \((A)\) had been kept at .93, rate \( r_1 \) would have prevailed with output set at \( Q_1 \). The rise in the operating ratio to 1.324 caused this category to be grossly under-charged. Revenues should have been \( R = \frac{E}{D} = \frac{392.0}{.93} = $421.5 \) million. Actual revenues received were (from table 4.2) $296.1. Therefore, \( r_2 \) was charged resulting in a grant to these shippers of $421.5 - 296.1 = $125.4 million. Output at the new grant-induced rate \((r_2)\) increased to \( Q_2 \). The total grant element is depicted by shaded area A.

Moving in figure 3 to the 5000-9999 pounds category, rates should have been set at \( r_4 \) yielding revenues of \( R = \frac{E}{D} = \frac{436.4}{.93} = 468.9 \) million, and output of \( Q_4 \). Instead, \( r_3 \) was charged yielding revenues of $532.6 million. The grant in this case flows to the carrier. Output is reduced from \( Q_4 \) to \( Q_3 \), resulting in a total grant element of $532.6 - 468.9 = $63.7 million = shaded area B.

The economic impact of these grants is obviously a misallocation of resources. Some shipment categories are subsidized resulting in an excessive allocation of production to
Figure 3. The Economic Impact Of Rate Structure Grant Elements
their market. Other categories are deprived of some transport
due to the essentially discriminatory level of rates charged.
This topic is taken up again in much greater detail in the
appendix to this thesis. The grant elements, flows and ra-
tios are computed and analyzed, and suggestions are put forth
for methods to rid the rate structure of these distortions.

Current Problems in Price Determination:
Regulation Versus Competition

Thus far we have discussed a market whose structure
appears to have a great potential for a high level of competi-
tion. A service only differentiated to any great degree by
the size and composition of the shipment demanded, an unusually
large number of buyers and sellers, and the existence of
literally no evidence of market concentration; all of these
market characteristics give this industry a higher theoreti-
cal potential for competition than most other sectors of the
economy. We have also seen how the regulatory rules, regula-
tions and policies effectively neutralize much of the market's
competitive potential. The reasons for this policy approach
have been reviewed. Regulatory policy-makers obviously fear
the potential outcome of a free market environment.

The reader may or may not share the I.C.C.'s economic
mis-givings about the desirability of allowing more free
market activity in this sector. Regardless, the intensity
of the regulatory debate has been such that only polar policy
proposals have been given much critical evaluation. Regulate
or de-regulate seemingly have been the only options (16).
Compounding these problems is the fact that regulatory "tradition" and the lack of modern experience with a non-regulated motor transport system cause the issues to become blurred in the heat of the debate (15). De-regulators are written off as "radicals" and regulators are accused of being the lackeys of the industry they are charged with controlling. Because of this strained policy-making environment, the debate goes on and little effective change is brought about.

Effective and substantial changes in our approach to regulating this industry are clearly required. The radical variations in the profitability of common carriers indicates that the I.C.C. is not succeeding in providing the sound financial position for industry members which is desired (see table 4.1). The exceedingly complex rate schedules do not provide the public with the ease of access to price information which they must have to rationally choose between carriers. The price distortions in the rate structure, discussed in the grants analysis section of this chapter, do not speak well for the price inequities forced upon some shippers, or the mis-investment of resources which results from such grants.

A vast improvement must be made in the price determination method employed in this industry if rates are ever to reflect the actual economic costs of providing transport services. More freedom in the making of basic supply decisions must be granted to carriers if they are ever to be able to take advantage of existing economies of scale or increases in the type and quantity of transport demanded. This sounds like just another call for de-regulation. Such is not the
The goal of this thesis is to develop a regulatory and pricing system which allows regulation and competition to shed their adversary relationship. If these two concepts can be made to enhance the economic gains which each seeks to bring about, this industry could realize its structural competitive potential and the "public interest" could be protected. The remainder of this thesis is dedicated to the construction, analysis and critique of a market model which combines the economic gains to be realized from a greatly increased level of competition, and the social gains possible from a rational regulatory approach to "protecting the public interest".

Notes

1. Rates, in the long run, would be equal to AC, but would not be set at the lowest point on the AC curve due to the downward-sloping demand curve faced by a monopolistically competitive firm.

2. E includes those items which vary with the volume of traffic, such as fuel, depreciation, etc. R includes all revenues received directly from transport operations, and excludes all subsidiary income.

3. A ton-mile = one ton, moved one mile.

4. Variables were selected non-randomly; a linear regression curve was assumed; variances of rates-of-return were assumed equal for every operating ratio.

5. Only 34 of the 75 firms sampled in the following two chapters realized rT greater than .23 in 1974 (3).

6. P. 22, Supra.
One of the primary I.C.C. regulatory goals appears to be the virtual elimination of effective competition from the market for the interstate transport of goods by motor common carrier. Their rate supervisory policies, restrictions on market entry, allocation of market shares, and their emphasis on the compensatory nature of rates; all of these serve to undermine attempts by common carriers to engage in standard forms of price and non-price competition. Inefficient firms do fail, but their exit from the market can only be delayed by the regulatory protections and the support offered to the survival of such firms by these policies.

Conversely, the economic stimulus required in this industry to allow efficiency and imaginative management to flourish is an increase in competition. If firms were allowed to offer a better service or a lower rate to the customers of their competitors, the inefficient firms would be forced to quickly increase their level of efficiency or exit from the market. At present, an aggressive firm must expend a sizeable sum and experience a significant delay while fighting the bureaucratic structure of the I.C.C. to obtain the necessary operating rights or the permission to lower their rates.

Regulation can weigh heavily on the shoulders of regula-
ted firms. It is not difficult to imagine how incentives could be dampened in a market where a manager's flexibility is severely limited. Other than routine scheduling, personnel administration, maintenance management and quality control functions, the role of a manager in an overly restrictive regulatory environment can be reduced to one of reacting to rules rather than acting on market opportunities. This is hardly an exciting prospect for a dynamic and imaginative executive.

What is needed then, is a form of competition which would allow a carrier, on its own initiative, to gain a larger market share or to price its output at a level consistent with its capabilities to provide transport of a higher quality or at a lower cost than its competitors. Such a system equates to direct price competition between carriers.

Marginal cost pricing, or any close variation of this price/output determination method, has been flatly rejected by the I.C.C. for use in the regulated transport market (17, 141-142). There is little to be gained by reviewing the extensive literature on this subject. It will simply be assumed that marginal cost pricing is not a legal alternative to the present cost-plus system. Having made this assumption, can regulation and price competition co-exist? Under the model proposed in this chapter—"Base-Return Pricing"—they can.

**Base-Return Pricing (BRP) Introduced**

Briefly, the base-return price determination system is
one which places primary emphasis upon a firm's level of efficiency relative to its competitors. Minimum revenue (rate) levels are computed based upon an I.C.C.-mandated minimum rate-of-return (the "base-return"). The system relegates operating expenses to the role as a limiter rather than a direct determinant of profits.

The primary advantage of the BRP system is that in addition to offering the efficiency incentive of potentially greater profits or market shares to a firm, it places the responsibility for realizing these gains squarely on the shoulders of carrier managers. The I.C.C. can no longer be petitioned to act as revenue source of last resort for carriers through routine approval of compensatory cost-push rate increases. A firm would control its own fiscal destiny under this system.

Arguments for the adoption of BRP are presented throughout the remainder of this work. In the following chapters, each of the obvious (to the author) objections to such a method is discussed. An explanation and an analysis of the system are presented in this chapter, with a discussion of the competitive implications of BRP conducted in chapter 6. The system's probable impact upon the industry is taken up in the final chapter.

Pre-requisites to BRP Application:
Modifying the Rules of Regulation

Major modifications to the regulatory rules applicable to this industry are required prior to application of the BRP
system. The Motor Carrier Act must be revised. These revisions are described in this section and are referred to throughout the remainder of this analysis.

1) All interstate carriers except those specifically classified as private carriers will be regulated under the new motor carrier act. They will be required to comply with the provisions of the BRP system.

2) Private carriers will be exempt from all route restrictions. Commodities hauled (to include backhaul) will be limited to those items used by the private firm in the course of its normal business.

3) Free market entry and exit of firms will be allowed, subject only to certification of a prospective entrant's capability to meet and comply with existing safety requirements and standards.

4) Rate-making will be the sole responsibility of carriers, subject only to the constraints on minimum rates required by BRP formulae.

5) Carrier financial records will be kept in the format prescribed by the I.C.C. They will be subject to un-announced audit by the commission. Reports will be submitted as required by the I.C.C. for monitoring the BRP system.

6) Each carrier will be required to publish a "Declaration of Areas Serviced" prior to beginning operations. Firms will have unrestricted access to all routes within the areas they designate for their own operations. A new declaration will be published at any time the firm wishes to modify its scope of operations. The declaration will be in the form of
a map. Serviced areas must take the form of a standard geometric figure, such as a circle, with its center located at a primary headquarters or warehouse of the carrier. Figure 4 is a much-simplified sample of a "Designation of Areas Serviced" as it might appear under this system.

The reason for specifying this type of operating area is based upon a major concern of regulators. With increased market freedom, carriers might try to ignore low-volume traffic areas (i.e., small towns). They may concentrate on the more low-cost service they are capable of providing to the high-volume metropolitan areas. If carriers were not required to define their operating area in a standard geometric shape, they could "gerry-mander" their operating areas to include only major highways and towns, excluding the rural areas. Under BRP, firms would be required to serve all shippers in their areas, eliminating this potential for discrimination.

This requirement to serve all area shippers also solves the problem of "through shipments", i.e., those passing beyond one carrier's service area. Once carrier "A" ships goods into carrier "B"'s service area, it constitutes a demand within "B"'s area. Carrier "B" is therefore required to transport the shipment at least through its area toward the shipment's final destination. This requirement to handle through shipments on demand should aid shippers by creating an incentive for inter-carrier cooperation in these operations (this topic is discussed further in chapter 7).

7) Carrier commodity restrictions will be greatly modified. Certain firms would continue to specialize, such as
DECLARATION OF AREAS SERVICED
Common Carrier Trucking, Inc.
1234 5th St., St. Louis, Mo.
Ph. 314-765-4321

EXCLUDED COMMODITIES:
(1) All Bulk Fuels
(2) All Perishables Requiring Refrigeration

Figure 4. Sample Declaration of Areas Serviced
household goods carriers do presently. Common carriers of
general freight, however, could haul all commodities, subject
to certification of their ability to comply with existing
safety, storage and handling requirements.

Those items which cannot be hauled, for whatever reason,
would be listed on the carrier's "Designation of Areas Ser-
vice". For example, a carrier may not wish to haul fuel or
perishables which require refrigeration. They would thus
design their operating capital structure to eliminate the
capability to handle these items; fuel and refrigerator trail-
ers would not be purchased. If a commodity is not specifi-
cally excluded by the carrier on its "designation", the firm
must be prepared to haul the commodity for any shipper in its
service area.

Discussion of the mechanics of operating under this sys-
tem, and the capability for carrier administration and I.C.C.
enforcement of applicable regulations, is delayed until chap-
ter 7, where the skeletal plan for re-regulation of trucking
is presented.

The Base-Return Pricing Model

With the regulatory "ground rules" adopted, we have only
to decide upon a specific base-return \(B\) which will be set
for the industry by the I.C.C. When this is accomplished,
the BRP formulae can be computed for firms and the system can
be implemented.

A reasonable return for use in this analysis is the "fair
return" suggested by Dr. Silberman in his industry risk analysis; \( B = .23 \). Under BRP, firms will be required to set rates at a level which will gain for them at least the base-return (23%) to their investment in transportation (\( rT \)), before taxes and interest.

The base-return formula is: \( R_B = B(\text{It}) + E \); where \( R_B \) = the operating revenue to be realized by the firm, \( B \) = the base-return to investment (23%), \( \text{It} \) = the firm's investment in transportation (net working capital plus net operating property), and \( E \) = the firm's operating expense. The base-return operating ratio (\( A_B \)) is similar to the previously discussed operating ratio (\( A \)), except that \( R_B \) is substituted for \( R \) in the formula: \( A_B = E \div R_B \). Subtracting \( R \) from \( R_B \) (actual revenue from the base-return revenue) will yield the total revenue change required by the firm to comply with BRP criteria.

To demonstrate the dynamics of the system, we will initially assume that there are only two firms in the industry, firms A and B. We begin in table 5.1 with data extracts from actual 1974 financial statistics of two of the 75 firms analyzed in this section (3). Firms A and B will be assigned these actual data during the analysis.¹

It would appear from the data presented in table 5.1 that firm B was the more efficient of the two, in that it received a significantly higher rate-of-return to investment (\( rT \)). The application of BRP techniques will disprove that assumption. It will show how profits could have been "normalized" between the firms and their combined revenues (the total
### TABLE 5.1

**Financial Statistics**

For Two Sample Common Carriers: 1 1974

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Firm A</th>
<th>Firm B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment In Transportation (It)</td>
<td>$3,087,000</td>
<td>$4,108,000</td>
</tr>
<tr>
<td>Operating Expense (E):</td>
<td>$11,975,000</td>
<td>$11,650,000</td>
</tr>
<tr>
<td>Operating Revenue (R):</td>
<td>$12,609,000</td>
<td>$12,955,000</td>
</tr>
<tr>
<td>Operating Ratio (E : R):</td>
<td>.9497</td>
<td>.8993</td>
</tr>
<tr>
<td>Rate-of-Return to Investment in Transportation (rT):</td>
<td>.21</td>
<td>.32</td>
</tr>
</tbody>
</table>

Firm B: Bender & Loudon Motor Freight of Ohio.  
cost to shippers) reduced. Base-return calculations for the two firms yield:

**Firm A:**  
\[ R_B = B(\text{It}) + E = 0.23(3087000) + 11975000 \]
\[ = 12,685,010. \]
\[ A_B = E \div R_B = 11975000 \div 12685010 = 0.9515. \]
\[ R_B - R = 12685010 - 12609000 = 76,010. \]

**Firm B:**  
\[ R_B = B(\text{It}) + E = 0.23(4108000) + 11650000 \]
\[ = 12,594,840. \]
\[ A_B = E \div R_B = 11650000 \div 1259840 = 0.9250. \]
\[ R_B - R = 12594840 - 12955000 = -360,160. \]

The total revenue change = \((R_B - R)_A + (R_B - R)_B = 76010 + (-360160) = -284,150.\) Under ERP, this amount would be removed from the transport bill of shippers.

With the revenue change requirements computed, these firms would now distribute the resulting revenue changes between the categories included in their rate structures. Since the I.C.C. does not require that individual firms report financial data broken down by shipment weight category, such data for firms A and B were not available for analysis. However, the revenue distribution process is demonstrated in the appendix to this thesis using hypothetical data. It may be of interest to the reader to see how this is accomplished while also attempting to reduce rate structure grant elements.

**Measurement and Analysis of Operating Efficiency**

We will assume that sample firms A and B have made the required distribution of revenue in the manner described in
the appendix. After application of BRP formulae, firms A and B would be earning the same rate-of-return: \( r_T = B = 0.23 \). Their new operating ratios \( (A_B) \) would be quite dissimilar, however. This variance in \( A_B \) can be used as a direct measurement of the relative efficiency of these firms. Such a measure is a basic requirement to the methodology of the BRP system.

