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Regulation and Deregulation

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Transportation in the United States is subject to economic and social regulation of bewildering complexity and is administered by a variety of institutions in

pursuit of numerous desired ends. This paper describes the nature of current state- and federal-level transportation regulation, especially economic regula-

tion. Because the future of transport regulation has been called into question, the paper also discusses proposals for deregulation and investigates their potential impacts. Finally, issues are raised about the relation of regulatory change to state transportation planning and program administration and to state agencies charged with these duties.

EARLY REGULATION

The foundations of U.S. regulation were established in English common law because the provision of transportation was known as a "common calling," and transportation common carriers were subject to special requirements in the sale of their services. Common carriers were required to serve all at reasonable rates without discrimination. In return, government afforded common carriers special protection and privilege.

With the development of railroads in the United States, the question was raised whether these basic legal tenets and the body of case law that developed about them could deal with the issues generated by a new and rapidly dominant technology. Complaints about the business practices of the new mode were extensive. In several eastern states in the 1830s, 1840s, and 1850s, legislative and special commissions established for this purpose sought to establish maximum rates for the movement of freight and passengers, to require publication of rail rates, and to bar discrimination (1). More significantly, the midwestern Grange states enacted laws in the 1870s to prevent railroad abuses; these laws dealt with maximum rates as well as discrimination among persons, places, and commodities.

Following U.S. Supreme Court interpretation of state regulation and studies by congressional committees, the basic instrument of national regulation of the railroads was established in 1887 with the Act to Regulate Commerce (i.e., Interstate Commerce Act and related laws, Title 49, Subtitle IV, U.S.C.). With changes in transport technology and the conditions of competition in the various transportation markets, regulation was extended by such legislation as the Hepburn Act of 1906, the Panama Canal Act of 1912, the Transportation Act of 1920, the Motor Carrier Act of 1935, the Civil Aeronautics Act of 1938, and the Transportation Act of 1940 (2).

The result was a comprehensive set of regulations of the various modes covering market entry and exit, prices, discrimination, and the general market behavior of many, but not all, transport firms. Institutions to accomplish regulation included the independent federal commissions of the Civil Aeronautics Board (CAB), the Interstate Commerce Commission (ICC),

and the Federal Maritime Commission (FMC), plus state and city public service or public utility commissions.

CURRENT REGULATION

In recent years, there have been two major trends that have greatly changed the regulatory atmosphere. First, economic regulation, defined as the control of rates and conditions of service offered by transport firms, has been reduced through the Railroad Revitalization and Regulatory Reform Act of 1976 (4R Act) and the Air Transport Deregulation Act of 1978. More importantly, the ICC (and before it, the CAB) has greatly changed the thrust of economic regulation through administration action. Second, social regulation, dealing with health, safety, and environmental protection, has been greatly expanded in all areas (but with particular impact on transport) through such federal legislation as the National Environmental Policy Act of 1969, the Clean Air Act (especially as amended in 1977), the Noise Control Act of 1972, the Resource Conservation and Recovery Act of 1976, the Federal Water Pollution Control Act (and its 1972 amendments), the Clean Water Act of 1977, and numerous acts dealing with transport safety. These acts are supplemented by a great variety of state legislation.

ISSUES IN REGULATION

As with most long-lived institutions, there are major issues about economic regulation. Table 1 (3) lists the pros and cons of these issues in light of the current state of regulation.

The issues concerning social regulation are equally extensive but may be summarized by stating that proponents believe social regulation insufficiently restricts the excessive number of costly and incompatible externalities resulting from transport output. Opponents believe the restrictions are onerous, are overly extensive, stifle productivity and technological change, and represent extreme examples of government red tape.

Certainly the tremendous differences between the claims of proponents and opponents of transport regulation, economic or social, suggest that resolution of these issues is anything but easy. Moreover, various resolutions are likely to have varying impacts on various sectors of the population and other aspects of transport supply and demand. Those who deal with the full scope of transportation in the field of government, or those who deal with transportation as users or providers, should be aware that issue resolution regarding regulation is

Table 1. Summary of arguments for and against economic regulation of transportation.

For Regulation	Against Regulation
1. Will prevent destructive competition (competition is thought to be inherently destructive; without constraints on entry and controls on prices, service in the public interest would not survive)	1. Will result in monopoly profits and inefficient resource allocation
2. Will keep rates stable, nondiscriminatory (among areas, commodities, and different shippers), reasonable, and nonpredatory	2. Will generate excessive costs due to such restrictions (for example, in trucking) as circuitous routing, commodity restrictions, protection of inefficient firms, insufficient competitive pressures, and labor inefficiencies or high returns
3. Will continue services by retaining common carrier obligations, cross subsidizing low-density areas, and preserving national networks of suppliers	3. Will offer the wrong price-quality options (with higher prices and quality of service than competition would ordinarily allow)
4. Will avoid increasing industry concentration	4. Will increase external costs such as energy consumption and highway congestion
5. Will eliminate "fly-by-night" operators	5. Will result in inequities for small entrepreneurs and minority suppliers who become frozen out of various markets
6. Will retain an adequate flow of information	
7. Will maintain safety standards	

likely to affect the operation of such public tools as finance, pricing and taxation, ownership and operation of transport systems, planning and the provision of information, and the organization of government institutions or of industry. The ways in which regulatory issues are resolved can likewise affect all the goals that transportation seeks to achieve (Table 2, 3).

RESEARCH ON IMPACTS OF REGULATORY CHANGE

Fortunately, regulation has been extensively investigated over the years. As background for policy discussion in the legislative field, this section reports the results of some of those investigations as they pertain to potential regulatory changes. The impacts are reported according to a format that uses the 11 transportation goals presented in Table 2. Further, gainers and losers from deregulation are pointed out, and modal impact is described.

Overall Effects of Changes in Economic Regulation

Most studies suggest that deregulation of competitive transportation markets would yield very large net benefits (4, 5). Firms would be expected to compete within and between the modes.

Although the benefits of a program of deregulation are likely to be substantial, neither all benefits nor all costs can be predicted in advance. In particular, the exact consequences of altering the role of motor carrier rate bureaus as forums for fixing prices may not yet have been fully determined. Rate bureaus have been reluctant to divulge needed information that might be used to analyze how far price-fixing activities keep certain motor carrier rates above competitive levels, or whether there may be compensating benefits to shippers. To date, only partial answers have been available, such as those of researchers examining intrastate motor carrier rates in the unregulated environment of New Jersey. In that state, it was shown that unregulated rates are higher than expected, perhaps due to the umbrella effect of regulated rate bureau-determined rates (6).

Additional evidence was provided to the ICC in its

Ex Parte 297, Sub. No. 3, on the investigation of rate bureau practices by such agencies as the U.S. Department of Justice (DOJ) and the Federal Trade Commission (FTC) and its Bureau of Competition. The ICC is empowered to alter approved rate bureau practices where necessary. The DOJ and FTC, among others, argue that the ICC should act to remove the rate bureaus' antitrust immunity. [U.S. Senator Edward M. Kennedy (D.-Mass.), chairman of the Senate Antitrust and Monopoly Subcommittee, conducted hearings in 1977 and 1978 on freight rate competition in the motor carrier industry in general and on rate bureau practices in particular. The testimony of ICC Chairman Daniel O'Neal was quite instructive about ICC procedures (or lack thereof) to determine whether rate bureau practices are beneficial.]