As a general rule under BRP, the higher the base-return operating ratio \( (A_B) \), the higher the level of operating efficiency of the firm. Based upon this rule, firm A was "more efficient" than firm B by 2.86%:

\[
\frac{A_B \text{Firm A} - A_B \text{Firm B}}{A_B \text{Firm B}} = (0.9515 - 0.9250) = 0.0265 \times 100 = 2.65%.
\]

An alternate method of expressing this relationship is by computing the requirements for revenue in excess of expenses. Return-per-revenue-dollar \( (r_R) \) is calculated: \( r_R = (1 - A_B) \). For firm A: \( r_R = 1 - 0.9515 = 0.0485 \). For firm B: \( r_R = 1 - 0.9250 = 0.0750 \). Comparing these measures we find: \( \frac{0.0485 - 0.0750}{0.0750} = -0.35 \). Firm A can price its output so as to receive 35% less return-per-revenue-dollar than firm B, while they both earn identical rates-of-return to investment \( (r_T) \).

These approaches to the measurement of efficiency have important implications for the relative competitive positions of these two firms. However, before describing the BRP competitive hypothesis, a major objection to the BRP approach to the measurement of comparative efficiency should be discussed and disposed of.
Shipment Composition and Efficiency Measurement

In arriving at our base-return operating ratio as the overall measure of efficiency, several assumptions were implicitly made about the explanatory power of the aggregate data used. The numerator of the $A_B$ formula, $E$, reflects operating expenses incurred in shipping TL (truckload) as well as LTL (less-than-truckload) shipments. TL shipments generally result in a lower average unit cost than LTL shipments (17, 151). For this reason, it is charged that aggregating output into tons, miles or ton-miles can distort the efficiency implications of aggregate cost and output data (23, Appendix B).

Such is not the case for our efficiency measure, $A_B$. However, because of the recurring nature of this topic in the literature, the problem will not be dismissed so easily. It will be closely examined in this section to ensure that BHP is not credited with performing a function of which it is not actually capable.

Simply stated, the problem arises when the composition of a firm's output varies radically with that of another. For example, firm A shipped primarily TL shipments while firm B handled primarily LTL shipments. Without allowing for this output composition variance, a measure of efficiency based upon output and expenses would automatically assign the higher efficiency rating to firm A, based upon its lower average unit cost-per-ton.

In fact, efficiency may not impact on this comparison to
the degree assumed. The analyst might simply be observing the results of firm A handling primarily the less-costly TL shipments, while its competitor concentrates on LTL shipments. For this reason, shipment composition in a firm's output must be controlled for when measuring carrier efficiency in terms of output data.

The use of $A_B$ satisfies this requirement. This measure of efficiency has built into its structure the ability to eliminate output composition factors which cause distortions in efficiency measurement. BRP requires that a carrier receive revenue equal to at least that which would be received if all shipment categories paid their full share of operating costs. Therefore, even if a carrier concentrates on one shipment type (TL or LTL), his return will still be effected by the efficiency with which he moves those shipments, not by the weight or category of the shipment itself.

To demonstrate this point, an alternative measure of efficiency will be computed for our two sample firms A and B. This "efficiency ratio" (ER) will measure their relative efficiency levels while controlling explicitly for their respective output composition mixes. Using the BRP efficiency measure $A_B$, firm A was determined to be more efficient than firm B by 2.86%. If $A_B$ actually resolves the output composition problem, any measure of efficiency explicitly allowing for output composition should reach approximately the same conclusion. Therefore, if these computed efficiency ratios result in a measure (±5%) of that obtained using $A_B$ (2.717% to 3.003%), the base-return operating ratio will be accepted
as a reliable measure of carrier operating efficiency. Its competitive measurement property will then be used to analyze the performance of firms in their roles as competitors.

The efficiency ratio formula developed for use in this analysis is:

\[ ER = \frac{\frac{T_{LTL}}{E_{LTL}} \left(\frac{T_{LTL}}{T_{TOT}}\right) + \frac{T_{TL}}{E_{TL}} \left(\frac{T_{TL}}{T_{TOT}}\right)}{\text{It}} \]

This equation consists of the following elements:

\( \frac{T_{LTL}}{E_{LTL}} \): Cost-per-LTL ton. \( T_{LTL} \) (tons hauled in LTL shipments) was extracted from one of the two primary data sources for this section (3).

The most specific estimate found in the literature of the cost relationship between shipping LTL and TL shipments assigned a 2.08-to-1 cost ratio between LTL and TL categories. That is, LTL shipments were estimated to cost approximately 2.08 times as much per-ton to deliver as TL shipments (23, B-50). This relationship: \( AC_{LTL} = 2.08(AC_{TL}) \) will be assumed sufficiently accurate for purposes of the following analysis.

\( E_{LTL} \) (total expenses incurred in transporting LTL ton) is therefore computed:

\[ E_{LTL} = E \left(\frac{2.08 \left(\frac{T_{LTL}}{T_{TOT}}\right)}{2.08 \left(\frac{T_{LTL}}{T_{TOT}}\right) + \left(\frac{T_{TL}}{T_{TOT}}\right)}\right) \]

This equation yields total LTL expenses for the firm by assigning the appropriate unit cost to LTL tons and applying that rate to the portion of expenses used in LTL operations. \( \frac{T_{LTL}}{T_{TOT}} \) = the percent of all tons which were shipped in LTL categories.
\[ \frac{t_{TL}}{E_{TL}} \] is the cost per TL ton. \[ \frac{t_{TL}}{E_{TL}} \] is extracted from the same source as \( T_{TL} \) (3). \( E_{TL} = E - E_{TL} \).

\[ \frac{t_{TL}}{T_{TOT}} \] is the percent of all tons which were shipped in TL shipments.

\( I \) = investment in transportation. These data were extracted from the second primary data source (10).

Table 5.2 contains all data necessary to compute the efficiency ratios for the two firms. Computations yield:

**Firm A:**

\[ E_{TL} = 11975 \left( \frac{2.08 \left( 102877 \right)}{757055} + \frac{654178}{757055} \right) = 11975 \left( \frac{2.08 \left( 102877 \right)}{757055} + \frac{654178}{757055} \right) \]

\[ E_{TL} = 11975 - 2592 = 9383. \]

\[ E_{TL} = 11975 \left( \frac{2.08 \left( 102877 \right)}{757055} + \frac{654178}{757055} \right) = 11975 \left( \frac{2.08 \left( 102877 \right)}{757055} + \frac{654178}{757055} \right) \]

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\[ E_{TL} = 11975 - 2592 = 9383. \]

Comparing our efficiency ratios to determine the relative efficiency of these two firms we observe: \( ER_{Firm A} \)

\[ ER_{Firm A} = \frac{0.0213}{0.0072} = 0.2958 = 2.958\%. \] That is, firm A is 2.958
### TABLE 5.2

Financial and Operating Statistics\(^1\)
Sample Firms A and B: 1974

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Firm A</th>
<th>Firm B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Tons Hauled (^\text{TOT}):</td>
<td>7,570,55</td>
<td>3,016,22</td>
</tr>
<tr>
<td>LTL Tons Hauled (^\text{LTL}):</td>
<td>10,287,7</td>
<td>14,615,2</td>
</tr>
<tr>
<td>TL Tons Hauled (^\text{TL}):</td>
<td>6,541,78</td>
<td>15,547,0</td>
</tr>
<tr>
<td>Operating Expenses ((E)):</td>
<td>1,197,5</td>
<td>1,165,0</td>
</tr>
<tr>
<td>Investment in Transportation ((I_t)):</td>
<td>308,7</td>
<td>410,8</td>
</tr>
</tbody>
</table>

\(^1\)All figures in thousands.

times as efficient as firm B using the efficiency ratio method.

Comparing this relationship with that found using $A_B$ as an efficiency measure, we find that the ER measure varies only 3.4% from the $A_B$ measure: $(\pm) 5\% = 2.717\%$ to $3.003\%$. The ER result ($2.958\%$) is well within the range allowed prior to computing ER.

Based upon these findings, $A_B$ will be accepted as a reliable measure of the relative efficiency of firms. The output composition complaint will be dismissed as irrelevant when drawing conclusions about carrier efficiency using the base-return operating ratio ($A_B$).

To re-state our "general rule", the higher the base-return operating ratio, the higher the level of efficiency of a firm. The competitive implications of the efficiency measuring capability of $A_B$ are such that we can now build our model of price competition under regulation.

Notes

1. Sample firms A and B represent, respectively, U.S. Truck Company of Detroit, Michigan, and Bender and Loudon Motor Freight of Richfield, Ohio.

2. P. 53, Supra.
We determined in chapter 5 that when the base-return operating ratio \( A_B \) is the primary measure of carrier efficiency, our sample firm \( A \) out-performed firm \( B \) by a significant margin. Several options are therefore open to a firm such as firm \( A \), which has an efficiency advantage over its rival. The competitive implications of this situation make up the subject of this chapter.

Competitive Options

Managers of a firm with an efficiency advantage over its rival must decide between several competitive options. Within the constraints imposed by base-return revenue requirements and the magnitude of the competitive advantage, a firm can opt to maximize growth, or profits, or some combination of both. Alternatively, it may pursue some sub-maximizing course of action, usually described as "satisficing" behavior. Our concern will now be focused upon the processes through which the pursuit of these options would impact on the market and rate structures of the industry under BRP.

Four assumptions are basic to the analysis which follows:

1) Each firm is assumed to have equal access to all factors of production. Management talent, labor, technologically
advanced equipment and warehousing facilities are all assumed to be available at a non-discriminatory price to all firms. Whether or not these inputs are efficiently combined by the firm constitutes the primary competitive variable in the analysis.

2) All firms face the same long run industry average cost curve for each shipment type.¹

3) Customers are assumed indifferent to the services of firms. Product differentiation is possible only in terms of the rate charged.

4) The level of investment varies directly with the level of output; \( I(t) = (f)Q \). With increased output (more ton-miles hauled), more operating property (trucks, warehouse space, etc) must be obtained. No empirical measure was made of this relationship due to a lack of properly formatted statistical data. A hypothetical function is assumed for the theoretical presentation in this chapter.

These four assumptions, when combined with the base-return regulatory modifications listed in chapter 5,² result in a market wherein the internal efficiency of the carrier is the determining factor in its relative competitive position among its rivals. Given the requirement to earn a minimum rate-of-return (the base-return), the only way in which a firm can out-perform its competitors is by operating more efficiently. The firm which accomplishes this goal to a degree superior to its competitors can act on the competitive options discussed in the following sections: maximization of growth or profits.
Growth Maximization

If the carrier with the efficiency advantage opts to maximize growth (i.e., market share), it must first analyze its potential for price competition. Management must then determine the probable impact on the firm's market share if this course of action is pursued.

To demonstrate this managerial process of market analysis, we will assume a market composed of two hypothetical firms; X and Y. Table 6.1 contains the necessary financial and operating statistics for these firms. With both carriers initially earning $r_T = B = .23$, firm X must charge rates designed to gain at least 17.6¢ per-revenue-dollar in excess of operating expenses ($r_R = 1 - .824 = .176 = 17.6¢$). Firm Y must earn $r_R$ of at least 22.2¢. Lower rates than these would place the firms in violation of I.C.C. minimum rate regulations under BRP, by reducing their rates-of-return below the base-return level.

Firm X has a 4.6¢ per-revenue-dollar pricing advantage over firm Y (22.2 - 17.6 = 4.6). By setting its rates at the minimum level, firm X's price advantage will be realized. Being indifferent to suppliers, customers will be gained for firm X due to its competitive rate advantage. Firm X will increase its market share up to the point where the two firms' rates reach equality. This will occur due to the increased investment required of firm X as its output rises ($I_T = (f)Q$). At that point, shippers will be totally indifferent to the services of these firms due to the lack of any price differential, and X and Y will divide the remaining demand equally.
<table>
<thead>
<tr>
<th>CARRIER</th>
<th>Q</th>
<th>MKT SHARE</th>
<th>R_B</th>
<th>E</th>
<th>A_B</th>
<th>It</th>
<th>rR</th>
<th>rT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm X</td>
<td>1500</td>
<td>50%</td>
<td>12750</td>
<td>10500</td>
<td>.824</td>
<td>9783</td>
<td>17.6¢</td>
<td>.23</td>
</tr>
<tr>
<td>Firm Y</td>
<td>1500</td>
<td>50%</td>
<td>13500</td>
<td>10500</td>
<td>.824</td>
<td>13043</td>
<td>22.2¢</td>
<td>.23</td>
</tr>
<tr>
<td>TOTALS</td>
<td>3000</td>
<td>100%</td>
<td>26250</td>
<td>21000</td>
<td>.800</td>
<td>22826</td>
<td>20.0¢</td>
<td>.23</td>
</tr>
</tbody>
</table>

Source: Hypothetical data constructed by the author.
Figure 5 depicts this process graphically. We assume that demand remains constant at 3000 ton-miles (we will make no differentiation between TL or LTL tons for this example). The firms are assumed to be at a point on the industry AC curve where the average unit cost (less return) is constant over the relevant range (1250 to 1750 ton-miles). The E curve reflects AC (less return) for both carriers.

The two $R_B = B(\text{It}) + E = S$ curves represent the supply curves of firms X and Y. In this modified cost-plus approach, $R_B$ (the base-return revenue) must be realized for each shipment at all levels of output. The supply curves slope upward reflecting the investment function: $\text{It} = (f)Q$. Price and quantity combinations consistent with setting $r_T$ equal to the base-return can be plotted from these supply curves as shown by the dashed lines in figure 5.

There is no demand curve plotted. Demand is assumed to remain constant at 3000 ton-miles. Since shippers are indifferent to all but price, the firm with the lowest rate will supply all transport up to that point where another firm can match the rate. They then will begin to split the output equally between them.

At the point of application of BRP formulae, both firms have equal market shares. Each supplies 1500 ton-miles. However, due to the minimum rate constraints imposed by the BRP calculations, firm Y must charge $9.00 per-ton-mile while firm X may charge as low as $8.50. The vertical distance between the two firms’ supply curves measures this competitive pricing advantage of firm X. It reflects X’s ability
Figure 5. Base-Return Pricing: The Competitive Process (Growth Maximization)
through superior operating efficiency) to provide an equal amount of transport with a lower amount of investment, and hence, to be able to charge a lower rate.

Table 6.2 presents the financial and operating statistics for these two firms after firm X gains its full potential market share. Comparing tables 6.1 and 6.2, the impact of this competitive process on the market share distribution and the rate structure can be observed.

Firm X has captured 58.3% of the market. Shippers face the same overall price for their transportation; \( R_B = \$26,250 \) for supply of 3000 ton-miles. Both firms continue to earn the base return; \( r_T = 23\% \) before taxes and interest.

Firm Y cannot reduce its rates below a level at which its rate-of-return equals the base-return. In order to regain its market share, firm Y will have to shift its supply curve (\( R_B = B(It) + E = S \)) to the right. Since the base-return is set at its minimum by I.C.C. policy, reduction of the revenues required (shifting of the supply curve to the right) can only be accomplished by reducing investment or operating expenses. Reduction of either of these variables without a reduction in output implies increased efficiency.

Reducing investment while maintaining output, return and expenses at their current levels equates to using factors of production more intensively, i.e., getting more production for each dollar of investment. Reducing expenses while holding output, return and investment at their current levels requires the use of factors of production more efficiently, i.e., producing at a lower unit cost. Either of these actions will
TABLE 6.2

Financial and Operating Statistics
Hypothetical Firms X and Y
Growth Maximization: After Competition

<table>
<thead>
<tr>
<th>CARRIER</th>
<th>Q SHARE</th>
<th>MKT</th>
<th>$RB</th>
<th>$E</th>
<th>$A_B</th>
<th>It</th>
<th>rR</th>
<th>rT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm X</td>
<td>1750</td>
<td>58.3%</td>
<td>15312.50</td>
<td>12250</td>
<td>.800</td>
<td>13315</td>
<td>20.0¢</td>
<td>.23</td>
</tr>
<tr>
<td>Firm Y</td>
<td>1250</td>
<td>41.7%</td>
<td>10937.50</td>
<td>8750</td>
<td>.800</td>
<td>9511</td>
<td>20.0¢</td>
<td>.23</td>
</tr>
<tr>
<td>TOTALS</td>
<td>3000</td>
<td>100.0%</td>
<td>26250.00</td>
<td>21000</td>
<td>.800</td>
<td>22826</td>
<td>20.0¢</td>
<td>.23</td>
</tr>
</tbody>
</table>

Source: Table 6.1 and figure 5.
cause $R_B$ to drop, the supply curve will shift to the right, and firm Y will capture a competitive price advantage over firm X.

At that point, customers would gravitate to firm Y due to its lower rates. The shipping public would receive the same amount of transportation at a further reduced rate due to Y's increased efficiency. During the entire process, both firms X and Y will retain their rate-of-return at $R_B$, the I.C.C. required rate.

Accepting the growth maximization option can cause firms to continuously strive to improve their efficiency. This results in a lower transport bill for the economy and a more efficient or intensive use of factors of production. Both of these results are consistent with optimal economic behavior and the national transportation policy.

**Profit Maximization**

If the carrier with the efficiency advantage opts to maximize profits ($rT$), management is again faced with analyzing the firm's potential profit capabilities. To demonstrate this process, we again start with the data assumed for hypothetical firms X and Y in table 6.1.

Figure 6 graphically presents the profit maximization process. Table 6.3 contains the mathematical computations implicit in figure 6. The figure and table are collated by placing the (a), (b), (c) and (d) of figure 6 under the CARRIER column of table 6.3.
Figure 6. Base-Return Pricing: The Competitive Process (Profit Maximization)
### TABLE 6.3

**Financial and Operating Statistics**

**Hypothetical Firms X, Y and Z**

**Profit Maximization: After Competition**

<table>
<thead>
<tr>
<th>CARRIER</th>
<th>MKT</th>
<th>Q</th>
<th>SHARE</th>
<th>R_B</th>
<th>E</th>
<th>A_B</th>
<th>It</th>
<th>rR</th>
<th>rT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Firm X</td>
<td>1500</td>
<td>50%</td>
<td>12750</td>
<td>10500</td>
<td>.824</td>
<td>9783</td>
<td>17.6¢</td>
<td>.23</td>
<td></td>
</tr>
<tr>
<td>Firm Y</td>
<td>1500</td>
<td>50%</td>
<td>13500</td>
<td>10500</td>
<td>.778</td>
<td>13043</td>
<td>22.2¢</td>
<td>.23</td>
<td></td>
</tr>
<tr>
<td>TOTALS</td>
<td>3000</td>
<td>100%</td>
<td>26250</td>
<td>21000</td>
<td>.800</td>
<td>22826</td>
<td>20.0¢</td>
<td>.23</td>
<td></td>
</tr>
<tr>
<td>(b)1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>Firm X</td>
<td>1500</td>
<td>50%</td>
<td>13500</td>
<td>10500</td>
<td>.778</td>
<td>9783</td>
<td>22.2¢</td>
<td>.31</td>
<td></td>
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<tr>
<td>Firm Y</td>
<td>1500</td>
<td>50%</td>
<td>13500</td>
<td>10500</td>
<td>.778</td>
<td>13043</td>
<td>22.2¢</td>
<td>.23</td>
<td></td>
</tr>
<tr>
<td>TOTALS</td>
<td>3000</td>
<td>100%</td>
<td>27000</td>
<td>21000</td>
<td>.778</td>
<td>22826</td>
<td>22.2¢</td>
<td>.26</td>
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<tr>
<td>(c)1</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firm X</td>
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<td>50%</td>
<td>12750</td>
<td>10500</td>
<td>.824</td>
<td>9783</td>
<td>17.6¢</td>
<td>.23</td>
<td></td>
</tr>
<tr>
<td>Firm Y</td>
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<td>8500</td>
<td>7000</td>
<td>.824</td>
<td>6521</td>
<td>17.6¢</td>
<td>.23</td>
<td></td>
</tr>
<tr>
<td>Firm Z</td>
<td>1000</td>
<td>33%</td>
<td>8500</td>
<td>7000</td>
<td>.824</td>
<td>6521</td>
<td>17.6¢</td>
<td>.23</td>
<td></td>
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<tr>
<td>TOTALS</td>
<td>3500</td>
<td>116%</td>
<td>29750</td>
<td>24500</td>
<td>.824</td>
<td>22826</td>
<td>17.6¢</td>
<td>.23</td>
<td></td>
</tr>
<tr>
<td>(d)1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firm X</td>
<td>1332</td>
<td>44%</td>
<td>11033</td>
<td>9324</td>
<td>.845</td>
<td>7430</td>
<td>15.5¢</td>
<td>.23</td>
<td></td>
</tr>
<tr>
<td>Firm Y</td>
<td>834</td>
<td>28%</td>
<td>6908</td>
<td>5838</td>
<td>.845</td>
<td>4652</td>
<td>15.5¢</td>
<td>.23</td>
<td></td>
</tr>
<tr>
<td>Firm Z</td>
<td>834</td>
<td>28%</td>
<td>6908</td>
<td>5838</td>
<td>.845</td>
<td>4652</td>
<td>15.5¢</td>
<td>.23</td>
<td></td>
</tr>
<tr>
<td>TOTALS</td>
<td>3000</td>
<td>100%</td>
<td>24849</td>
<td>21000</td>
<td>.845</td>
<td>16734</td>
<td>15.5¢</td>
<td>.23</td>
<td></td>
</tr>
</tbody>
</table>

1Sections (a), (b), (c) and (d) of this table correlate to the equivalent lettered sections of figure 6.

Source: Table 6.1 and Figure 6.
We begin in figure 6(a) with the market position of each firm immediately after the application of BRP. The firms have equal market shares. Firm X supplies its transportation at $8.50 per-ton-mile while firm Y charges $9.00. These rates are set at the minimum allowable level under the BRP minimum rate restriction; both firms are earning $r_T = 23\%$. Table 6.3(a) shows the market statistics for this situation.

In figure 6(b), firm X has decided to raise its rates equal to firm Y's to capture a higher rate-of-return. The shaded area identifies that range of rates which will yield $r_T > 0.23$ for firm X. Table 6.3(b) shows that firm X has indeed raised its rate-of-return to 0.31 at the expense of the shipping public. The total transport bill has risen nearly 3\% from $^RB = $26,250 to $^RB = $27,000. However, firm X cannot maintain this position beyond the short run.

Rates-of-return of regulated firms are (and would continue to be under BRP) public information. Entrepreneurs would quickly note the economic profits accruing to firm X ($r_T > b$). With freedom of entry, potential competitors would be attracted into the industry. This action would result in a rapid deterioration of firm X's price advantage.

To demonstrate how entry of a new firm would effect the market, we will assume the entry of firm Z. We will also assume that firm Z is only as efficient as our less-profitable firm Y (At any assumed level of efficiency, the analytical concepts would remain the same. Only the resulting statistics would change to reflect different relative market positions for the three firms.).
Figure 6(c) reflects the market structure immediately after the entry of firm Z. Referring to table 6-3(c), we note that an excess supply condition has developed. 3500 ton-miles are offered at a rate of $8.50 per-ton-mile. Only 3000 ton-miles are demanded. Firm X has had to lower its rate to $8.50 to retain its market share. Its excess rate-of-return has been eliminated. The three firms must now compete for market shares as the excess supply is contracted.

Figure 6(d) shows the long run market structure. Table 6.3(d) shows that demand equals supply—the market is again in equilibrium. Major changes have occurred in the aggregate market financial statistics, however. The total transport bill has been reduced by 5.3% over its original amount from $26,250 to $24,849. Investment in transportation has been reduced by over 26% from $22,826 to $16,734. That "extra" $6,092 has been released for investment in other sectors of the economy.

Accepting the profit maximization option causes transportation factors of production to be used more intensively and efficiently. This results in a lower transport bill for the economy. These findings parallel those achieved in the growth maximization model; they are consistent with optimal economic and regulatory results.

Alternative Competitive Options

Modifying or combining portions of the growth and profit maximizing options, or aiming for less than maximized results,
will not change the basic analytical concepts presented in the previous two sections. The primary effect of these actions will be to dampen the impact of the potential market effects of these basic competitive options. For this reason, analysis of these alternatives will not be conducted here. Figures 5 and 6 will provide the reader with a framework for analysis of the potential results of this sub-maximizing behavior.

**BRP Price Competition: "Marginalism Through the Back Door"**

We have seen that requiring common carriers to operate within a BRP market framework could cause an improved utilization of the factors of production devoted to the provision of interstate motor transportation services. This improvement in factor utilization could also result in an overall decrease in the public transport bill as carriers move closer to the minimum point on their long run AC curves.

BRP also grants much more freedom to make basic supply decisions to common carrier managers. The economic incentives provided by this system might result in improvements in technology and management techniques as carriers attempt to maximize their operational efficiency.

Even though marginal cost pricing is not explicitly employed under this system, marginal relationships would become of greatly increased importance to imaginative managers. Carriers should increase output (their "service area" size) up to that point where the marginal revenue gained from servicing
the last unit of area would be equal to the marginal cost of providing that service. Adjustments should be made in capital stock and service area as the \( MR = MC \) position is sought.

Underlying this entire system are the basic price and output results sought under any of the marginal approaches to price and output determination. How, then, does BRP really differ from the standard models of price competition contained in the body of economic theory? It differs in two primary ways:

1) The process by which rates (prices) are actually set differs considerably. Carriers must supply all demand within their service areas. Therefore, rather than the conventional approach; setting \( MC = MR \), firms must attempt to shift \( MC \) and \( MR \) to that level consistent with the optimal method of supplying a "given" demand. This approach requires carriers to seek the maximum level of efficiency through minimization of all costs incurred in their operations. This can only be accomplished through improved management techniques (or an improvement in the level of technology) which would lead to a more efficient and intensive use of all factors of production.

2) This system contains little if any potential for leading to the market results of competition feared by regulators. The requirement for all firms to earn the base-return requires that they maintain rates no lower than that level which covers full costs—-to include variable costs, total fixed costs, and at least the base-return to their investment. This requirement excludes all possibility for the development of "predatory" price competition. In summary, BRP could re-
result in a very unusual economic phenomenon; the reconciliation of regulation and price competition!

To test the economic claims made for BRP against the "real world", the following chapter will discuss the projected impact of such a system on several current industry problems, all of which tend to supply much "heat" to the regulatory debate. This will be followed by the presentation of a skeletal plan for implementing the BRP system within the current regulatory administrative structure.

Notes

1. The industry AC curve for shipment types could not be estimated in this thesis due to the non-availability of necessary data. Firms are not required to report (and are most reluctant to disclose) their cost data by shipment weight. Likewise, rate bureaus were similarly non-committal when approached for data gathering assistance.

2. PP 45-49, Supra.
In order for any form of price competition to be adopted in the industry under study, it must first be capable of assuaging regulators in regard to their many economic fears of increased market freedom. It must also provide for an industry at least equal to the present one in efficiency and responsiveness to demand. In order for the base-return pricing approach to regulatory and pricing practices in this industry to pass these tests, it must essentially be demonstrated that this system is capable of reconciling the inherent economic conflicts between the concepts of regulation and competition.

The most profitable approach to demonstrating the capability of BRP to pass these "tests", it seems, would be to concentrate on the areas and problems of current debate in the literature between regulators and de-regulators. Such an analysis might provide a new perspective from which these philosophical opponents can view the issues. If BRP has something constructive to add toward solutions for these problems, its adoption might appear even more appealing to policymakers.

Five of the most important areas of regulatory dispute will be discussed in this chapter; 1) predatory pricing; 2)
market concentration; 3) industry stability; 4) the "small shipment" problem; and, 5) the "backhaul" problem. If BRP leads to resolution of the conflicts involved in these areas, its adoption will be assumed. At that point, a suggested administrative structure for the BRP-regulated industry will be developed, along with recommended new roles to be played by rate bureaus and the I.C.C.

Predatory Pricing and Market Concentration

The Primary I.C.C. fear of price competition in the industry was summarized earlier as: 1

...able to sustain losses beyond the short run, they (larger firms) would begin to provide transport services without covering full costs....."predatory" firms would thereby gain major market shares accompanied by excessive market power.....this.....situation would naturally lead to.....a general deterioration of.....our transportation system.

Predatory pricing would not be legally possible under BRP. The imposition of the requirement to earn a base-return eliminates any possibility of predatory pricing activity occurring in the regulated sector of the industry, except through a direct violation of the law. Analysis of the base-return revenue equation \( R_B = B(\text{It}) + E \) and the relationships of the other BRP variables will reveal the constraints on rate-making which prevent predatory pricing practices. The key rate-making variables and their inter-relationships are described in the following series of equations:

\[
R_B \quad \text{(Base Revenue)} = B(\text{It}) + E \\
B \quad \text{(Base-Return to Investment)} = (f)\text{I.C.C. Policy (based}
upon industry risk analysis).

\[ \text{It (investment in transportation)} = (f)Q, \text{ Ex, Pf.} \]

\[ \text{E (Operating Expenses)} = (f)Q, \text{ Ex, Pf and Rr.} \]

\[ \text{Q (Output)} = (f)\text{Demand.} \]

\[ \text{Ex ("X"-efficiency)} = (f)\text{Management.} \]

\[ \text{Pf (Factor Prices)} = (f)\text{Supply and Demand in Factor Markets.} \]

\[ \text{Rr (Regulatory market Restrictions)} = (f)\text{Law.} \]

\( R_B \) represents the minimum rate level allowable under law. Carriers must earn a return-to-transport investment of at least 1%, which is set by the I.C.C. E and It are therefore the only variables in the \( R_B \) equation. In order to set rates at a lower level (as a potential predator would desire), E or It must be reduced.

A reduction in It requires either a reduction in Q, or Pf, or an increase in Ex. Reducing Q is equivalent to reducing market share (contracting the "area serviced"). Since the goal of a predatory price reduction is an increase in market share, reduction of Q would constitute irrational behavior on the part of a would-be predator.

Pf is determined by the supply and demand for factors of production. Since we have assumed non-discriminatory access to these factors (all carriers confront the same market supply curve),\(^2\) a reduction in factor prices would effect all firms equally, granting no advantage to a price predator.

In both economic and management theory, an increase in Ex is one of the major goals of business. A firm which can decrease its rates due to increased efficiency is behaving
optimally. Regardless, predatory pricing requires that firms autonomously set rates below a full cost level. An increase in Ex results directly in a reduction of costs. The firm would not be acting in a predatory manner by reducing its rates in response to a new efficiency-induced lower ATC curve.

A reduction in E requires a reduction in Q, or Pf, an increase in Ex, or a discriminatory reduction in expenses attributable to I.C.C. policies (Rr). Q, Pf and Ex have been disposed of in the preceding paragraph as possible contributors to predatory pricing. If Rr under the new Motor Carrier act treats all firms equally in regard to their market capabilities and options (as the BRP system does), this variable must also be rejected as a possible contributor to predatory pricing potential.

Without this predatory option legally available to firms, market concentration can develop only to that point where all remaining firms have maximized their efficiency (lowered E and It to their minimum levels consistent with the carrier's level of output). At this point, all remaining firms would be operating at the lowest point on the industry long run AC curve. They would be of optimal size consistent with their production function and their level of demand. This result for the market structure should appeal to regulators. In addition to increasing the overall efficiency of the industry, fears of the results of price competition will have been allayed.

The long run equilibrium market structure would most likely consist of fewer firms. However, oligopoly develop-
ment would not be expected. Pressured by the level of the required base-return (B) to seek their minimum investment and expense levels consistent with their desired market share, carriers would move in the long run toward the optimum size and number for the market. This would come about as they reached the minimum point on the Ex-minimized AC curve. Figure 7 depicts this process.