The results of an ongoing analysis sponsored by the U.S. Senate Judiciary Committee should shed further light on the substantial costs to the shipper of motor carrier rate bureau practices. This study uses data collected by rate bureaus.

Even if this new study and the previous evidence are not totally conclusive on the exact level of benefits from rate bureau reforms, nonetheless, change appears beneficial. Presumably, the burden of proof should be on those who argue for retaining current regulations. It should be easier to quantify the purported benefits of the existing regulated situation—if benefits exist—rather than the potential benefits of proposed deregulation. Moreover, there are measurable administrative costs to the regulatory process. On the other hand, the benefits of price fixing to the shipper under status quo policies do not seem to have been demonstrated by those advocating continued regulation.

Following are capsule descriptions of impacts of reduced economic regulation of transportation. [These descriptions are based on an unpublished memorandum written for the National Transportation Policy Study Commission in June 1978 by Professor Ernest Williams, who is not responsible for my interpretation of his views given here.]

1. Efficiency. Competition in most transport markets should be sufficient to ensure rates at or below cost plus a reasonable profit, thus providing protection for the shipper. Allocative efficiency among modes can-

Table 2. Summary of national transportation goals and their primary characteristics.

Goal	Characteristics
1. Adequate service	Would mean comfortable, convenient, fast, accessible, and reliable service to all
2. Appropriate rates and prices	Refers to reasonable fares, rates, and costs for rider, shipper, and providers of transportation
3. Economic efficiency	Would maximize service for each transportation dollar (inputs), administrative effectiveness, intergovernmental cooperation, and promote competition among modes
4. Energy conservation and development	Would conserve and develop transportation fuel and would provide movement of energy for other uses
5. Environmental protection and enhancement	Would relate to concern for aesthetics; noise, air, and water protection; and historical site preservation
6. Safety	Would see that operators, passengers, and pedestrians are safe from personal injury and crime; goods are safe from damage; vehicle design and insurance are appropriate
7. Employment	Would provide transportation employment opportunities, job protection, access to all employment opportunities, and fair labor-management relations
8. Industry promotion and protection	Would provide protection for each mode against unfair competition and would maximize private-provider participation
9. Regional and urban development	Would encourage economic development and coordinated land use and transportation development
10. Equity	Would see to the impartial treatment of modes, users, and regions
11. Defense	Would assist in national and civil defense efforts and in international relations

not be secured, however, unless changes in government financing are also adopted so that market freedom is founded on neutral public policies with respect to rights-of-way. Competition is expected to eliminate inefficient carriers or cause them to reform their practices. These benefits will not necessarily flow to communities or routes where traffic volume will support only one or several carriers. Nor is freedom to abandon likely to result in so large a reduction of rail kilometers as efficiency criteria require. As major transport inputs are procured in markets characterized by a measure of market power, the most efficient allocation of resources between transport and other sectors of the economy cannot be ensured without appropriate antitrust-type enforcement.

Results become speculative when one recalls that regulation that the U.S. Congress takes away can also be reimposed; hence, the responses of large regulated carriers (especially railroads) and of the regulatory agencies are likely to be cautious. It seems that most railroads did not benefit from the pricing freedom that Congress believed it had granted in the 4R Act. Moreover, railroads and other carriers find a proportion of their traffic tendered by organizations much larger than themselves and equipped with strong bargaining power and wider alternatives than smaller shippers.

2. Adequate service. With regulations adjusted to permit carriers the freedom to price within wide limits, various service-rate packages presumably would be offered. Such action would afford shippers a broader choice.

3. Appropriate rates and prices. If the assumption of constant or declining returns to scale and to route density holds for all modes and if common costs are insignificant, rates should move to a close approximation of cost in all substantially competitive markets. Wherever the opposite prevails, some development of the type of discrimination that the Act to Regulate Commerce [Interstate Commerce Act, Section 1 (49 U.S.C. Section 10701)] and the Elkins Act sought to control may be expected in view of unequal bargaining power between buyers and sellers of service. [The recodified Interstate Commerce Act incorporates the Elkins provision for forfeiture of three times the amount of rebates or concessions for six years from the time of action (49 U.S.C. Section 10701).] For this reason, enforcement of improved antitrust rules and regulations will be required with deregulation by using the mechanisms that now apply to other sectors of the economy.

4. Energy conservation. Deregulation has been expected to induce a shift of traffic to more fuel- and labor-efficient modes by the adjustment of pricing. The combined impact of constrained capital inflow to the rail industry since 1906 and the massive public investment in the Interstate highway system since 1956 has altered the cost relations between these modes in such a way that much more modest expectations are in order, absent a massive upgrading of the rail plant. The proposition that railroads are more fuel efficient in their current state than motor carriers for the kinds of hauls performed today by motor carriers is at issue.

The proposition that freedom from entry and route controls will greatly improve the round-trip loading of motor vehicles, hence their fuel efficiency, may not give adequate account to the imbalance of traffic flows and the degree of use of specialized vehicles dedicated to particular commodities that have one-way flows. As with much else, there are few facts on which to decide the issue.

5. Environment. The impact here is as uncertain as in the case of energy conservation. Sharp rate competition in the marketplace, however, might induce less

adequate maintenance of vehicles with possible adverse energy and environmental effects. For this reason, strict enforcement of safety standards for certificated carriers should be part of deregulation proposals.

6. Safety. The problem exists of enforcing safety regulation with a shifting population of carriers under severe competitive pressure. Enforcement of hours of service, vehicle standards, and other regulations may be most effective (7).

7. Employment. Absent major intermodal shifts, the impact of regulatory reform on employment is likely to be minimal to the operating forces. With certain activities of rate bureaus curtailed and with rate making decentralized to meet competition on the spot, carriers may require more staff for marketing, rate-making, agency, and customer-contact purposes. The changed character of rate making will render some existing employee skills superfluous and will require replacement by different types. The Class B ICC practitioner will lose business, for example, but lawyers may profit from increased litigation before the courts. Shippers may find it necessary to enlarge traffic departments in order to track changing service patterns and rates, although it is also possible that rates would become simplified without such a detailed regulatory apparatus.

8. Industry promotion. The advantage, in the short run, is likely to go to smaller organizations that can readily adjust to change. In the less-than-truckload (LTL) business and in railroading, the longer run should see concentration of volume in the hands of fewer carriers with broader territories (reflecting possible economies of scale), increased bargaining powers, and improved capital flow.

9. Urban and regional development. Rural and sparsely populated areas may gain from better service (perhaps at higher rates more reflective of costs), and high-density intercity markets may also gain from continued good service at reduced rates closer to costs.

10. Equity. If by equity is meant equal access to service and to comparable rates by all shippers, regardless of size and location, adverse results are anticipated. If equity means equal opportunity to compete for traffic, some carriers will lose due to failure or inability to adjust to changed circumstances, which is the responsibility of carrier management.