In figure 7(a) and 7(b), the potential for reduction of $R_B$ (i.e., the potential for price competition) is contained on the vertical axis, with carrier size (a) and number of carriers (b) on the horizontal axes. A hypothetical Ex-efficiency minimized average cost curve is depicted for the industry.

In figure 7(a), point M is that point where a carrier has minimized its It and E (i.e., maximized its efficiency). As it moves in either direction along PMC away from M, AC increases as its size varies from the optimum. This causes its potential for price competition to fall relative to its competitors. M is therefore an equilibrium point for carriers toward which managers would attempt to move their firms.

In figure 7(b), M again represents an equilibrium point. This time, however, it is a market concentration equilibrium. At point M, there are the exact number of firms in the industry to allow them all to operate at the minimum point on the maximum efficiency AC curve ($AC_{ExM}$). If firms leave the industry, the number of carriers will fall toward point P. Demand must be met by carriers according to regulatory (BRP) law. Therefore, existing firms must "pick up the slack" for
Potential for Reduction in Base-Return Revenue ($R_B$).

Average Cost Curve Minimized, assuming industry maximization of $\text{Ex}$ ("$X$"-efficiency).

Figure 7. Market Structure Versus Competitive Potential In The Base-Return Pricing Long Run
departed firms. This causes them to move away from their optimal output (as reflected in figure 7(a) by point M), as they increase either It or E due to the increased demand.

The result of this adjustment would appear directly in rate increases due to the minimum rate requirements imposed by the base-return. At this point, entrepreneurs would note their potential to under-price existing firms by operating at M in figure 7(a). They would enter the market and compete business away from existing firms until the industry again stabilized at point M in figure 7(b).

If firms enter the industry when it is at M, they have a zero probability for survival. Demand is being met by the optimal number of firms operating at the absolute minimum cost. The only way a new firm could gain business, aside from the appearance of a new increased demand for transport, would be to under-price existing firms. This would be impossible due to the requirement to gain the base-return. A new firm could not earn such a return because existing firms are already charging the absolute minimum base-return rate. The new firm must charge the current industry rate, which will gain for it no competitive advantage over existing firms. The new entrant will be forced to leave the market.

No measure of "M" for either the size or number of firms was computed. However, to give the reader a highly speculative estimate of the long run BRP structure, analysis of existing firms can be conducted.

If the average "class I" regulated motor carrier of property in 1974 were to be considered a reasonable estimate of
optimal carrier size, 1,170 such carriers would remain under figure 7(b)'s long run equilibrium. This number excludes intra-state and private carriers. By almost any measure, 1170 can be considered to constitute "many sellers". Adoption of BRP does not appear to hold much potential for excessive market concentration.

Industry Stability

The preceding section was obviously of a highly theoretical nature. It is not suggested that market reality would ever closely resemble figure 7. There are simply too many variables in the production function of a common carrier (not counting the highly volatile human variable). Given this concession to reality, the I.C.C. concern about industry stability must be addressed.

According to the commission, allowing free market entry (which BRP does) would result in great turbulence in the industry. Firms would enter and leave rapidly, distorting the market structure and resulting in unreliable transport supply (16, 59). Beyond the short run, the adoption of BRP should have the opposite effect. Market structure and supply should both tend to stabilize.

After the publication of BRP rate schedules, competition for market shares would naturally increase. The more efficient firms would capitalize on their pricing advantages and the less efficient would overhaul their operating procedures. This period would probably be marked by significant shifts in
market shares. At the end of this initial "adjustment" period, the industry would tend to stabilize.

"Free" market entry, as described earlier in this thesis, should not be interpreted as "easy" market entry. The prospective entrant would first have to recognize a need (demand) for his services. He would then have to devise an operational management plan which would provide transport services at a level of efficiency at least equal to existing firms. Again, it is the imposition of the required base-return which prevents the market from being flooded with inefficient firms.

This does not mean that BRP market entry requirements are insurmountable; quite the contrary. If the existing transport demand is not being met in quality and quantity by existing firms, a market entrant can supply that demand with little effective opposition from currently operating carriers. To demonstrate this process, the assumption of consumer indifference to all but rate differentials will be lifted somewhat. We will assume that one transport quality variable - transit time - results in service differentiation for shippers.

Assume, for example, an area which is served by five carriers of equal size who are operating at the highest possible level of efficiency (and therefore, at the lowest possible rate level). In the following simple market description, demand is being met but the time element required to transport the average shipment (the quality variable) is constrained by the maximum capabilities of the five existing firms.
Demand: 10,000 ton-miles.
Carriers: Five.
Supply: 10,000 ton-miles.
Average Delivery Time: 72 hours per-ton-mile.

If a market study indicates that shippers in this area desire quicker response to their shipping needs, the new carrier could enter the market, pick up some of the traffic, and operate at a healthy profit level (at least B). A revised market description might then be:

Demand: 10,000 ton-miles.
Carriers: Six.
Supply: 10,000 ton-miles.
Average Delivery Time: 60 hours per-ton-mile.

If shippers had been satisfied with the quality of service (i.e., transit time) being provided by the five initial firms, there would have been no possibility for the new firm to gain a market share. Since the five firms were assumed to have been operating at the lowest possible cost, there would have been nothing which the new market entrant could have offered customers to solicit their business. Entry would have been prevented by the market.

This is the result which the I.C.C. presently seeks when it requires that certificates of public convenience and necessity be obtained by a prospective carrier prior to market entry. However, the value judgements of regulators and the self-supportive testimony of existing firms, both of which currently impact on I.C.C. market entry decisions, would not enter into the picture in the ERP case (13, 36-40)(28). These subjective
factors would give way to the objective decisions of the marketplace, which would rule on all market entry cases.

The Small Shipment Problem

I.C.C. policy reflects regulators' belief that, given free choice over all supply decisions, carriers would ignore small shippers and many small or otherwise "undesirable" shipments. They would concentrate instead on the more low-cost/high-volume traffic available in metropolitan areas. The result of this discrimination would be the eventual elimination of the capability to market some commodities, and the virtual economic suffocation of small communities. These phenomena would occur because of the prohibitive costs involved in these small shippers providing their own transport (15)(19, 16).

This scenario could easily develop under total de-regulation. However, this phenomenon would not occur under BRP. There is simply no incentive to ignore any particular type of shipment or shipper. BRP imposes upon the carrier the requirement to earn the base-return on all shipments. The carrier's real incentive thus becomes the handling of small shipments in a more efficient manner than his competitors. This will allow it to either capture as much of the small shipment market as possible, or gain the highest return possible.

Rates will always be higher per-ton-mile for small shipments than for large, simply because E is higher per-ton-mile for small shipments (17, 151). However, these shipments will
not be priced out of the market due to transport rates. Under BRP, if one firm is charging these shippers an exhorbitant rate either to reap increased profits or because the carrier is simply inefficient, another firm will quickly begin supplying the demand at a lower rate. This will occur either because profits greater than B are available, or because the competitor of the current firm will realize its efficiency advantage and attempt to capture the market. Either way, the exhorbitant rates will continuously be pressured downward toward their minimum level; that which would be charged under a maximized "X"-efficiency level.

The only possibility for discrimination against a particular shipper or shipment type exists, again, in a violation of the law; either the Motor Carrier Act or the antitrust statutes (collusion among firms to keep prices higher). Either of these, upon a regulator's initiative or a shipper's complaint to the I.C.C., can be rectified by judicial enforcement.

It is realized, however, that regulators, who see little virtue in competitive pricing or pure competition, would not easily take this profit and/or market share maximizing scenario on faith. Therefore, the provision has been included in the BRP framework to include the requirement that all carriers serve all existing shippers in their "designated service areas". A firm is thus legally bound to transport the goods offered for shipment in its operating area regardless of location or size.

It is left to the professional regulators to devise an
effective penalty for violation of this provision. However, a temporary mandatory reduction of the area serviced by the violator has appeal as an effective deterrent against this type of economic discrimination.

The Backhaul Problem

The "backhaul problem" exists as a result of current regulatory rules which are designed to protect the market shares of regulated firms. Simply, it involves restrictions placed upon carriers as to the types of commodities which they can haul on return trips ("backhauls").

Certain commodities are restricted from backhaul over specified routes for two primary reasons; 1) they could infringe upon the market of another carrier operating over that route; or, 2) they could result in the disruption of the rate structure if backhauling carriers under-price their services so as to cover only variable costs (14, 16-21). The backhaul problem should cease to exist under BRP.

Backhaul competition from private (non-regulated) carriers has been prohibited by the BRP system. One of the requirements stated in this thesis to be a pre-requisite to the adoption of BRP was:

....Commodities hauled (to include backhaul) will be limited to those items used by the private firm in the course of its normal business....

There are no guaranteed market shares under BRP. However, since commodities owned by private carriers were never in the market for transportation by regulated carriers, they could
not negatively effect the demand structure of the regulated market. Regulators are apprehensive that carriers could charge rates designed to cover only variable costs of a backhaul, thereby disrupting the rate and market structures artificially. BRP also makes this practice prohibitive. Carriers must earn a rate-of-return of at least B. If a carrier under-charges on backhaul runs so as to cover only the variable costs of the shipment, he must raise rates on other shipments to make up the deficiency resulting from this practice. This would open his rate structure to increased competition from other firms operating in the same area.

This rate "check-and-balance" system operates in the following manner: The formula for a single rate (r) is: 
\[ r = \frac{E_s}{E} [B (I_t) + 1] \]
where \( E_s \) = the operating expenses incurred in the particular shipment. \( \frac{E_s}{E} \) therefore equals the proportion of total operating expenses chargeable to that shipment (variable costs plus a proportional share of fixed costs). We will assume the following greatly simplified operating data for a hypothetical carrier to demonstrate the rate-making process; \( I_t = $1000, B = .23, E \text{ per-ton-mile} = $1, \) and total ton-miles hauled in the revenue period (the fiscal quarter) = 10,000. We will also assume that the firm is perfectly efficient.

The firm contracts for a 100 ton-mile trip (say, 4 tons for 25 miles). It charges on the first half of the trip the full rate of: 
\[ r = \frac{100}{10000} \left[ 23(1000) + 1000 \right] = $102.30. \] On the return trip (the backhaul), it charges only for variable ex-
penses. This reduced backhaul rate is; \( r = \$1(\text{ton-miles}) = 1(100) = \$100 \). The firm has earned a total of \( \$102.30 + \$100 = \$202.30 \) on the entire run.

At the end of the revenue period the carrier must have earned at least its base-return to investment. To do that, it must have earned revenues equal to at least \( R_B \), which is computed; \( R_B = B(\text{It}) + E = .23(1000) + 10000 = \$10,230 \). Operating at the reduced backhaul rate, the carrier would only earn revenues equal to its reduced-rate earnings per-ton-mile times the total ton-miles, which is; \( R = \frac{202.30}{200}(10000) = \$10,115 \). Its rate-of-return equals; \( \frac{(R - E)}{\text{It}} = \frac{(10115 - 10000)}{1000} = .115 \). The carrier did not earn a rate-of-return at least equal to \( B \ ( .23 ) \) and is therefore in violation of the Motor Carrier Act.

To correct this deficiency, the firm must raise its rates above its current level to regain its required \( r_T \). Upon raising its rates, its competitors automatically gain a price competition advantage over it; a situation a carrier manager would presumably avoid. BRP thus appears to solve the backhaul problem.

Implementing BRP: Regulatory Procedures and Requirements

Having seen that BRP can go far toward ensuring compliance with the spirit of the basic requirements of the national transportation policy while simultaneously encouraging the development of a more efficient industry, we will now assume that the I.C.C. has decided to adopt the system for use in
this transportation sector. After the initial BRP calculations have been completed, rates have been published by firms and declarations of areas serviced have been filed, a standard administrative system would be required to ensure the continued successful operation of BRP. Drafting the legal basis of the administrative framework is rightfully the business of I.C.C. commissioners and industry participants. The following suggestions are submitted for consideration by regulators as they approach this task:

Rate Schedules: All rates should be filed with the I.C.C. and made available to the public on demand. Rates should be revised quarterly. The requirement to earn at least $R_B$ should be the overriding consideration in these adjustments. The following are samples of other factors which, as a minimum, should be taken into consideration by firms when computing their quarterly rate revisions:

1) The level of demand during the relevant quarters for the preceding two years (a seasonal factor);
2) General economic trends in the economy;
3) I.C.C. demand projections;
4) Planned investment or dis-investment;
5) Unusual cost predictions (such as an upcoming Teamster's wage hike or a predicted fuel price increase);
6) Specific shipment category cost changes; and,
7) Revenue deficiencies or surpluses in relation to $B$ remaining from past quarters.

When these data are inserted into a firm's production function, revenues (and therefore rates) can be computed by
mathematical computations that are clearly computer-applicable. It is recognized that rates will vary with the accuracy of future estimates. This is the precise reason for requiring quarterly adjustments. Changes can be brought into line with actual costs and realized demand before a firm's profit level is greatly distorted.

Areas Serviced: Changes to areas serviced should be filed only with quarterly rate revisions. More frequent changes would introduce confusion into the market and rate structures. These revisions should be made available to the public upon request, and should be filed with all I.C.C. field offices in the carrier's operating area. Shippers could thereby obtain information quickly and inexpensively on available services.

Reports: Full disclosure of operating and financial statistics should be accomplished quarterly by all carriers. In order to evaluate carrier operations effectively, the I.C.C. should require at least the following information:

1) All aggregate financial and operating data, similar to that published by the American Trucking Associations, Inc. in its financial and operating statistics periodical (3); and,

2) Financial and operating data, broken down by standard weight category (for rate structure grants analysis).

There would no doubt be other financial and operational administrative requirements resulting from the adoption of BHP which have not been included in this section. The administrative burden which could result from these requirements would be counter-productive if carriers were required to
spend an inordinate amount of their time and financial assets on these tasks. For this reason, it is recommended that firms depend for much of their BRP administrative support on the current industry rate-makers; the motor carrier rate bureaus.

BRP Administration:
A New Challenge for Rate Bureaus

Many complex and time-consuming activities would be required of carriers under the BRP system. Many firms might not be equipped with the expertise to conduct the operational and financial analyses necessary for compliance with I.C.C. reporting requirements and BRP rate-making constraints. Motor carrier rate bureaus are ideally suited to fill this management gap for carriers.

Most of the data analysis required under BRP would be highly adaptable to computer applications. Rate bureaus currently have data processing capabilities which they use extensively in the rate change justifications which they prepare for submission to the I.C.C. for member firms (10)(20)(23)(25)(28). Working with carriers, they could increase the effectiveness of the industry by performing many necessary management-enhancing functions in the areas of statistical manipulation and report preparation.

For example, the rate-making/rate-adjusting process could be accomplished in a manner not unlike the following: Carriers would first submit necessary financial and operating statistics to the rate bureau, to include any unique operational plans,
cost predictions or management decisions which would directly impact upon the level of rates. The bureaus would develop a rate-making computer program based upon the base-return revenue requirement \( R_B = R(1) + E \) and the elements of the firm's cost and production functions.

With the proper program, rate bureaus could provide carriers with a comprehensive rate schedule based upon minimum allowable rates. After the carrier's management analyzed the minimum rate schedule, a decision could be made as to what percentage (if any) the firm wished to exceed its minimum return. If, for example, the carrier knows it has a 10% pricing advantage over its competitors due to superior efficiency, it may wish to set rates slightly above its minimum level so as to gain a return greater than \( B \), while maintaining (or increasing slightly) its market share. This decision would be given to the rate bureau, which would then prepare:

1) The actual rate schedule of the carrier for the coming revenue period;

2) Proforma aggregate financial summaries for submission to the I.C.C.; and,

3) Aggregate operational and financial summaries of past operations by shipment category for submission to the I.C.C.