11. Defense. Increased price-service options should benefit the U.S. Department of Defense, as it does other shippers.

12. Gainers. Large shippers clearly stand to gain. They will obtain automatically the right to intercorporate hauling, the right to back-haul for hire without regulatory proceedings, and bargaining power in accord with the traffic volumes at their disposal. It is also likely that shippers in general will benefit from improved service, availability of capacity in peak periods, and generally lower rates. Carriers with flexible managements should be able to capitalize on rate and route freedom to enlarge and balance traffic volume—even though their margins may be reduced—with the possible exception of certain railroads tied to territories and route patterns by fixed infrastructures.

13. Losers. Because the cross subsidy inherent in current rate structures will disappear, branchline points and points of small traffic generation will be forced up to rates more closely aligned with costs. Under reformed procedures, small carriers will require improved cargo clearinghouse support, perhaps by using enlarged alliances to expand joint territorial contact. Carriers will tend to move into a better position to use the economies of owner-operators than in the past, which might result in a relative loss for organized labor, at least in the short run. The increase of car-

rier freedom may abridge the existing rights of certain shippers who lack bargaining power. For this reason, antitrust rules should apply to prevent predatory behavior by carriers or shippers.

Modal Impacts: Railroads

Changed Rate Regulation

Possible rate regulation changes that could apply to railroads are (a) establishment of an expanding no-suspend zone of reasonableness, with rates outside the zone subject to review on grounds of alleged predation or market power and rates inside the zone reviewed by agencies enforcing U.S. antitrust statutes; (b) extension of certain motor and water carrier rate exemptions to railroads; (c) allowance of rail contract rate making on terms equivalent to those available to other modes; (d) permitting easier abandonment of branchlines; (e) elimination of ICC car service orders and car rental rates; and (f) alteration of rate bureau practices. Evidence concerning impacts of the first four of these rail regulatory changes follows.

Creation of a No-Suspend Zone of Reasonableness

Permitting an increasing no-suspend zone enhances economic efficiency by allowing rates to respond to changing market conditions and to tend toward marginal cost in the long run in markets not characterized by inordinate market power or externalities. [Potential negative efficiency consequences of allowing rate freedom might exist in cases of market power.]

A recent U.S. Department of Transportation (DOT) study indicated that rail rates are typically below variable costs on forest products, crushed and broken stone, miscellaneous mixed shipments, fresh vegetables, fruits and nuts, grain mill products, and gravel (8). According to this study, such rates range from 80 to 100 percent of system variable cost. To the extent that these rates also fall below marginal cost, permitting some upward rate freedom would enhance efficiency. The same study predicts that allowing some rate flexibility would result in a savings of \$250 million to the railroad industry.

The Association of American Railroads (AAR) has calculated an additional savings to the railroad industry that would result from rate freedom through avoidance of the time lag inherent in any rate case before the ICC; the savings would have totaled \$2.2 billion between 1967 and 1975 (9). DOT, in its recent 504/901 study, also cites reduction of regulatory lag as an important saving associated with a no-suspend zone. [The 504/901 study is a reference to sections of the 4R Act that mandated the study.]

Raising rates on those commodities for which rates are currently below variable cost would, according to DOT, both increase operating revenues for the railroads and result in either some diversion to other modes or a reduction in movement of the affected commodity (8).

The question of identifying the scope of rail monopoly power is an important aspect of rail deregulation proposals. In a recent congressional symposium that addressed this question, it was asserted that given shippers' opportunities for transportation and product substitution, rail-captive traffic is constantly changing and eroding. The symposium report cites growth in competition to rail for coal (e.g., through mine-mouth generation, other modes, and the use of other energy sources), grain, automobiles, and pulp board as examples of eroding rail market power (10).

A question that must be posed with regard to any no-suspend zone is whether it is wide enough to permit efficient pricing in general and at peak and off-peak times in particular. The 4R Act allowed more rate flexibility for demand-sensitive rates, but a requirement for a 30-day notice of publication and subsequent court challenges by shippers prevented any real demand-sensitive pricing. DOT has estimated that variation in demand for produce movements between California and Chicago for rail service is more than 600 percent. [The ICC acted on March 22, 1979, to deregulate rail carriage of fresh fruits and vegetables in Ex Parte No. 346 (Sub. No. 1), Rail General Exemption Authority—Fresh Fruits and Vegetables.] Peak off-peak variations in demand should be considered in determining the exact level of a no-suspend zone.

Another reasonable prediction as to the likely impacts of rate freedom on rates and service is as follows: Rates in markets with excess capacity would first be driven below average cost and some excess capacity would be eliminated. Where more than one railroad competes in a market, discriminatory rates would cease. Rates would tend to go down on high-valued goods and rise on low-valued goods. To the extent that railroads maintain any market power, rates would tend to be higher, and more capacity would be shed than under a competitive environment (11).

DOT predicts that there could be some short-run deterioration in rail safety because rate flexibility will allow the railroads to lower some rates below average cost and to begin a process of disinvestment where excess capacity now exists (8). Once disinvestment is complete, improved economic conditions resulting from regulatory reform should provide more resources for facilities and maintenance. As a result, safety may be improved.

A recent article illustrated the potential conflict between goals of energy efficiency and economic efficiency. It predicted that deregulation of rail and truck freight operations, although enhancing economic efficiency, may have the net effect of increasing energy use (12). With regard to rail rate freedom in particular, the example was cited of the shipper who, faced with lower rail rates or improved service, would opt for better service in the form of more frequent smaller shipments. Thus, although the optimum shipment size would decrease, the energy required to fill the shipper's transportation needs would increase (12). It was also noted that (a) total logistics costs as well as energy consumption are probably close to being optimized now and (b) for-hire transportation is not an area with great potential for fuel savings (12).

Extending Exemptions to the Railroads

DOT commented on the ICC proposal to exempt fresh fruits and vegetables from rail rate regulation. DOT asserted that the development of monopoly rates (the only potential negative consequence) would not be possible because the commodities in question would be subject to direct motor carrier competition. This lack of potential for rail-monopoly pricing would apply not only to fresh fruits and vegetables but to any commodity now exempt for motor carriers.

With regard to the impact that extending the exemption to railroads would have on rates, DOT predicts that, if the exemption were extended, railroads would offer contract rates to shippers for those who prefer rate stability. Shippers not opting for contract rates would be subject to the prevailing rates reflecting market conditions at the time. In either case, efficiency would

be enhanced, and shippers would have access to more price-service options.

Rail Contract Rates

According to the DOT 504/901 report, permitting railroads to offer contract rates would reduce shipper uncertainty over future rates; thus, service would be tailored more nearly to the needs of particular shippers. Further, DOT predicts that rail contract rate making would help solve the problem of regulatory imbalance, as competing motor carriers and water carriers are currently able to negotiate long-term contracts (9).

In a recent ICC proceeding on rail contract rates, DOT predicted that implementation of this policy would lower the railroads' cost of doing business, provide rate-service options more economical to shippers, and thus be anti-inflationary.

Eased Rail Branchline Abandonments

In addition to the several rate-related policies discussed here, policies could be recommended to alter the standard for abandonment approval and to expedite abandonment proceedings. The standard could be altered by requiring that carriers not be obliged to offer uneconomical service. In terms of rail branchlines, branchlines that are or become uneconomical would either be abandoned or operating losses and a return on investment would be the responsibility of various levels of government or of shippers in the affected community, not the carrier. Further, proceedings could be expedited, and a subsidy program might compensate carriers for losses incurred pending a decision on abandonment.

Easing rail abandonments would enhance direct economic efficiency. Railroads would be able to shed uneconomical branchlines, which would increase the prospects for financial viability of the affected rail firms.

The following are estimates of the cost savings to railroads that would result from abandonment of all uneconomical branchlines. Four categories of cost savings are relevant: (a) revenue accruing from the sale of land and salvageable assets, (b) savings in rehabilitation costs that would occur if uneconomical lines were retained, (c) annual savings in operating losses that would occur if lines were retained, and (d) savings in legal and administrative costs associated with abandonment proceedings.

The DOT 504/901 study estimates that legal and administrative costs to a carrier for each abandonment application can exceed \$50 000 (9). By expediting the proceedings and altering the standard for approval, the cost per application should decrease, which may encourage railroads to pursue abandonment on nonviable lines.

Another study on the potential benefits of large-scale branchline abandonments calculates cost savings based on an estimate of 56 482 km (35 301 miles) of nonviable lines. Such abandonment would imply, according to the simulation, a saving of \$1.5 billion from the sale of land and salvageable assets; a saving in foregone rehabilitation costs of \$2 billion; and an annual saving in operating costs of between \$138 and \$303 million (13). Disinvestment of these lines implies an annual saving to the railroads of between \$450 and \$600 million. These savings would double the railroads' net return on investment (13).

A different study predicts that, if the rail network is rationalized, additional light-density lines will become

nonviable, and, by the year 2000, a total of 120 000 km (75 000 miles) of rail network will have been abandoned, assuming no subsidy for continued operations is provided (14). An abandonment program of this magnitude would imply a much larger saving than that estimated here.

The Federal Railroad Administration (FRA) estimated that as of 1971, 33 600 km (21 000 miles) of low-density lines were uneconomical, which means a saving of \$105 million in salvage value and an annual saving of between \$29 and \$42 million in operating costs if the lines were abandoned (8).

A subsequent DOT study produced higher savings estimates. For an estimated 40 800 km (25 500 miles) of light-density lines outside the Northeast region projected to be abandoned, DOT estimated an annual saving in operating costs of \$150 million; this amounts to 18 percent of the net income of railroads outside the Northeast. The value of the track and facilities of these lines was estimated at \$640 million (8).

In summary, the estimates of branchlines that would be abandoned and the cost savings that would result vary widely. The route kilometers affected by a liberal abandonment policy range from 33 600 to 120 000. Estimates of annual operating cost savings range from \$29 million to \$303 million; salvage value estimates vary from \$105 million to \$1.5 billion; and savings in rehabilitation costs are estimated to be \$2 billion.

An additional impact on economic efficiency of rail abandonment policy depends on the question of subsidy of lines that are retained. One author raises the issue of cross subsidy among levels of government. Any external benefits from continued service on nonviable lines accrue largely to local areas, although the bulk of subsidy for continued service is federal. Subsidizing uneconomical lines only at the federal level rather than requiring users and direct beneficiaries to share financial responsibility would have a negative impact on equity (15).

The impact of more abandonments on rail rates is uncertain. If increased abandonment results in consolidating traffic on fewer lines, such that economies of use are realized, rates may go down (11, p. 23). On the other hand, if abandonment is accompanied by upward rate flexibility, shippers may be willing to pay higher rates to retain service on low-density lines, and fewer abandonments may be necessary. What is most relevant is not that rates would increase or decrease, but that railroads would no longer be forced to operate lines where rates are below cost.

The question of whether some low-density lines have the potential to become economically viable depends on railroad cost characteristics and the elasticity of demand for transport of the affected commodities. If demand is relatively inelastic, raising rates might generate increased revenues for railroads. Conversely, if demand is relatively elastic, raising rates would result in lower revenues. It has been observed that it is mostly bulk commodities that originate on branchlines, and processed or finished goods originate on main lines. Service advantages of shipping by truck rather than rail are much less important to shippers of bulk commodities than to shippers of processed and finished goods. Therefore, the demand for rail service by shippers of bulk would tend to be less elastic (i.e., bulk-commodity shippers would be less inclined to shift to motor carriage than shippers who valued the service advantages associated with motor carriage), and increased rail rates on some low-density lines might generate sufficient revenues to continue service (13, pp. 93-96).

For shippers who do shift from rail to truck as a

result of rail abandonment, an issue is whether they face higher or lower costs following the shift. It should be noted that motor carriage offers service advantages over rail. Even where truck rates are higher, it does not necessarily imply that shipper's total logistics costs rise as a result.

Case studies of rail abandonments offer mixed evidence of rate impacts. A study of the impacts of Midwest abandonments following the 4R Act revealed that in the majority of cases the truck rate substituting for abandoned rail service was lower than the rail rate at nearby grain elevators (16). Only two of the 40 elevators affected by the abandonments closed as a direct result of abandonment. An AAR review of a number of retrospective abandonment studies also found that many shippers were forced to switch to motor carrier transportation to cut their operating costs (17). A DOT abandonment study supports this finding. With regard to grain elevators in particular, large grain subterminals were constructed near high-density rail lines; following abandonment, grain was trucked to these subterminals and shipped in unit trains. The lower freight costs associated with unit trains more than paid for constructing the new subterminals plus the trucking costs (8, p. 166).

This evidence does not imply that costs to all shippers will go down as a result of easier rail abandonment policies. Some shippers clearly will be faced with higher transport costs that may result in firms going out of business. The evidence does suggest, however, that there is considerable potential for lower costs for perhaps the majority of affected shippers as a result of rail rationalization.

Where truck rates are so much higher than rail that a shipper cannot afford to use truck service and continue in business, some shipments would be eliminated with easier abandonment policies. There is considerable evidence, however, that instances of lower-cost truck service have resulted from rail abandonment, with resulting expansion of affected businesses.

DOT has made predictions of which industries would be most affected by eased rail abandonment. Agriculture was considered the most affected. Lumber and wood products would be moderately affected, and affected to lesser degrees would be food and kindred products, chemical and allied products, and petroleum and petrochemical products (8, p. 161). As to specific impacts on costs of the affected commodities, DOT estimated that costs to receivers of grain will increase, and the increase will be passed along to consumers. The effect on the costs of agricultural limestone may become prohibitive for those who lose rail service. The impact of higher feed costs on livestock production, however, would not exceed 0.5 percent of the total costs (8, pp. 168-169).

Evidence suggests that little impact on local employment results from low-density rail abandonments. In a review of a number of retrospective rail line abandonments, AAR found that the highway network in rural areas allows workers to commute substantial distances to new employment opportunities and that low-density abandonments have had no significant impact on employment (17).

A report of the National Transportation Policy Study Commission on current transportation issues in the United States cites the employment impacts of rail abandonments as potentially not serious except in those communities with a concentration of rail employees, and even in those communities decreases in rail employment are likely to be compensated by increases in trucking employment (18).

In a study of the economic effects of rail abandonments on selected communities, it was reported that only 2 of 10 communities studied perceived significant short-run impacts on employment (19).

A DOT study of employment impacts of eased rail abandonment policies likened the impact to that of deregulation generally. Calculations indicated that 1700 jobs would be affected at a total payroll bill of \$32 million. Employees affected would enjoy labor-protection provisions. These estimates of employees affected do not take into account any resulting increases in employment in trucking (8, pp. 163-164).