The carrier would file these items with the commission, distribute its new rate schedule as necessary, and continue operations.

The bureaus could perform other functions which would be of great value to carriers, such as:

1) Preparing market studies;
2) Advising on the potential for profit from various areas;

3) Providing investment advice, to include surveys of factor markets and their relative prices;

4) Publishing average cost data for shipment types from the data in its computer memories;

5) Aiding in the establishment of "through-service" operations. Advising all firms on the most practical and jointly profitable points for inter-area shipment transfers; and,

6) Providing other research and analysis projects upon request of member firms.

Rate bureaus could "make the system go"!

BRP Management:
A Revised Role for the I.C.C.

With the adoption of BRP, the role of the I.C.C. as regulator of the motor transportation industry would change radically. It is left to the professional regulators to define their specific activities under this system. Some functions which might be performed by the commission in its new role include:

1) Periodic risk analysis of the industry to permit timely revision of the required base-return when risk factors justify such adjustments;

2) Periodic surprise examinations of carrier financial records to ensure compliance with BRP minimum rate regulations;

3) Periodic shipper surveys to search out potential vio-
lations of regulations committed against uninformed and unwary shippers;

4) Periodic publishing of industry statistics, to include basic financial data;

5) Periodic demand projections based upon carrier and shipper surveys; and,

6) Enforcement of all violations of the act.

ERP: "The Bottom Line"

The BRP system has been outlined and its implementation and administration have been discussed. What then is the economic summation of the application of this approach? This system, when fully implemented, would theoretically bring about, in the long run, the following economic results:

1) Price would be set at the minimum point on the industry long run ATC curve;

2) An optimal and stable rate structure would prevail;

3) All firms would receive exactly that rate-of-return necessary to attract sufficient capital investment;¹¹

4) Demand would equal supply for all shipment types;

5) Grants would not exist; subsidies and cross-subsidies would be eliminated;

6) Industry composition would be optimal; no excessive market concentration or saturation would exist; and,

7) "X"-efficiency would be maximized; all factors of production would be combined in their optimal mix and would be used as intensively as possible.
The degree to which any of these claimed potential results of BRP application are realized in practice depends upon the human capabilities of management. However, the degree to which these objectives are realized is less important than the direction in which they would point the industry.

A key objective of the U. S. economy in the future must be the economical use of resources in the production of essential, quality products;

.....The essential measure of the success of the economy is not production and consumption at all, but the nature, extent, quality and complexity of the total capital stock.....any.....change which results in the maintenance of a given total stock with a lessened throughput.....is clearly a gain.....(4, 315).

Transport is one of the most essential outputs of the economy in that it is not normally an end in itself, but can be thought of as an input to the production of almost all other goods. "Minimizing the throughput" involved in the production of transportation thus qualifies as a high priority goal for the economy.

Base-return pricing has inherent in its structure the faculty of functioning as a "throughput minimization mechanism". By causing the capital stock devoted to transportation to be minimized, and by causing that minimum to be employed as intensively as possible, this system reduces the economic waste associated with the transport sector of our GNP/growth-oriented economy. With such an improved level of efficiency, the regulated motor transport industry could set the example of how to provide a quality product with the minimum use of our limited natural resources and capital stock.
Notes

1. PP 5-6, supra.
2. P. 61, supra.
3. F. 47, supra.

4. 794 class I carriers earned 67.86% of revenues earned by all regulated inter-city motor carriers of property in 1974 (14, 125).

5. P. 46, supra.

6. This "quality variable" could have been any of a number of services which could be provided in a more or less attractive manner by carriers as part of their operations.

7. P. 46, supra.

8. Regulators should be careful to strictly define a "private carrier" when addressing this problem. One could imagine a giant conglomerate or holding company classifying itself as a private carrier for all of its subsidiaries. Whether or not to allow this practice would depend upon the commission's interpretation of the potential deleterious effects this would have on the regulated transport market.

9. P. 47, supra.

10. Changes in B should be made gradually and cautiously. The powerful effects of a change in B parallel closely those of the reserve requirement in the banking industry. Rapid, large changes could create havoc as firms radically adjust rates in an attempt to meet the revenue requirements imposed by the new minimum rate-of-return.

11. As the industry stabilizes, risk would most likely be reduced for investors. This should result in a long run reduction in B and therefore a reduction in the transport bill of the economy.
In Chapter 4, the existence of economic "grants" in the rate structures of common carriers was discussed briefly. The economic impact of these grants on the industry evidences itself primarily in the mis-allocation of resources from grantor to grantee shippers and carriers.

This appendix will provide the reader with a more thorough measurement of these grant-induced economic distortions, and will develop a model for use in eliminating (or at least reducing) their size and their impact upon current and BRP rate structures. The analysis will be couched in the analytical framework of "Grants Economics". The reader is referred to the work cited in the references for a rather thorough introductory presentation of this field (5).

Identifying Grant Flows in the Rate Structure

I.C.C. policy requires that rates not be discriminatory or preferential. In order to implement this policy, the commission directs that each shipment "pay its own way". That is, carriers must recover the full economic costs of each shipment transported (17, 140-143). If this criterion is violated and transportation continues to be supplied, there must, by regulatory definition (and of mathematical necessity),
be a grant from one party to another.

If specific categories of shipments are paying more than the full cost entailed in their transport, the shippers using these categories are effecting grants to the carrier who is "overcharging" them. If there are other shipment categories which are not charged for the full cost of service provided, the carrier is then effecting a grant to shippers who use these categories by "undercharging" them. It is also possible that overcharged shippers are subsidizing the shipments of those undercharged customers. In this case, shippers are effecting grants between themselves which pass through the carrier's rate structure. In this situation, the carrier would realize no net grant equivalent.

Table A.1 summarizes the types of grant flows described above. The last column in the table indicates the direction in which a carrier's operating ratio would move as a result of these grants. Recalling the formula for the operating ratio, \( A = \frac{E}{R} \), it is apparent that when \( R \) increases due to overcharging a customer (setting the rate above a full cost level), the operating ratio would be lower (-) than if the full cost rate had been charged. Likewise, recovering less than full costs through a lowered rate causes a decrease in \( R \) and a corresponding rise (+) in \( A \). If two shippers offset the grants to a carrier by being, respectively, over and undercharged an equal amount, \( R \) will remain stable at the full cost level for the carrier and its operating ratio will not be effected.

The operating ratio can also be used in the measurement of the magnitude of grant flows. \( A = .93 \) is the specific
TABLE A.1
The Grant Flow
Through the Rate Structure

<table>
<thead>
<tr>
<th>Direction Of Grant-Flow</th>
<th>Over Charge</th>
<th>Under Charge</th>
<th>Effect On Carrier's Operating Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grant To Carrier:</td>
<td>X</td>
<td></td>
<td>(-)</td>
</tr>
<tr>
<td>Grant From Carrier:</td>
<td>X</td>
<td>X</td>
<td>(+)</td>
</tr>
<tr>
<td>Grant Between Shippers:</td>
<td>X</td>
<td>X</td>
<td>No Effect</td>
</tr>
</tbody>
</table>

Source: Table constructed by the author to illustrate grant-flows as analyzed in this section.
operating ratio at which firms are encouraged by the I.C.C. to aim when setting rates \((A = D = .93)\). Deviations from this target ratio can be made to provide measurements of the extent to which a rate structure results in grant equivalents (subsidies, or under and overcharges) to shippers and carriers.

Firms are faced with a certain amount of operating expense which is associated with the given level of demand. Since, in compliance with their operating rights carriers must supply all transport demanded in their markets, \(E\) is essentially fixed by the level of demand. If carriers were required to maintain their operating ratios at \(A = D = .93\), operating revenue \((R)\) would be constrained to a level equal to \(\frac{E}{.93} = 1.0753E\). If we adopt this revenue constraint imposed upon carriers by the use of \(D\) as an operating ratio, we can measure grant equivalents by noting actual deviations from operating revenues which would be realized at \(A = D\).

With \(E\) assumed given, if \(A > D\), \(R\) must be below the level which would be received at \(A = D\). This situation is equivalent to undercharging shippers for services rendered, or, of effecting a grant to them in the amount of the revenue deficiency. With \(A < D\), \(R\) is above its desired level and, by the same process, the grant will flow to the carrier. This type of grant, flowing from or to a carrier, will be identified in this appendix as the "carrier grant equivalent" \((G_c)\).

These revenue deficiencies and excesses are justifiably labelled grants, because the revenue gained when a carrier operates at \(A = D\) results in a fair return for the carrier. Also, it results in the shipping public paying "its fair share"
of the transport burden. These are two of the primary goals of the I.C.C. regulatory policies. With $A \neq D$, the net worth of the grantor will fall and that of the grantee will rise by an equivalent amount.

In this analysis, shipments have been categorized by weight. If operating ratios are computed for the different weight categories, grants flowing from or to customers using these different shipment categories can be measured by operating ratio analysis. If the rate charged to a particular shipment category results in $A > D$, shippers in that category are receiving grants from the carrier by being charged less than full cost rates. With $A < D$ for a category, shippers would pay excessive rates, resulting in grants flowing to the carrier from customers using that category.

From these data, the total grant equivalent present in the rate structure of the firm ($G_t$) can be calculated. To compute $G_t$, all grant equivalents for each shipment category are first identified in the manner described above. They consist of revenues above or below those which would have been received by carriers if each shipment category was charged rates yielding the $A = D$ operating ratio of .93. The total grant equivalent is equal to the sum of the absolute values of these individual grant equivalents: $G_t = \sum_{g=1}^{n} |G_g|$.

To complicate the analysis further, the individual shipment grant equivalents described above could also cancel each other on the carrier's balance sheet. That is, the carrier's overall operating ratio could equal .93 even if none of the individual categories were yielding that ratio for the firm.
This would occur when total overcharges to some shippers equaled total undercharges to others. Some shippers would be providing cross-subsidies to others, while the operating ratio of the firm remained at D.

The Mathematical Grants Analysis Model

If a carrier operates below D (operating ratio < .93), it is earning excess revenues and is therefore receiving a grant from the shipping public (its operating expenses are less than 93% of its operating revenues; therefore, revenue exceeds I.C.C. recommended levels). Likewise, if the carrier operates above D, its revenues are deficient and it is effecting a grant to the shipping public. Table A.2 depicts the format of the model to be used in this appendix for measuring these grants. Column descriptions for table A.2 are included below the table. The method of completing the table follows:

1) Extract R and E from data supplied by firms or rate bureaus. The data in table A.2 are hypothetical, constructed by the author.

2) Compute A: \( A = E \div R \).

3) \( D \) is given. It always equals .93 under current regulatory policy.

4) Compute \( R_d \) ("desired" revenue): \( R_d = E \div D \). \( E \) is divided by \( D \) to determine the desired revenue level which will adequately compensate the carrier for meeting its demand.

5) Compute \( G \) (the grant equivalent): \( G = R_d - R \). For
## TABLE A.2

Grants Analysis of Common Carrier Rate Structures
(Hypothetical Data)
Motor Carrier Rate Bureau Aggregates

<table>
<thead>
<tr>
<th>SHIPMENT</th>
<th>R</th>
<th>E</th>
<th>A</th>
<th>D</th>
<th>Rd</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Charge</td>
<td>500</td>
<td>625</td>
<td>1.250</td>
<td>.93</td>
<td>672</td>
<td>172</td>
</tr>
<tr>
<td>1-499 pounds</td>
<td>1000</td>
<td>1150</td>
<td>1.150</td>
<td>.93</td>
<td>1237</td>
<td>237</td>
</tr>
<tr>
<td>500-999 pounds</td>
<td>1000</td>
<td>1000</td>
<td>1.000</td>
<td>.93</td>
<td>1075</td>
<td>75</td>
</tr>
<tr>
<td>1000-1999 pounds</td>
<td>1500</td>
<td>1425</td>
<td>.950</td>
<td>.93</td>
<td>1532</td>
<td>32</td>
</tr>
<tr>
<td>2000-4999 pounds</td>
<td>1500</td>
<td>1250</td>
<td>.833</td>
<td>.93</td>
<td>1344</td>
<td>-156</td>
</tr>
<tr>
<td>5000-9999 pounds</td>
<td>1000</td>
<td>800</td>
<td>.800</td>
<td>.93</td>
<td>860</td>
<td>-140</td>
</tr>
<tr>
<td>&gt;10,000 pounds</td>
<td>500</td>
<td>350</td>
<td>.700</td>
<td>.93</td>
<td>377</td>
<td>-123</td>
</tr>
<tr>
<td>Truckload</td>
<td>3000</td>
<td>2700</td>
<td>.900</td>
<td>.93</td>
<td>2903</td>
<td>-97</td>
</tr>
<tr>
<td>TOTALS</td>
<td>10000</td>
<td>9300</td>
<td>.930</td>
<td>.93</td>
<td>10000</td>
<td>0</td>
</tr>
</tbody>
</table>

1^R, E, Rd and G in $ millions.

**Note:** Column Descriptions:
- **SHIPMENT**: Standard Shipment Weight Categories.
- **R**: Operating Revenue.
- **E**: Operating Expense.
- **A**: Actual Operating Ratio (A = E ÷ R).
- **D**: I.C.C. Desired Operating Ratio (D = .93).
- **Rd**: Revenue which would be received if A = D; (Rd = E ÷ D).
- **G**: Grant Equivalent. A positive number indicates a grant to shippers in the weight category. A negative number denotes a grant from shippers. On the TOTALS line, a positive number indicates a grant from carriers and a negative number denotes a grant to carriers; G = (Rd - R).

**Source:** Data were constructed and data manipulations performed by the author for illustrative purposes in identifying and measuring grants contained in the regulated common carrier rate structures.
each shipment category, G tells us the total grant equivalent involved in the revenue level for that shipment. For "minimum charge" in table A.2, revenue fell $172 million short of what it would have been (Rd) with a .93 operating ratio for that category. Therefore, in the minimum charge category, carriers included in the table effected a grant of $172 million to shippers using that category. A $156 million grant was paid by those whose shipments fell in the category of 2000-4999 pounds.

If shippers assume, as they should be able to, that I.C.C. rate regulations result in just rates, few of them would question assigned rate structures. Therefore, these types of grants are assumed to be essentially implicit in nature. Shippers are probably not fully aware that their rates are economically "unjustifiable".

That portion of the total grant equivalent which flows between carriers and the shipping public (Gc) is more explicit in nature. Carriers would recognize this grant by simply viewing their balance sheets. Whenever a firm is operating with $\not A = D$, its total revenue is at a level other than where it "should be". Returning to table A.2, the TOTALS line indicates that, for these hypothetical firms, $A = D = .93$. Therefore, there should be no carrier grant equivalent (Gc) present. This fact is affirmed by the 0 appearing on the TOTALS line in the G column.

Gc is computed by summing the individual entries in the G column of the table ($Gc = \sum_{g=1}^{n} G_g$). It measures the misapplied revenues between the carrier and the public. The hypothetical data in table A.2 were purposely constructed so as
to reflect a zero Gc. This allows the reader to observe the grants "flowing through" the carrier's rate structure. One shipper's gain is another's loss, while the carrier operating ratio is on target at 0.93. This is a clear picture of the cross-subsidization which occurs in the market. In the real world, a zero Gc would clearly be the exception. Operating ratios vary considerably between firms.