Increased rail abandonments may have implications for community growth and economic development. However, the AAR's review of recent abandonment studies indicated that abandonment of branchlines has had little or no impact on economic development of the affected communities (17). A survey of 71 abandonments in Iowa revealed little effect on employment and business or community growth (13, p. 141). In another survey of 10 abandoned communities, even in those instances where the price of products increased as a result, residents continued to buy products locally at higher prices rather than purchase goods in other rail-served communities. Although some firms changed their plans and did not locate in the affected communities, almost all of the communities surveyed added one or more firms after the termination of rail service (19, pp. 59-60).

A study done by the Public Interest Economics Center (PIEC), Washington, D.C., found that, in considering both the direct impact on fuel consumption by rail and motor carriers and the indirect impact on demand for more or less energy-intensive transportation equipment as a result of modal shifts, the impact of rail abandonments on energy consumption was insignificant (20).

A survey of 71 abandoned lines in Iowa found mixed impacts on fuel consumption depending on whether truck service was substituted only for branchline service or whether longer-haul truck service was used. Fuel consumption increased when grain was trucked greater distances following abandonment. In instances where grain was shipped to the same market as before abandonment, fuel consumption decreased significantly (21). Truck transportation is often more efficient than rail for short-haul movements such as those involving branchline operations. Other things being equal, trucks are more fuel efficient for shipments of less than 119 Mg (132 tons) and distances of less than 24 km (15 miles) (18, p. 83).

There are three major potential sources of environmental degradation associated with rail abandonments: air emissions, noise pollution, and the increased need for highway maintenance and construction. PIEC found that the change in fuel consumption resulting from abandonment was insignificant, and it concluded that any impact on air emissions must also be insignificant (20, p. 134). With regard to noise pollution, PIEC found that neither truck nor rail noise present health hazards. Further, the noise levels emitted by both modes are similar, and, therefore, any shift from rail to truck as a result of rail abandonment would have no significant impact on noise pollution (20, p. 132). PIEC's findings suggest that the impact on the environment of increased highway maintenance and construction would also be insignificant. Usually truck traffic changes are not expected to be great enough to warrant increased highway maintenance or construction (20, p. 130).

Modal Impacts: Trucking

The impacts of trucking deregulation are highly con-

troversial. Nonetheless, evidence suggests that regulatory reform will be largely beneficial to trucking interests (through improved productivity) and to users (yielding more price-service options). Reform will not be detrimental to competing modes if these modes, especially railroads, are simultaneously deregulated and if financing, pricing, and taxation reforms are also enacted.

Efficiency

The American Trucking Associations (ATA) argue that deregulation would increase the number of truckers handling the same amount of freight, thereby creating excess capacity and using more fuel. Evidence on freight demand elasticities does not support this view (22).

Efficiency gains from regulatory reforms include the increased ability of truckers to fill backhauls. Studies show that regulated trucking firms do travel some distance empty (23, 24), but the extent of empty backhauls may be less than commonly believed. AAR data reveal that for long-haul truck movement, both regulated and unregulated trucking is usually filled (e.g., about 90 percent of the time). As 100 percent loaded movements would be impractical, these figures support the view that deregulation might not yield great and immediate efficiency gains to all truckers by filling empty backhauls.

The AAR data may permit studies of commodity flows by direction, so that analyses could show the potential for using fewer vehicles to handle the traffic in particular corridors. Data from the continuing traffic study of rate bureaus may also facilitate such analyses. [Sen. Kennedy's Judiciary Committee staff has contracted with various rate bureaus to provide an analysis of the data from the rate bureaus' continuing traffic study.]

Rates and Prices

Following the exemption from regulation of particular agricultural commodities, rates declined (e.g., frozen fruits and vegetables by 19 percent, fresh poultry by 33 percent, and frozen poultry by 36 percent) with reduced stop-off charges as well (25, 26). Evidence from Canada shows higher rates in those provinces with stricter regulation (27).

An examination of the rates of return of various types of trucking may show where future competition might bring rate decreases by applying a zone-of-reasonableness concept. The average return on equity for carriers of general commodities in 1977 was 16.36 percent. A rate reduction of 0.4 percent could reduce this to the new ICC standard of a 14 percent rate of return on equity. Long-haul carriers with very large revenues (more than \$10 million/year) showed returns of 21.14 percent on equity in 1977, which includes the nationwide carriers of LTL freight. Rate reductions of 1½ percent would have been required in 1977 to reduce this return on equity to 14 percent. Higher returns are evident in certain regions (e.g., southern, midwestern, southwestern, and Rocky Mountain ICC regions). Regulatory reform may provide relatively greater rate reductions in these regions (28).

A study conducted with data from New Jersey (a state with unregulated intrastate motor carriers) found that large shipping firms received discounts of between 9.7 and 15.2 percent of the applicable interstate tariffs when they dealt with non-ICC-regulated intrastate carriers, and smaller shippers received discounts of between 8.5 and 11.4 percent. The regulated tariffs may serve as a

floor even for nonregulated firms because 70 percent of the regulated carriers and 45 percent of the nonregulated carriers used the Middle Atlantic Tariff or used it as a base for negotiations (6). Nonetheless, the New Jersey intrastate firms had better operating ratios (88.11) than the ICC-certificated sector (95.92). [Operating ratio is defined as operating costs divided by operating revenues.] The unregulated firms were smaller and more nonunion than the ICC-regulated firms (6, Table 46).

New rate-making freedom should result in rates based more on costs associated with distance, weight, volume, and direction versus the current structure of rate setting by commodity type. Separate charges for pickup, delivery, and line haul would be expected, and easily damaged goods would experience increased rate differentials.

Safety

Policies for motor carrier regulation have been discussed that allow eased entry into certificated motor carriers and contract carriage and provide regulated carriers with pricing freedom within an expanding zone of reasonableness to be established by Congress. On the one hand, these policies open the highways to new truckers and other common carriers, thereby increasing the risk of accidents and, accordingly, the incidence of personal injury and property damage. On the other hand, new rate freedom is likely to intensify price competition—a goal of deregulation—but it is also likely that some carriers, if pressed financially, will be tempted to "cut corners" in the area of safety. More safeguards to life and property on the highways of the nation may be needed. Highway fatalities for 1978 exceeded the 50 000 mark, and the early experience in 1979 shows further increases are in store (29).

Motor carrier safety regulation and its enforcement are duties of DOT. [The authority of DOT derives from Section 204 (a) of the Interstate Commerce Act, 49 U.S.C. 304 (a), which was transferred to it when the agency was created on October 15, 1966.] There is some evidence that the Bureau of Motor Carrier Safety (BMCS) does not have the personnel or funds to enable it to enforce these regulations effectively. For example, at one of the largest unannounced roadside inspections conducted by DOT on I-80 near Berwick, Pennsylvania, on August 7-11, 1978, on inspection of 676 vehicles, it was found that 352 (52 percent) had to be placed out of service for one or more violations. The principal defect was brakes. In addition, 371 driver hours-of-service violations were detected and 25 drivers placed out of service; 63 percent of all exempt and 55 percent of all authorized for-hire vehicles and drivers were declared out of service (30).

A year earlier the U.S. General Accounting Office (GAO) reported to Congress (31) that

In view of the limited accident data being obtained, the continuing infrequency of safety inspections, and the high ratios of trucks taken out of service after inspection, little assurance exists that most motor carriers are operating in compliance with federal safety regulations.

Drivers affirm that federal safety standards are not being enforced and that exempt carriers lead the industry in violations. In a survey of about 10 500 of the nation's truck drivers, nearly half of the exempt carriers who violate the BMCS hours-of-service rules do so by using multiple log books (32.7 percent), by regularly misrepresenting logs (44.94 percent), and by regularly driving beyond the 10-h limit (45.98 percent). At the other end of the scale, corresponding figures

for company-employed common carrier drivers were 1.87 percent, 4.27 percent, and 2.48 percent, respectively (32).

In an effort to come to grips with an existing national transportation problem and to mitigate any possible effects of the new regulation policies proposed, new policies could condition the right of motor carriers to operate (as distinguished from the existing requirement to obtain operating authority) on demonstration of adequate insurance protection. Collection could be a cooperative federal and state effort financed in part by sharing the proceeds of the federal heavy-vehicle use tax. Noncertificated motor carriers and other modes could be subject to similar requirements.

Energy

Fuel savings from less regulation of trucking have been estimated at 3.5 million m³/year (22 million bbl/year). Most gains accrue to private carriers and regulated LTL carriers. There is relatively little fuel saving by regulated full-truckload carriers (33).

Adequate Service

Within New Jersey, 97 percent of shippers reported that intrastate (unregulated) service was as good or better than regulated interstate service (6). Following deregulation, entry into the interstate LTL business may occur by such small intrastate firms, by newly expanded freight forwarders, and by expansion and merger of existing LTL interstate firms. These actions will result in less interlining. Regarding the stability of the industry, the New Jersey study found that the average age of unregulated intrastate firms was 18.43 years (6). A study of the exempt (agricultural) trucking sector found no more frequent exit from that industry than for similar industries (33). Another study found that the average age of exempt livestock trucking firms was 18 years (33, p. 38). Thus, fears of excessive turnover in a deregulated environment should not be realized.

On the other hand, monopoly should not occur either. Most studies have shown constant returns to scale, although economies may exist in the LTL sector for short hauls (34).

Service to small communities may improve with deregulation (35).

Employment

The average compensation for regulated trucking firms (often using union drivers) is substantially above that for nonregulated firms, as shown below (4, p. 231; 36):

Class	Average Driver Compensation		Percentage of Excess
	Regulated (\$)	Nonregulated (\$)	
Old Class I (\$1-5 million/year annual revenues)	11 099	8 504	30.5
Old Class II (\$300 000-\$1 million)	10 033	7 566	32.6

At least one study suggests that Teamsters Union members have gained from existing regulatory policies (37).

Industry Promotion

Regulated trucking firms own certificates that have scarcity value. The ATA estimates their value may

approximate 15 to 20 percent of the annual revenues of the firms that own them (4, p. 57). In 1972, operating rights of carriers with more than \$1 million in annual revenues were carried on their books at values of more than \$300 million, which may underestimate the market value (4, p. 5). Household goods certificates were estimated to be worth \$60.8 million in 1977 (38). The value of these certificates can be expected to decline as new entry is permitted.

Modal Impacts: Intercity Bus

Rates and Entry

The ICC was given authority to regulate the intercity bus industry by the Motor Carrier Act of 1935 and currently regulates bus entry, operations and route changes, exit, and fares. In 1948, the Reed-Bulwinkle Act made joint fare setting by rate bureaus legal and not subject to antitrust restriction. These acts are the basis for most of the current regulation of intercity buses. It should be recognized that intercity bus firms often derive substantial revenues from package-express and charter operations, in addition to common-carrier passenger service.

Problems in the industry that suggest regulatory change are as follows:

1. Very little intraindustry service competition exists,
2. The industry appears unable to achieve past rates of return under existing regulation (between 1960 and 1970, intercity buses showed a very stable rate of return averaging about 13 percent, the highest and most stable rate for passenger carriers),
3. Cross subsidy has been widely used by bus companies to continue to provide service that loses money in one area but makes a profit on overall operations,
4. Intraindustry rate competition has been discouraged by tariff-filing requirements and certain rate bureau practices, and
5. More than 1750 communities have lost bus service over the past 10 years.

Federal legislation in 1978 (Surface Transportation Assistance Act) sought to aid the industry by authorizing (but not appropriating) funds for rural intercity bus service and terminal development, repealing the excise tax on buses and bus parts, and providing an exemption from the federal fuel tax of 1 cent/L (4 cents/gal).

Deregulation Policies

In the long term, deregulation would suggest complete reform of intercity bus rates and rate bureau practices, entry (subject to compliance with safety, insurance, and financial standards), and exit.

Interim, but less vigorous, policies would be (a) increased rate flexibility, including an expanding no-suspend zone of reasonableness to be established by Congress; (b) easier entry of new carriers, or carriers offering new service on existing routes, with an increased burden of proof on protestants; and (c) federal, state, and local cooperation to subsidize shortfalls for certain uneconomic routes where benefits exceed costs. Such interim policies could give established carriers the opportunity to adjust their operations to become fully competitive. They would also permit new entrants who are financially fit and can demonstrate safe operations.

There have been no large-scale studies to date of anticipated impacts from intercity bus deregulation.

Prior to the 1970s, few bus companies, their competitors, or their riders challenged the ICC's authority to regulate rates, routes, entry, and exit. Inflation, the National Railroad Passenger Corporation (Amtrak), and a general decline in the intercity bus industry have changed that situation. A variety of studies have recently been completed or commissioned.

Adequate Service

Regulatory reform of the intercity bus industry will probably improve service characteristics through more intraindustry competition. Whether service will become more accessible to all is debatable, especially in the rural market.

The intercity bus industry is dominated by two carriers, Greyhound and Trailways. Each has coast-to-coast networks. Together they operate approximately 65 percent of all U.S. intercity bus passenger kilometers and more than 80 percent of those operated by Class I carriers (39). Most of their rural intercity routes feed into the crosscountry network. Two schools of thought exist regarding the impact of deregulation on service. Concern has been voiced that, when the large carriers drop the most unprofitable low-density routes (as they almost certainly will when given the chance), communities affected will be left with no public transportation. It has also been argued that carriers will seek to serve only the densest passenger routes, or to provide only charter and package-express service that may yield higher returns than common carrier passenger service under existing regulations. Other observers contend that profit in the bus industry is not dependent on economies of scale, and smaller carriers, providing specialized service over a limited route, may well be profitable (40). In the latter case, deregulation would allow easier entry of these small carriers, with no loss (and perhaps an increase) of service as large carriers leave the markets. A series of small networks might well provide better regional service than the existing networks geared to long-distance travel. Both the smaller and larger carriers, if given increased freedom to offer a variety of price and service options, can become more responsive to consumer demand.

Policy recommending limited subsidization of service (on terms similar to those aiding rail branchlines or essential, small community air service) could prevent mass abandonment of unprofitable routes in the interim and, at the same time, remove the need for private carriers (or other passengers through cross subsidy) to bear the losses.