Total grants (Gt) between all shippers in the various weight categories can be identified in table A.2 by summing the absolute values of each shipment category grant equivalent. This total will measure all mis-applied revenue in the sector: \( G_t = \sum_{g=1}^{n} |G_{eq}| \). For these hypothetical firms, \( G_t = 172 + 237 + 75 + 32 + 156 + 140 + 123 + 97 = 1072 \) million.

A determination should also be made as to the percentage which Gt is of the total transport bill. This "grant ratio" will tell us the proportion of total operating revenues mis-applied via the observed grant mechanism. The total transport bill equals that amount paid by shippers for transport services. That amount is R, the operating revenues of firms. Gr is therefore the total grant equivalent divided by operating revenues: \( G_r = G_t \div R \). For our hypothetical group of firms in table A.2, \( G_r = 1072 \div 10000 = 0.1072 = 10.32\% \) of the transport bill is in the form of grant equivalents which have been traced to the rate structure.

**Common Carrier Rate Structure Grants: 1976**

Tables A.3 through A.6 present grants analyses of aggre-
### Table A.3

**Grants Analysis of Common Carrier Rate Structures**

**Eastern Central Motor Carriers Association (ECMCA)**

1976 Data: Projected by ECMCA

From 1975 Through 14 February 1976 Operating Levels

<table>
<thead>
<tr>
<th>SHIPMENT</th>
<th>R</th>
<th>E</th>
<th>A</th>
<th>D</th>
<th>Rd</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Charge</td>
<td>107.6</td>
<td>142.2</td>
<td>1.322</td>
<td>.93</td>
<td>152.9</td>
<td>45.3</td>
</tr>
<tr>
<td>1-499 lbs.</td>
<td>182.3</td>
<td>203.8</td>
<td>1.118</td>
<td>.93</td>
<td>219.1</td>
<td>36.8</td>
</tr>
<tr>
<td>500-999 lbs.</td>
<td>150.3</td>
<td>150.5</td>
<td>1.001</td>
<td>.93</td>
<td>161.8</td>
<td>11.5</td>
</tr>
<tr>
<td>1000-1999 lbs.</td>
<td>158.5</td>
<td>153.5</td>
<td>.968</td>
<td>.93</td>
<td>165.1</td>
<td>6.6</td>
</tr>
<tr>
<td>2000-4999 lbs.</td>
<td>214.6</td>
<td>193.1</td>
<td>.900</td>
<td>.93</td>
<td>207.6</td>
<td>-7.0</td>
</tr>
<tr>
<td>5000-9999 lbs.</td>
<td>141.1</td>
<td>123.5</td>
<td>.875</td>
<td>.93</td>
<td>132.8</td>
<td>-8.3</td>
</tr>
<tr>
<td>&gt;10,000 lbs.</td>
<td>59.3</td>
<td>52.3</td>
<td>.882</td>
<td>.93</td>
<td>56.2</td>
<td>-3.1</td>
</tr>
<tr>
<td>Truckload</td>
<td>476.5</td>
<td>463.2</td>
<td>.972</td>
<td>.93</td>
<td>498.1</td>
<td>21.6</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td>1490.2</td>
<td>1482.1</td>
<td>.995</td>
<td>.93</td>
<td>1593.6</td>
<td>103.4</td>
</tr>
</tbody>
</table>

1R, E, Rd and G in $ millions.

<table>
<thead>
<tr>
<th>SHIPMENT</th>
<th>R</th>
<th>E</th>
<th>A</th>
<th>D</th>
<th>Rd</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-499 lbs.</td>
<td>350.2</td>
<td>446.3</td>
<td>1.274</td>
<td>.93</td>
<td>479.9</td>
<td>129.7</td>
</tr>
<tr>
<td>500-999 lbs.</td>
<td>173.0</td>
<td>165.8</td>
<td>.958</td>
<td>.93</td>
<td>178.3</td>
<td>5.3</td>
</tr>
<tr>
<td>1000-1999 lbs.</td>
<td>182.4</td>
<td>166.2</td>
<td>.911</td>
<td>.93</td>
<td>178.7</td>
<td>-3.7</td>
</tr>
<tr>
<td>2000-4999 lbs.</td>
<td>239.6</td>
<td>198.1</td>
<td>.827</td>
<td>.93</td>
<td>213.0</td>
<td>-26.6</td>
</tr>
<tr>
<td>5000-9999 lbs.</td>
<td>155.6</td>
<td>116.7</td>
<td>.750</td>
<td>.93</td>
<td>125.5</td>
<td>-30.1</td>
</tr>
<tr>
<td>&gt;10,000 lbs.</td>
<td>483.4</td>
<td>440.1</td>
<td>.910</td>
<td>.93</td>
<td>473.2</td>
<td>-10.2</td>
</tr>
<tr>
<td>TOTALS</td>
<td>1584.2</td>
<td>1533.2</td>
<td>.968</td>
<td>.93</td>
<td>1648.6</td>
<td>64.4</td>
</tr>
</tbody>
</table>

1R, E, Rd and G in $ millions.

Source: R, E and A extracted from; Rocky Mountain Motor Tariff Bureau, Inc., Evidential Case Justifying Increased Motor Carrier Rates and Charges in Rocky Mountain Territories Scheduled Effective April 1, 1976. Rd and G calculated by the author.
TABLE A.5

Grants Analysis of Common Carrier Rate Structures
Middlewest Motor Freight Bureau (MMFB)
1976 Data: Projected by MMFB
From 1975 Operating Levels

<table>
<thead>
<tr>
<th>SHIPMENT</th>
<th>R</th>
<th>E</th>
<th>A</th>
<th>D</th>
<th>Rd</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Charge</td>
<td>54.4</td>
<td>71.2</td>
<td>1.309</td>
<td>.93</td>
<td>76.6</td>
<td>22.2</td>
</tr>
<tr>
<td>1-499 lbs.</td>
<td>62.1</td>
<td>79.5</td>
<td>1.280</td>
<td>.93</td>
<td>85.5</td>
<td>23.4</td>
</tr>
<tr>
<td>500-999 lbs.</td>
<td>62.1</td>
<td>64.2</td>
<td>1.034</td>
<td>.93</td>
<td>69.0</td>
<td>6.9</td>
</tr>
<tr>
<td>1000-1999 lbs.</td>
<td>77.0</td>
<td>69.6</td>
<td>.904</td>
<td>.93</td>
<td>74.8</td>
<td>-2.2</td>
</tr>
<tr>
<td>2000-4999 lbs.</td>
<td>91.0</td>
<td>71.3</td>
<td>.784</td>
<td>.93</td>
<td>76.7</td>
<td>-14.3</td>
</tr>
<tr>
<td>5000-9999 lbs.</td>
<td>76.8</td>
<td>55.7</td>
<td>.725</td>
<td>.93</td>
<td>59.9</td>
<td>-16.9</td>
</tr>
<tr>
<td>&gt;10,000 lbs.</td>
<td>138.8</td>
<td>100.5</td>
<td>.824</td>
<td>.93</td>
<td>108.0</td>
<td>-30.8</td>
</tr>
<tr>
<td>TOTALS</td>
<td>562.2</td>
<td>512.0</td>
<td>.911</td>
<td>.93</td>
<td>550.5</td>
<td>-11.7</td>
</tr>
</tbody>
</table>

1R, E, Rd and G in $ millions.

Source: R, E and A extracted from Middlewest Motor Freight Bureau, Restructuring of Minimum Charges and LTL Class Rates Resulting in Net Reduction. Rd and G calculated by the author.
### TABLE A.6

Grants Analysis of Common Carrier Rate Structures
Southern Motor Carriers Rate Conference (SMCRC)
1976 Data: Projected by SMCRC
From 1975 Through 14 February 1976 Operating Levels

<table>
<thead>
<tr>
<th>SHIPMENT</th>
<th>R</th>
<th>E</th>
<th>A</th>
<th>D</th>
<th>Rd</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Charge</td>
<td>134.1</td>
<td>178.6</td>
<td>1.331</td>
<td>.93</td>
<td>192.0</td>
<td>57.9</td>
</tr>
<tr>
<td>1-499 lbs.</td>
<td>226.6</td>
<td>262.5</td>
<td>1.159</td>
<td>.93</td>
<td>282.3</td>
<td>55.7</td>
</tr>
<tr>
<td>500-999 lbs.</td>
<td>182.5</td>
<td>185.6</td>
<td>1.017</td>
<td>.93</td>
<td>199.6</td>
<td>17.1</td>
</tr>
<tr>
<td>1000-1999 lbs.</td>
<td>195.3</td>
<td>187.5</td>
<td>.960</td>
<td>.93</td>
<td>201.6</td>
<td>6.3</td>
</tr>
<tr>
<td>2000-4999 lbs.</td>
<td>266.4</td>
<td>239.7</td>
<td>.900</td>
<td>.93</td>
<td>257.7</td>
<td>- 8.7</td>
</tr>
<tr>
<td>5000-9999 lbs.</td>
<td>159.1</td>
<td>140.2</td>
<td>.881</td>
<td>.93</td>
<td>150.8</td>
<td>- 8.3</td>
</tr>
<tr>
<td>&gt;10,000 lbs.</td>
<td>84.7</td>
<td>70.1</td>
<td>.828</td>
<td>.93</td>
<td>75.4</td>
<td>- 9.3</td>
</tr>
<tr>
<td>Truckload</td>
<td>545.6</td>
<td>528.8</td>
<td>1.012</td>
<td>.93</td>
<td>568.6</td>
<td>23.0</td>
</tr>
<tr>
<td>TOTALS</td>
<td>1794.3</td>
<td>1793.0</td>
<td>1.099</td>
<td>.93</td>
<td>1928.0</td>
<td>133.7</td>
</tr>
</tbody>
</table>

1R, E, Rd and G in $ millions.
Source: R, E and A extracted from Southern Motor Carriers Rate Conference, Inc., Increased Motor Carrier Rates and Charges From, To and Within the South. Rd and G calculated by the author.
gate common carrier financial operating data projected for 1976 by four motor carrier rate bureaus. These analyses were conducted according to the mathematical model presented in the preceding section. These samples consist of 300 common carriers (2% of the regulated industry) which earned combined 1974 operating revenues of $5.4 billion (25% of the regulated industry total) (1,1)(20)(23)(25)(28).

Table A.7 combines the data from tables A.3 through A.6 to present an aggregate financial operating picture of all sampled rate bureau statistics. Because of the large sample size and the broad distribution of firms in both size and geographical location, inferences about the industry will be drawn from trends observed.

Table A.8 summarizes the results of analysis performed in tables A.3 through A.7. The following conclusions can be drawn from the findings presented in table A.8:

1) 11.80% ($639.9 million) of the regulated transport bill of our sample firms is in the form of grant equivalents which have been traced directly to the rate structures of regulated firms. Applying this finding to the total 1974 industry revenues results in: \( .118(\$22.4 \text{ billion}) = \$2.64 \text{ billion} \). This amount was mis-applied in 1974 in the form of grant equivalents contained in common carrier rate structures.

2) Most carriers operated at a level above the I.C.C. suggested ratio \( (A = D = .93) \). For our sample firms, all carriers had a combined revenue deficiency of $289.9 million.

The manner in which rates are set and rate adjustments are proposed by the rate bureaus does not sufficiently take
### TABLE A.7

Grants Analysis of Common Carrier Rate Structures

**ECMCA, MMFB, RMNTB and SMGRC Aggregate Data**

1976 Projected Operating Levels

<table>
<thead>
<tr>
<th>SHIPMENT</th>
<th>R</th>
<th>E</th>
<th>A</th>
<th>D</th>
<th>Rd</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Charge</td>
<td>296.1</td>
<td>392.0</td>
<td>1.324</td>
<td>.93</td>
<td>421.5</td>
<td>125.4</td>
</tr>
<tr>
<td>1-499 lbs.</td>
<td>821.2</td>
<td>992.1</td>
<td>1.208</td>
<td>.93</td>
<td>1066.8</td>
<td>245.6</td>
</tr>
<tr>
<td>500-999 lbs.</td>
<td>567.9</td>
<td>566.1</td>
<td>.997</td>
<td>.93</td>
<td>608.7</td>
<td>40.8</td>
</tr>
<tr>
<td>1000-1999 lbs.</td>
<td>613.2</td>
<td>576.8</td>
<td>.941</td>
<td>.93</td>
<td>620.2</td>
<td>7.0</td>
</tr>
<tr>
<td>2000-4999 lbs.</td>
<td>811.6</td>
<td>702.2</td>
<td>.865</td>
<td>.93</td>
<td>755.1</td>
<td>-56.5</td>
</tr>
<tr>
<td>5000-9999 lbs.</td>
<td>532.6</td>
<td>436.1</td>
<td>.819</td>
<td>.93</td>
<td>468.9</td>
<td>-63.7</td>
</tr>
<tr>
<td>&gt;10,000 lbs.</td>
<td>766.2</td>
<td>663.0</td>
<td>.865</td>
<td>.93</td>
<td>712.9</td>
<td>-53.3</td>
</tr>
<tr>
<td>Truckload</td>
<td>1022.1</td>
<td>992.0</td>
<td>.971</td>
<td>.93</td>
<td>1066.7</td>
<td>44.6</td>
</tr>
<tr>
<td>TOTALS</td>
<td>5430.9</td>
<td>5320.3</td>
<td>.980</td>
<td>.93</td>
<td>5720.8</td>
<td>289.9</td>
</tr>
</tbody>
</table>

1R, E, Rd and G in $ millions.

**Source:** Compiled by the author from tables A.3 through A.6.
TABLE A.8

Grants Analysis of Common Carrier Rate Structures
Grant Equivalent Results

<table>
<thead>
<tr>
<th>Rate Bureau</th>
<th>Table</th>
<th>Gc</th>
<th>Gt</th>
<th>Gr</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECMCA (67 Carriers)</td>
<td>4.4</td>
<td>103.4</td>
<td>140.2</td>
<td>9.40%</td>
</tr>
<tr>
<td>RMMTB (49 Carriers)</td>
<td>4.5</td>
<td>64.4</td>
<td>205.6</td>
<td>12.97%</td>
</tr>
<tr>
<td>MMFB (97 Carriers)</td>
<td>4.6</td>
<td>-11.7</td>
<td>116.7</td>
<td>20.76%</td>
</tr>
<tr>
<td>SMCRC (87 Carriers)</td>
<td>4.7</td>
<td>133.7</td>
<td>186.3</td>
<td>10.40%</td>
</tr>
<tr>
<td>TOTAL (300 Carriers)</td>
<td>4.8</td>
<td>289.9</td>
<td>639.9</td>
<td>11.80%</td>
</tr>
</tbody>
</table>

Gc and Gt in $ millions.

Note: Formulae used above are:

\[ Gc = \sum_{g=1}^{n} G_g \]
\[ Gt = \sum_{g=1}^{n} |G_g| \]
\[ Gr = \frac{Gt}{R} \]

into account the grant equivalents in the rate structure. The I.C.C. desires that all carriers receive a fair rate-of-return (to stabilize the industry) and that all shipments pay their own way (to remove discrimination and preferential treatment from the market). If these goals are to be realized, these grants must be acknowledged, identified, measured and eliminated.

Rate Structure Grants Reduction:
A Suggested Approach to Current Problems

Explicit in the preceding analysis is a simple solution to the grants elimination problem; simply make the revenue adjustments necessary for each shipment category to be charged rates resulting in an operating ratio of .93. Table A.9 presents the method of computing these adjustments. Column descriptions are presented below the table. The method of completing the table follows:

1) Extract R and E from data supplied by firms or rate bureaus. The data in table A.9 are hypothetical, extracted from table A.2.

2) Compute A: $A = E \div R$.

3) D = .93 under current regulatory policy.

4) Compute (A-D): This is a simple subtraction of D from A. It tells us how far the shipment category's operating ratio deviates from D.

5) Compute M: $M = \frac{1}{D}(A-D)$. Multiplying M by 100 yields the percent change in revenue required to bring the category's R in line with a .93 operating ratio. For example, for the
## TABLE A.9

Grant Elimination Through Revenue Adjustment\(^1\)
(Hypothetical Data)

<table>
<thead>
<tr>
<th>SHIPMENT</th>
<th>R</th>
<th>E</th>
<th>A</th>
<th>D</th>
<th>(A-D)</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Charge</td>
<td>500</td>
<td>625</td>
<td>1.250</td>
<td>.93</td>
<td>.320</td>
<td>.3441</td>
</tr>
<tr>
<td>1-499 pounds</td>
<td>1000</td>
<td>1150</td>
<td>1.150</td>
<td>.93</td>
<td>.220</td>
<td>.2366</td>
</tr>
<tr>
<td>500-999 pounds</td>
<td>1000</td>
<td>1000</td>
<td>1.000</td>
<td>.93</td>
<td>.070</td>
<td>.0753</td>
</tr>
<tr>
<td>1000-1999 pounds</td>
<td>1500</td>
<td>1425</td>
<td>.950</td>
<td>.93</td>
<td>.020</td>
<td>.0215</td>
</tr>
<tr>
<td>2000-4999 pounds</td>
<td>1500</td>
<td>1250</td>
<td>.833</td>
<td>.93</td>
<td>-.097</td>
<td>-.1043</td>
</tr>
<tr>
<td>5000-9999 pounds</td>
<td>1000</td>
<td>800</td>
<td>.800</td>
<td>.93</td>
<td>-.130</td>
<td>-.1398</td>
</tr>
<tr>
<td>&gt;10,000 pounds</td>
<td>500</td>
<td>350</td>
<td>.700</td>
<td>.93</td>
<td>-.230</td>
<td>-.2473</td>
</tr>
<tr>
<td>Truckload</td>
<td>3000</td>
<td>2700</td>
<td>.900</td>
<td>.93</td>
<td>-.030</td>
<td>-.0323</td>
</tr>
<tr>
<td>TOTALS</td>
<td>10000</td>
<td>9300</td>
<td>.930</td>
<td>.93</td>
<td>.000</td>
<td>.0000</td>
</tr>
</tbody>
</table>

\(^1\)R and E in $ millions.

**Note:** Column Descriptions:

- **SHIPMENT:** Standard shipment weight categories.
- **R:** Operating Revenue.
- **E:** Operating Expense.
- **A:** Actual Operating Ratio \((A = E \div R)\).
- **D:** I.C.C. Desired Operating Ratio \((D = .93)\).
- \((A-D): \) The difference between the actual and I.C.C. operating ratios.
- **M:** Grant Elimination Multiplier. Example; in the "Minimum Charge" row, .3441 means, "raise revenue 34.41% from its current level to eliminate the grant equivalent." \(M = 1/D(A-D)\).

**Source:** Data were constructed and data manipulations performed by the author for illustrative purposes in computing percentage revenue adjustments required to eliminate grant equivalents from a rate structure.
"minimum charge" category, a 34.41% revenue increase is required. For the "5000-9999 pounds" category, a 13.98% revenue reduction is required. These adjustments will change revenue to a level equal to the desired revenue (Rd) calculated in table A.2.

This method, although relatively simple, would be very disruptive to the rate structure. A 34% rate increase would undoubtedly alarm shippers. A more gradual reduction in grant equivalents, applied during routine cost-push revenue increases, can be accomplished by the method described below. Over time, this system will result in an essentially grant-free rate structure.

The basic financial data presented in table A.6 were extracted from a rate increase proposal submitted to the I.C.C. by the Southern Motor Carriers Rate Conference (SMCRC)(25). The SMCRC submitted their proposal for rate hikes in response to an expected wage increase which was estimated to add $118.7 million to operating expenses (E). Their proposal was for an overall revenue increase of 6% ($107.6 million). Without this increase, the SMCRC firms' average operating ratio would have risen to A = 1.065. Gr would have risen from 10.4% to 15.1%.

After distribution of the $107.6 million over all categories of shipments using the SMCRC proposal, Gr falls from 10.4% to 10.2%--a small grant equivalent reduction. Careful allocation of the additional revenue using the grant minimization method proposed below could have resulted in a greater reduction of Gr, without the "shock effect" of the direct grant elimination method presented in table A.9.
Table A.10 summarizes the percent rate changes which would accompany each of three revenue allocation methods: the simple grant elimination method of table A.9, the actual SMCRC proposal, and the grant minimization method explained below in tables A.11 through A.13.

The first step in the grants minimization method is to reconstruct current operating data, interjecting the projected increases in operating expenses (E). Table A.11 is essentially a presentation of table A.6 with the new wage increase estimations added to E (25, 1-4). Using column G of table A.11, the SMCRC proposed gross revenue increase ($107.6) is distributed among the various shipment categories as follows:

1) In table A.12, each new grant equivalent from column G of table A.11 is, in turn, divided by the new carrier grant equivalent (Gc = $261.3 million).

2) This result is multiplied by the proposed revenue increase (Rp = $107.6 million).

3) This yields a proportionate revenue adjustment (Ra) which is then added to R to yield the revenue level which will be realized under the grant minimization method (Ra + R).

Table A.13 shows the aggregate financial operating data of SMCRC firms after (Ra + R) and the estimated wage increase are inserted. Gt is now 159.1 rather than 194.1 with SMCRC's method. Gr has been reduced to 8.4% rather than 10.2% with SMCRC's method. The application of this process has resulted in an 18% greater reduction in grants than the method employed by the rate bureau, and has avoided the radical adjustments required by the complete grant elimination method.
### TABLE A.10

Total Grant Elimination Rate Adjustment, The SMCRC Proposed Rate Increases, And A Grant-Minimizing Alternative

<table>
<thead>
<tr>
<th>Weight Category</th>
<th>Total Grant Elimination</th>
<th>SMCRC Proposal</th>
<th>Grant-Minimizing Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Charge</td>
<td>+43.12%</td>
<td>+10%</td>
<td>+22.1%</td>
</tr>
<tr>
<td>1-499 lbs.</td>
<td>+24.62%</td>
<td>+8%</td>
<td>+13.8%</td>
</tr>
<tr>
<td>500-999 lbs.</td>
<td>+9.36%</td>
<td>+7%</td>
<td>+7.0%</td>
</tr>
<tr>
<td>1000-1999 lbs.</td>
<td>+3.23%</td>
<td>+6%</td>
<td>+4.3%</td>
</tr>
<tr>
<td>2000-4999 lbs.</td>
<td>-3.23%</td>
<td>+5%</td>
<td>+1.4%</td>
</tr>
<tr>
<td>5000-9999 lbs.</td>
<td>-5.27%</td>
<td>+5%</td>
<td>+0.5%</td>
</tr>
<tr>
<td>&gt;10,000 lbs.</td>
<td>-10.97%</td>
<td>+5%</td>
<td>-2.2%</td>
</tr>
<tr>
<td>Truckload</td>
<td>+8.82%</td>
<td>+5%</td>
<td>+4.3%</td>
</tr>
<tr>
<td>TOTALS</td>
<td>+8.82%</td>
<td>+6%</td>
<td>+6.0%</td>
</tr>
</tbody>
</table>

**Source:** Total Grant Elimination percentages computed by the author according to the method described in table 4.10. SMCRC rate proposals extracted from Southern Motor Carriers Rate Conference, Inc., Increased Motor Carrier Rates and Charged From, To and Within the South. Grant-minimizing alternative percentages computed by the author according to the method described in tables A.11, A.12 and A.13.
# TABLE A.11

Rate Structure Grant Minimization Process
Southern Motor Carriers Rate Conference
Step 1: Grant Measurement with Increased Expenses

<table>
<thead>
<tr>
<th>SHIPMENT</th>
<th>R</th>
<th>E</th>
<th>A</th>
<th>Rd</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Charge</td>
<td>134.1</td>
<td>191.7</td>
<td>1.430</td>
<td>206.1</td>
<td>72.0</td>
</tr>
<tr>
<td>1-499 pounds</td>
<td>226.6</td>
<td>281.4</td>
<td>1.242</td>
<td>302.6</td>
<td>76.0</td>
</tr>
<tr>
<td>500-999 pounds</td>
<td>182.5</td>
<td>198.7</td>
<td>1.089</td>
<td>213.7</td>
<td>31.2</td>
</tr>
<tr>
<td>1000-1999 pounds</td>
<td>195.3</td>
<td>200.5</td>
<td>1.027</td>
<td>215.6</td>
<td>20.3</td>
</tr>
<tr>
<td>2000-4999 pounds</td>
<td>266.4</td>
<td>255.9</td>
<td>0.961</td>
<td>275.2</td>
<td>8.8</td>
</tr>
<tr>
<td>5000-9999 pounds</td>
<td>159.1</td>
<td>149.2</td>
<td>0.938</td>
<td>160.4</td>
<td>1.3</td>
</tr>
<tr>
<td>&gt;10,000 pounds</td>
<td>84.7</td>
<td>74.4</td>
<td>0.878</td>
<td>80.0</td>
<td>-4.7</td>
</tr>
<tr>
<td>Truckload</td>
<td>545.6</td>
<td>559.9</td>
<td>1.026</td>
<td>602.0</td>
<td>56.4</td>
</tr>
<tr>
<td>TOTALS</td>
<td>1794.3</td>
<td>1911.7</td>
<td>1.065</td>
<td>2055.6</td>
<td>261.3</td>
</tr>
</tbody>
</table>

1E was estimated by SMCRC from 1975 through 14 February operating data. R, E, Rd and G in $ millions.

Source: Table A.6 and; Southern Motor Carriers Rate Conference, Inc., Increased Motor Carrier Rates and Charges From, To and Within the South.
**TABLE A.12**

Rate Structure Grant Minimization Process  
Southern Motor Carriers Rate Conference  
Step 2: Revenue Adjustment Computation

<table>
<thead>
<tr>
<th>G&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Gc</th>
<th>Gm&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Rp</th>
<th>Ra</th>
<th>R</th>
<th>(Ra+R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>72.0</td>
<td>261.3</td>
<td>.2755</td>
<td>107.6</td>
<td>29.6</td>
<td>134.1</td>
<td>163.7</td>
</tr>
<tr>
<td>76.0</td>
<td>261.3</td>
<td>.2909</td>
<td>107.6</td>
<td>31.3</td>
<td>226.6</td>
<td>257.9</td>
</tr>
<tr>
<td>31.2</td>
<td>261.3</td>
<td>.1194</td>
<td>107.6</td>
<td>12.8</td>
<td>182.5</td>
<td>195.3</td>
</tr>
<tr>
<td>20.3</td>
<td>261.3</td>
<td>.0777</td>
<td>107.6</td>
<td>8.4</td>
<td>195.3</td>
<td>203.7</td>
</tr>
<tr>
<td>8.8</td>
<td>261.3</td>
<td>.0337</td>
<td>107.6</td>
<td>3.6</td>
<td>266.4</td>
<td>270.0</td>
</tr>
<tr>
<td>1.3</td>
<td>261.3</td>
<td>.0050</td>
<td>107.6</td>
<td>0.8</td>
<td>159.1</td>
<td>159.9</td>
</tr>
<tr>
<td>-4.7</td>
<td>261.3</td>
<td>- .0180</td>
<td>107.6</td>
<td>-1.9</td>
<td>84.7</td>
<td>82.8</td>
</tr>
<tr>
<td>56.4</td>
<td>261.3</td>
<td>.2158</td>
<td>107.6</td>
<td>23.2</td>
<td>545.6</td>
<td>568.8</td>
</tr>
</tbody>
</table>

\[ \sum = 1.0000 \quad \sum = 107.6 \sum = 1794.3 \sum = 1901.9 \]

<sup>1</sup>Grant equivalent resulting from projected rise in E without increasing revenue (R) (from Table A.11).

<sup>2</sup>Grant equivalent multiplier = the percent of the total grant equivalent which is contained in each particular weight category.

**Source:** Formula developed and computations made by the author. Data were obtained from table A.11 and Southern Motor Carriers Rate Conference, Inc., *Increased Motor Carrier Rates and Charges From, To, and Within the South.*
### TABLE A.13

**Rate Structure Grant Minimization Process**  
**Southern Motor Carriers Rate Conference**  
**Step 3: Operating Levels After Process Application**

<table>
<thead>
<tr>
<th>SHIPMENT</th>
<th>(Ra+R)</th>
<th>E</th>
<th>A</th>
<th>Rd</th>
<th>G</th>
<th>%DR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Charge</td>
<td>163.7</td>
<td>191.7</td>
<td>1.171</td>
<td>206.1</td>
<td>42.4</td>
<td>+22.1</td>
</tr>
<tr>
<td>1-499 lbs.</td>
<td>257.9</td>
<td>281.4</td>
<td>1.091</td>
<td>302.6</td>
<td>44.7</td>
<td>+13.8</td>
</tr>
<tr>
<td>500-999 lbs.</td>
<td>195.3</td>
<td>198.7</td>
<td>1.017</td>
<td>213.7</td>
<td>18.4</td>
<td>+ 7.0</td>
</tr>
<tr>
<td>1000-1999 lbs.</td>
<td>203.7</td>
<td>200.5</td>
<td>0.984</td>
<td>215.6</td>
<td>11.9</td>
<td>+ 4.3</td>
</tr>
<tr>
<td>2000-4999 lbs.</td>
<td>270.0</td>
<td>255.9</td>
<td>0.948</td>
<td>275.2</td>
<td>5.2</td>
<td>+ 1.4</td>
</tr>
<tr>
<td>5000-9999 lbs.</td>
<td>159.9</td>
<td>149.2</td>
<td>0.934</td>
<td>160.4</td>
<td>0.5</td>
<td>+ 0.5</td>
</tr>
<tr>
<td>&gt;10,000 lbs.</td>
<td>82.8</td>
<td>74.4</td>
<td>0.899</td>
<td>80.0</td>
<td>-2.8</td>
<td>- 2.2</td>
</tr>
<tr>
<td><strong>Truckload</strong></td>
<td>568.8</td>
<td>559.9</td>
<td>0.984</td>
<td>602.0</td>
<td>33.2</td>
<td>+ 4.3</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td>1901.9</td>
<td>1911.7</td>
<td>1.005</td>
<td>2055.6</td>
<td>153.7</td>
<td>+ 6.0</td>
</tr>
</tbody>
</table>

\(^1\) (Ra+R), E, Rd and G in $ millions.  
**Source:** Tables A.11 and A.12.
Rate changes will continue to occur due to soaring costs and increasing demand from an ever-growing economy. However, to maximize the economic potential of these revenue change requirements, their implementation should be used to minimize rate structure grant equivalents. This section describes only one of a myriad of procedures which could be developed under the current rate-making process to accomplish this much-needed economic adjustment. Continued employment of this or a similar method in the future could result in the eventual elimination from the rate structure of the type of grants uncovered in this section. If economic dislocations occur due to grant elimination, that will be the time for the application of any explicit grants deemed to be in the public interest.

Revenue Distribution and Grants Reduction Under BRP

In our discussion of the BRP model, the requirement was laid upon firms to distribute among shipment categories, any revenue changes imposed by the BRP revenue formula. The data required for accomplishment of this process was not available for sample firms A and B. Operating ratios for particular categories are required for firms if we are to distribute such revenues over shipment categories while attempting to reduce rate structure grant equivalents. This section will describe, using hypothetical data, the process which would be followed by firms in their revenue distribution efforts under BRP.