Economic Efficiency

Again, it is expected that economic efficiency should improve under regulatory reform. The proposed interim policy to provide subsidy on unprofitable routes will prevent large carriers from abandoning uneconomic low-density routes, while relaxed entry and rate regulations should encourage entry of other firms that can provide profitable service. There is some concern by private intercity bus firms that federally subsidized carriers now may be competing unfairly. It should be noted that intercity bus firms are eligible for federal funding (at state and local option) under Section 18 of the Federal Public Transportation Act of 1978.

Energy Conservation and Safety

Buses are, on the average, from two to seven times as fuel efficient as alternative modes (although compari-

sons based only on averages may be misleading) (41, p. 18). To the extent that regulatory reform encourages bus use at improved load factors, energy conservation will be favored. Similarly, bus safety records have been impressive (39). But recent projections (41, p. 108) have demonstrated that demand elasticity for intercity bus is very low on most routes (i.e., those with no direct competition). As a consequence, little impact on energy conservation or safety is expected through diversion from modes that are less energy efficient or less safe.

Regional Development

Of the 15 000 communities served by common carriers of passengers (air, bus, and rail), some 14 000 are served only by bus. A 1978 report offers a tentative conclusion, based on financial records of bus firms and consideration of the types of markets they serve, that service to rural communities does not appear to be less profitable than service to large cities (42, p. 19). Thus, simplified procedures for entering and leaving intercity bus markets should result in stable or increased service to rural regions not served by other modes.

Equity

Although intercity buses have been responsible for only about 2 percent of total intercity passenger kilometers since 1970, figures show that up to 1976 they handled more than 50 percent of total intercity passengers carried by public carriers (41, pp. 22-23). Analysis by income and age reveals concentrations of student, retired, and low-income bus ridership not encountered in other modes (whose limited routes or high fares make them inaccessible to these groups). Changed regulation could strengthen the bus industry by allowing it to continue to offer a service not provided by other public transport modes.

Environmental Protection

Buses compare very favorably to railroads (39, p. 328) and other passenger modes in terms of environmental disruption. However, compared to electrified rail, they do produce quantities of nitrogen oxides (40, p. 153).

Modal Impacts: Air Carriers

The deregulation of air cargo and passenger services occurred too recently to determine longer-term consequences. Earlier predictions included expected effects ranging from a loss of \$660 million/year to a gain of \$1189 million/year on trunk air carrier profits (as the elasticity of demand varied from -0.7 to -2.5 with a 16 percent fare reduction) (43). Deregulation's effects on the number of flights is unclear because low and flexible fares generate more passengers but higher load factors. Other predictions include an erosion of union power and the improved health of smaller short-haul air carriers relative to long-haul carriers in densely traveled markets (43).

Regarding loss of service to small communities, DOT (1976) and the CAB (1975) predicted little change. However, the Air Transport Association predicted substantial reductions in service (1975) (4, p. 235).

Rail Mergers

Yet another area of regulatory policy that might well be revised is that of corporate mergers. Under Section

5(2) of the Interstate Commerce Act as amended in 1940, mergers between railroads must have ICC approval. The ICC must consider several factors in its decisions:

1. Effect of the merger on adequate transportation service,
2. Effect on the public interest of the inclusion or exclusion of other railroads in the territory of the proposed merger,
3. Total fixed charges resulting from the proposed merger, and
4. Effect on labor.

The ICC has discretion to weigh the relative importance of these considerations and to consider other matters such as antitrust. [Mergers approved by the ICC are immune from antitrust laws, but the ICC must consider the competitive consequences of a proposed merger and determine that the probable adverse competitive results are outweighed by probable transportation and public interest benefits.]

It has been argued that the ICC interpretation of Section 5 of the Interstate Commerce Act has hindered railroad restructuring (8, p. 78). In attempts to maintain adequate service, the ICC has imposed protective conditions on merger packages to minimize the effect of merger on other parties (44). These conditions dilute the potential benefits of a merger and make restructuring less attractive. For example, during a 1950 merger proceeding involving the Detroit, Toledo and Ironton Railroad Company and others, several railroads alleged the merger would deprive them of traffic and jeopardize their financial position and ability to serve the public. The ICC imposed six conditions on the merger, limiting the merged roads' ability to alter premerger traffic patterns. These, known as Detroit, Toledo and Ironton Conditions or Standard Routing and Gateway Conditions, have been imposed on most mergers since 1950 (44).

It is also said that the ICC's failure to reach merger decisions in a reasonable length of time hinders needed rail restructuring. Between 1955 and 1972, the total time from initial filing with the ICC for merger, acquisition, or control of two or more Class I railroads to final authorization ranged from six to 108 months (44).

Title IV of the 4R Act added new rail merger procedures, as follows:

1. The U.S. Secretary of Transportation conducts the initial analysis of the impact of the proposed merger on shippers, consumers, labor, and geographical regions;
2. Public interest is the standard for ICC approval as opposed to the Interstate Commerce Act standards listed above;
3. Once an application that has been reviewed by the Secretary is presented to the ICC, it is directed to make a decision based on the public interest tests without concerning itself with inclusion applications (9, p. 126); and
4. Strict time limits have been specified for both the Interstate Commerce Act Merger Procedures (31 months total) and the 4R Act Expedited Railroad Merger Procedures (24 months after the ICC's receipt of the Secretary's recommendations).

Deregulation Recommendations

In accordance with the 4R Act goal of encouraging voluntary, privately initiated railroad restructuring, strengthened rail merger policy guidelines would prevent

potential efficiency gains from being jeopardized by uneconomic conditions placed on merger agreements. Specifically, economic analysis could be used to weigh the benefits of rationalization against possible costs to shippers and labor, and mergers could be subject to the antitrust policies applicable to other sectors of the U.S. economy.

Impact Analysis

Impacts would be expected in several areas. These would include economic efficiency, service, and equity.

Corporations may consider merger in order to improve financial strength and profitability through changes in operations, to gain access to capital, and to expand service. In many cases a carrier can achieve gains in efficiency only through investment. Such investment may upgrade or establish links between merged properties or redesign yards to accommodate traffic changes. If mergers are not burdened by involuntary inclusion of uneconomic assets and restrictions and if the process can be concluded in reasonable time, a merger is more likely to achieve the potential economies inherent in the consolidation process (45). [The Rail Services Planning Office has concluded that, although parallel mergers offer opportunities to reduce excess physical plant, increase traffic density, and reduce unit costs, end-to-end mergers generally provide potential for greater long-term advantages with fewer risks than most parallel mergers.]

There are several potential impacts on service. On the positive side, mergers that could improve service to the public are more likely to be initiated if there is reasonable assurance that few involuntary inclusions or uneconomic conditions will be imposed by the ICC (45, p. 47). On the other hand, if merger is used as a tool for resolving the marginal railroad problem, certain services of marginal carriers may be jeopardized by the merger (45, p. 39).

One potential difficulty in compressing the merger decision time period from 31 months is that, as proceedings evolve, they can become greatly complicated through the filing of inconsistent applications and petitions for inclusion. If the ICC is required to dispose of these petitions and applications within a shorter time limit, affected parties may be deprived of full opportunity to present their positions (10, p. 144).