In table A.14, we initially assume that our hypothetical firm (firm C) has invested $4100 in transportation (It = $4100).
<table>
<thead>
<tr>
<th>SHIPMENT</th>
<th>R</th>
<th>E</th>
<th>A</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Charge</td>
<td>500</td>
<td>625</td>
<td>1.250</td>
<td>172</td>
</tr>
<tr>
<td>1-499 pounds</td>
<td>1000</td>
<td>1150</td>
<td>1.150</td>
<td>237</td>
</tr>
<tr>
<td>500-999 pounds</td>
<td>1000</td>
<td>1000</td>
<td>1.000</td>
<td>75</td>
</tr>
<tr>
<td>1000-1999 pounds</td>
<td>1500</td>
<td>1425</td>
<td>.950</td>
<td>32</td>
</tr>
<tr>
<td>2000-4999 pounds</td>
<td>1500</td>
<td>1250</td>
<td>.833</td>
<td>-156</td>
</tr>
<tr>
<td>5000-9999 pounds</td>
<td>1000</td>
<td>800</td>
<td>.800</td>
<td>-140</td>
</tr>
<tr>
<td>&gt;10,000 pounds</td>
<td>500</td>
<td>350</td>
<td>.700</td>
<td>-123</td>
</tr>
<tr>
<td>Truckload</td>
<td>3000</td>
<td>2700</td>
<td>.900</td>
<td>-97</td>
</tr>
<tr>
<td>TOTALS</td>
<td>10000</td>
<td>9300</td>
<td>.930</td>
<td>0</td>
</tr>
</tbody>
</table>

**Source:** Table A.2.
and that table A.14 reflects its current financial operating condition. The base-return will be kept at $B = .23$. Base-return calculations for firm C reveal:

$$R_B = B(\text{It}) + E = .23(4100) + 9300 = 10243.$$  
$$A_B = E \div R_B = 9300 \div 10243 = .908.$$  
$$(R_B - R) = 10243 - 10000 = 243.$$

We must therefore add 243 to firm C's total revenue in order to reach the appropriate BRP operating ratio for this firm; $A_B = .908$. Table A.15 demonstrates the BRP method of distributing this revenue increase over the relevant shipment weight categories, while simultaneously allowing for maximum grants reduction in each category. The method of completing the table follows:

The SHIPMENT column of the table is completed with reference to column A of table A.14. Any shipment category having an operating ratio (A) greater than .908 (our computed $A_B$) is included in the revenue distribution process. The reason for excluding the other shipments is that they are already paying more than their "fair share" of the transport burden. They are effecting grants to the carrier and other shipment categories. It would be inappropriate, if we are attempting to simultaneously reduce grant equivalents, to increase the size of their grants by increasing the revenue requirements (rates) for these shipment categories.

The $(A_B - A)E$ column reflects the proportionate size of the difference between current and BRP operating ratios for each category, controlled for the impact of each category's expense level on the firm's operations. This column allows the appro-
<table>
<thead>
<tr>
<th>Revenue Increase</th>
<th>Hypothesized Price (A)</th>
<th>Under Base-Return Price</th>
<th>Calculation of Revenue Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rp</td>
<td>A &gt; Rp</td>
<td>Rp</td>
<td>V &lt; A</td>
</tr>
<tr>
<td>Rp</td>
<td><strong>A &gt; Rp</strong></td>
<td>Rp</td>
<td><strong>V &lt; A</strong></td>
</tr>
</tbody>
</table>

**APPENDIX**

Data are hypothetical, based upon table.

Formula: Formulas developed by the author for the Grant-Wintzendorf distribution of

\[
\text{table A.15}
\]
appropriate weight to be assigned to each category prior to performing the revenue distribution calculations which follow.

The grant equivalent multiplier (Gm) is obtained by dividing each \((A_B - A)E\) result by the sum of all \((A_B - A)E\) products. Each category's Gm is then multiplied by the carrier grant equivalent (Gc, the amount by which we desire to raise revenue). This results in a revenue adjustment (Ra) for each category, proportionate to its contribution to the total grant equivalent of the firm. When Ra is added to current revenue (R), it results in a grant-minimized BRP revenue \((R_B)\) for the firm, for each category included in the process.

The resulting \(R_B\) data from table A.15 are now transferred to a grants analysis table to determine the percentage by which rates must be adjusted to reach the new BRP revenue for each category. Table A.16 presents this process. The method of completing the table follows:

The R column is extracted from table A.14. It reflects the actual revenue level at the time of application of the BRP process. The \(R_B\) column is completed from table A.14 for those categories not included in the revenue distribution process (for these firms, \(R = R_B\)), and table A.15 for those categories whose revenues have been adjusted.

\(E\) is taken from table A.14; it is unchanged. \(A_B\) is computed for each category by the formula: \(A_B = E \div R_B\). It is included to inform the analyst of each category's relative deviation from the firm's desired operating ratio (.908).

The \(D_B\) column is the desired operating ratio for the firm. Note that it is not equivalent to the D used earlier
### TABLE A.16

**Grants Analysis of Base-Return Revenue Distribution**  
*(Hypothetical Firm C)*  
*(Revenue Increase)*

<table>
<thead>
<tr>
<th>SHIPMENT</th>
<th>R</th>
<th>R_B</th>
<th>E</th>
<th>A_B</th>
<th>D_B</th>
<th>Rd</th>
<th>G_B</th>
<th>%ΔR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Charge</td>
<td>500</td>
<td>581</td>
<td>625</td>
<td>1.076</td>
<td>.908</td>
<td>688</td>
<td>107</td>
<td>16.20</td>
</tr>
<tr>
<td>1-499 lbs.</td>
<td>1000</td>
<td>1105</td>
<td>1150</td>
<td>1.041</td>
<td>.908</td>
<td>1267</td>
<td>162</td>
<td>10.50</td>
</tr>
<tr>
<td>500-999 lbs.</td>
<td>1000</td>
<td>1035</td>
<td>1000</td>
<td>.966</td>
<td>.908</td>
<td>1101</td>
<td>66</td>
<td>3.50</td>
</tr>
<tr>
<td>1000-1999 lbs.</td>
<td>1500</td>
<td>1522</td>
<td>1425</td>
<td>.936</td>
<td>.908</td>
<td>1569</td>
<td>47</td>
<td>1.47</td>
</tr>
<tr>
<td>2000-4999 lbs.</td>
<td>1500</td>
<td>1500</td>
<td>1250</td>
<td>.833</td>
<td>.908</td>
<td>1377</td>
<td>-123</td>
<td>.00</td>
</tr>
<tr>
<td>5000-9999 lbs.</td>
<td>1000</td>
<td>1000</td>
<td>800</td>
<td>.800</td>
<td>.908</td>
<td>881</td>
<td>-119</td>
<td>.00</td>
</tr>
<tr>
<td>≥10,000 lbs.</td>
<td>500</td>
<td>500</td>
<td>350</td>
<td>.700</td>
<td>.908</td>
<td>386</td>
<td>-114</td>
<td>.00</td>
</tr>
<tr>
<td>Truckload</td>
<td>3000</td>
<td>3000</td>
<td>2700</td>
<td>.900</td>
<td>.908</td>
<td>2974</td>
<td>-26</td>
<td>.00</td>
</tr>
<tr>
<td>TOTALS</td>
<td>10000</td>
<td>10243</td>
<td>9300</td>
<td>.908</td>
<td>.908</td>
<td>10243</td>
<td>0</td>
<td>2.43</td>
</tr>
</tbody>
</table>

*Source:* Tables A.14 and A.15.
in the grants analysis of current problems. That D reflected
the I.C.C. estimate of an appropriate operating ratio (.93)
for all firms. In this case, $D_B = A_B$ for every category.

In this case, $D_B = A_B$ for every category.

Rd is the desired revenue level at which each category
would operate, given the desired operating ratio of .908. It
is computed by the formula; $Rd = \frac{1}{D_B}(E) = 1.1013E$.

$G_B$ is the grant equivalent remaining within the rate
structure of each category. It is computed by subtracting
the BRP revenue ($R_B$) from the desired revenue ($Rd$).

Finally, the $\% R$ column indicates the rate adjustment
required for each category to realize $R_B$ revenues. It is com-
puted; $\% R = (R_B - R) \div R$.

The TOTALS line under the $A_B$, $D_B$ and $Rd$ columns of table
A.16 confirms that the carrier is now operating at its desired
operating ratio (.908), and is receiving its desired level of
revenue ($10,243$). There is no carrier grant equivalent ($Gc$)
remaining. $Gc = \sum_{g=1}^{N} G_g = 107 + 162 + 66 + 47 - 123 - 119 - 114$
- 26 = 0. The firm was seeking a 2.43% overall revenue in-
crease (from $10000$ to $10243$). The total of the $\% R$ column
also reflects success in this measure.

The total grant equivalent is computed by summing the
absolute values of all category grant equivalents. For our
original data in table A.14; $Gt = 172 + 237 + 75 + 32 + 156 +$
$140 + 123 + 97 = 1032$. Our base-return adjusted total grant
equivalent is; $Gt_B = 107 + 162 + 66 + 47 + 123 + 119 + 114 +$
$26 = 764$.

The grant ratio is computed by the formula; $Gr = Gt \div R$. 

<table>
<thead>
<tr>
<th>$A_B$</th>
<th>$D_B$</th>
<th>$Rd$</th>
<th>$R_B$</th>
<th>$G_B$</th>
<th>$% R$</th>
</tr>
</thead>
<tbody>
<tr>
<td>107</td>
<td>162</td>
<td>66</td>
<td>47</td>
<td>123</td>
<td>119</td>
</tr>
<tr>
<td>66</td>
<td>123</td>
<td>119</td>
<td>114</td>
<td>26</td>
<td></td>
</tr>
</tbody>
</table>

The grant ratio is computed by the formula; $Gr = Gt \div R$. 

<table>
<thead>
<tr>
<th>$A_B$</th>
<th>$D_B$</th>
<th>$Rd$</th>
<th>$R_B$</th>
<th>$G_B$</th>
<th>$% R$</th>
</tr>
</thead>
<tbody>
<tr>
<td>107</td>
<td>162</td>
<td>66</td>
<td>47</td>
<td>123</td>
<td>119</td>
</tr>
<tr>
<td>66</td>
<td>123</td>
<td>119</td>
<td>114</td>
<td>26</td>
<td></td>
</tr>
</tbody>
</table>
For our original data in table A.14, \( Gr = \frac{1032}{10000} = .1032 \).

Our base-return adjusted grant ratio is; \( Gr_B = \frac{Gt}{R} = \frac{764}{10243} = .0746 \).

The desired result from this revenue distribution process was a reduction in both total grant equivalents and the grant ratio of the rate structure. The application of BRP formulae and revenue distribution techniques has resulted in a 26% reduction in \( Gt \) and a 28% reduction in \( Gr \).

Tables A.17 and A.18 present the identical process for firm C with one exception. Investment in transportation is now assumed to be much lower (\( It = $2000 \)). Our BRP formulae in this case result in the requirement for a revenue reduction. The specific data are;

\[
R_B = B(\text{It}) + E = .23(2000) + 9300 = $9760.
\]

\[
A_B = E \div R_B = 9300 \div 9760 = .953.
\]

\[
Gc = R_B - R = 9760 - 10000 = -$240.
\]

We must distribute a $240 reduction among the shipment categories. To maximize the grant reduction potential of the system, we will reduce revenues only for those firms whose operating ratios (in table A.14) are less than \( A_B \). Those with \( A \) greater than \( A_B \) are already being subsidized by the categories with \( A \) less than \( A_B \).

The revenue distribution computations are contained in table A.17. The \text{TOTALS} line in table A.18 under the \( A_B, D_B, Rd \) and \( G \) columns confirms that the carrier is operating at its desired operating ratio (.953) and that no grant equivalent to or from the carrier exists after BRP application. The firm was seeking an over 2.4% revenue decrease ($9760 - $10000).
### Revenue Decrease Hypothetical Firm C Under Base Return Pricing

Data are hypothetical, based upon table 17.

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenue (in thousands)</th>
<th>Cost (in thousands)</th>
<th>Profit (in thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>3,200</td>
<td>1,500</td>
<td>1,700</td>
</tr>
<tr>
<td>2001</td>
<td>3,200</td>
<td>1,500</td>
<td>1,700</td>
</tr>
<tr>
<td>2002</td>
<td>3,200</td>
<td>1,500</td>
<td>1,700</td>
</tr>
<tr>
<td>2003</td>
<td>3,200</td>
<td>1,500</td>
<td>1,700</td>
</tr>
</tbody>
</table>

**Prepared by the author for the Grant-Winitz Distribution of Data.**

**Source:** Formula developed by author.

**Table A.17**
<table>
<thead>
<tr>
<th>SHIPMENT</th>
<th>R</th>
<th>R&lt;sub&gt;B&lt;/sub&gt;</th>
<th>E</th>
<th>A&lt;sub&gt;E&lt;/sub&gt;</th>
<th>D&lt;sub&gt;B&lt;/sub&gt;</th>
<th>Rd</th>
<th>G&lt;sub&gt;B&lt;/sub&gt;</th>
<th>% R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min Charge</td>
<td>500</td>
<td>500</td>
<td>625</td>
<td>1.250</td>
<td>.953</td>
<td>657</td>
<td>157</td>
<td>.00</td>
</tr>
<tr>
<td>1-499 lbs.</td>
<td>1000</td>
<td>1000</td>
<td>1150</td>
<td>1.150</td>
<td>.953</td>
<td>1207</td>
<td>207</td>
<td>.00</td>
</tr>
<tr>
<td>500-999</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1.000</td>
<td>.953</td>
<td>1049</td>
<td>49</td>
<td>.00</td>
</tr>
<tr>
<td>1000-1999</td>
<td>1500</td>
<td>1498</td>
<td>1425</td>
<td>.951</td>
<td>.953</td>
<td>1495</td>
<td>-3</td>
<td>-0.13</td>
</tr>
<tr>
<td>2000-4999</td>
<td>1500</td>
<td>1429</td>
<td>1250</td>
<td>.875</td>
<td>.953</td>
<td>1312</td>
<td>-117</td>
<td>-4.73</td>
</tr>
<tr>
<td>5000-9999</td>
<td>1000</td>
<td>942</td>
<td>800</td>
<td>.849</td>
<td>.953</td>
<td>840</td>
<td>-102</td>
<td>-5.80</td>
</tr>
<tr>
<td>&gt;10,000</td>
<td>500</td>
<td>458</td>
<td>350</td>
<td>.764</td>
<td>.953</td>
<td>367</td>
<td>-91</td>
<td>-8.40</td>
</tr>
<tr>
<td>Truckload</td>
<td>3000</td>
<td>2933</td>
<td>2700</td>
<td>.921</td>
<td>.953</td>
<td>2833</td>
<td>-100</td>
<td>-2.23</td>
</tr>
<tr>
<td>TOTALS</td>
<td>10000</td>
<td>9760</td>
<td>9300</td>
<td>.953</td>
<td>.953</td>
<td>9760</td>
<td>0</td>
<td>-2.40</td>
</tr>
</tbody>
</table>

Source: Tables A.14 and A.17.
The %R column indicates that this has been realized.

The total grant equivalents compare as follows; $G_t$ (from table A.14) = 1032. $G_{t_B} = 157 + 207 + 49 + 3 + 117 + 102 + 91 + 100 = 826$. The result is a 20% reduction in the total grant equivalent of the firm's rate structure. Grant ratio calculations yield; $G_r$ (from table A.14) = .1032. $G_{r_B} = 826 \div 9760 = .0846$, an 18% reduction.

Notes

1. PP. 34-40, supra.
2. PP. 100-101, supra.
3. See table 4.1, p. 29, supra.
4. PP. 49-52, supra.
References


2.  Regulation or Disaster?, 1975, 8p.