Mergers--Motor Carrier

Section 5(2) of the Interstate Commerce Act authorizes motor carriers to consolidate or merge with ICC approval, if the proposed action is found to be just, reasonable, and in the public interest. Two basic criteria are used by the ICC to determine whether consolidation is in the public interest: (a) the anticipated public benefits available from unification and (b) the effect on competing carriers. The impact of proposed mergers on competing truckers is controversial, but the ICC generally appears supportive of trucking mergers (46). [If merging firms have less than \$300 000 gross operating revenues for a 12-month period prior to merger, no ICC approval is required.]

To comply with the congressional mandate of controlled entry, the ICC has taken the position that the service to be performed after merger should be no greater than each carrier could have performed separately by means of interchange agreements. If the merged route authorization is greater than the prior combined route structures, a new competitive service has been created. For a new service, the ICC must decide if benefits to the shipping public are greater

than adverse impacts on protesting truckers before a merger approval is granted (46, pp. 112-113).

New service does not automatically mean a merger will be denied, but the ICC's position has caused restrictions to be placed on some motor carrier mergers that lessen the service and profit potential of merger (46, p. 165). [Three of the more severe restrictions are (a) gateway restrictions to prevent route authorization conversions, (b) nonauthorization of tacking, and (c) overall commodity and place restrictions based on a vendor's route dormancy.]

Deregulation Recommendations

In the near term, the ICC could strive to eliminate restrictions that lessen the potential gains from motor carrier mergers. There are at least two methods of achieving this goal and meeting the existing congressional mandate of entry control. First, a strict burden of proof could be required for protesting carriers who claim that restrictions are needed to protect their ability to meet common carrier obligations (46, pp. 165-166). Second, where there is conclusive proof of extensive damage to competing carriers, merger applicants should be required to make short-term indemnity payments to protestants, permitting a reasonable time to adjust to the new competitive situation (46, pp. 165-166).

Impact Analysis

Impacts are expected in the areas of service and employment. The primary advantage of trucking consolidation (particularly end-to-end) lies in reducing the amount of interlining required and in improving service through reduced handling, less chance for theft and damage, quicker hauls, improved scheduling, and faster tracing (46, p. 60). With less restriction on merger agreements, the potential for service improvement increases.

Because the motor carrier industry is still growing, mergers may not eliminate overall employment opportunities. One transportation labor leader has said, "In the long run, mergers create jobs" (46, p. 96).

Long-Run Merger Policies

In the long run, transportation mergers for all modes could be subject to reformed antitrust laws to increase efficiency. Such antitrust policy should consider, to the extent they are measurable, gains in technical efficiency that result from a merger. These gains would be weighed against any losses in the allocative efficiency associated with potential monopolization of a market in such a way that mergers would be unlawful only where the costs exceeded the benefits. (Current antitrust law does not weigh benefits against costs in assessing mergers.)

The statute affecting the legality of corporate mergers, Section 7 of the Clayton Antitrust Act, condemns mergers whose effect may be substantially to lessen competition or tend to create a monopoly. The category of mergers most relevant to the transportation industry is that of horizontal mergers, that is, those affecting one market. Section 7 has been interpreted by the courts to strike down horizontal mergers creating market shares of as little as 5 percent (47).

A recent review of antitrust, which generally supports more vigorous enforcement, cites the counterproductive impacts of federal antitrust action with respect to mergers. It is suggested that federal antitrust resources would be more productively spent on mo-

nopolization or trade-practice cases than on mergers (48).

Subjecting transport mergers to DOJ rather than ICC authority would eliminate the need for prior approval of mergers. To subject transportation mergers to market-share standards may not be appropriate as an indicator of potential market dominance in freight transportation, as discussed in a PIEC paper on the benefits of rail deregulation (20, p. 30).

End-to-end mergers, which do not reduce competition in a particular market, represent potential gains in technical efficiency to the affected carriers, with little, if any, potential for increased market power (45). For this reason, an efficient antitrust policy with respect to transportation would presume legal most predominantly end-to-end mergers.

The impact of predominantly parallel mergers (as contrasted to end-to-end mergers) would be mixed. Parallel mergers may result in cost savings to carriers but may increase market power by reducing the number of carriers in the affected market. A key aspect of any DOJ actions on transportation mergers would be definition of the relevant market. Intermodal and intramodal competition, geographical competition, and potential for product substitutability are but some of the factors to be addressed in any determination of potential market power gains resulting from a merger. An efficient antitrust policy would weigh any efficiency losses (i.e., restrictions in output that may result from a merger) against potential efficiency gains. This is particularly relevant for railroad mergers, where merging two carriers may leave only one rail firm in a particular market, though no lessening of competition would result (when considering competition from other modes), and important cost savings may result from the merger.

Past mergers have provided trucking companies with access to markets otherwise blocked by ICC entry restrictions. As entry is freed, motor carriers may prefer internal growth as a more cost-effective means for expansion. In the LTL sector of trucking there may be potential for both scale economies and for monopolization if artificial barriers to entry persist. It is important that antitrust policy not preclude service advantages associated with large terminal networks that may result from trucking mergers. At the same time, incumbent LTL carriers should not be permitted to monopolize markets through merger, although new entrants are barred from the market through regulatory restrictions.

INTERMODALISM

Numerous federal regulations have been passed by Congress during the past 70 years that affect intermodal ownership and operation. The list includes the Interstate Commerce Act (restricts rail ownership of other modes), the Panama Canal Act of 1912 (restricts rail-controlled water operations), the Motor Carrier Act of 1935 (limits intermodal acquisitions of motor carriers), the Transportation Act of 1940 (modifies Motor Carrier Act provisions to apply only to rail carrier acquisitions of motor carriers and restricts rail and pipeline participation in water carriage), and the Federal Aviation Act of 1958 (restricts surface carriers from engaging in direct air carriage).

Each restriction resulted from an attempt by Congress to protect a particular mode from domination by more established modes of transportation. In most instances congressional directives provided agencies with wide latitude. On a number of occasions, without success, the regulatory agencies have asked Congress

for specific clarifying legislation (49).

As a result, federal agencies have recently taken the initiative to further the concept of intermodal cooperation and coordination within the context of existing regulation. In early 1978, the ICC approved a single-rate barge-rail tariff agreed on by a railroad and a barge firm in Iowa. These two firms joined together voluntarily and designed an innovative tariff to save Iowa shippers 60-80 cents/m³ (2-3 cents/bu) in transporting grain to New Orleans (50). Also in 1978, a Memorandum of Staff Agreement was signed by the managing directors of the ICC and the Federal Maritime Commission (FMC) "to establish cooperative internal procedures... in intermodal matters in which each agency has an interest" (51).

In early 1979 the ICC released proposals concerning deregulation of intermodal services, requesting shipper and carrier comments before a legislative package is presented to Congress. The ICC hopes that such proposals will encourage the participation of carriers in joint intermodal services. The proposals encompass (a) the repeal of the section of the Interstate Commerce Act that "prohibits common control or ownership of railroads and water carriers operating through the Panama Canal" (52) and (b) the end of regulations over barge and intercoastal tariffs so that such carriers "could establish through routes and joint rates with regulated carriers of other modes... and could provide substituted service for other surface carriers." In this proposal, deregulation of rate and tariff filing is tied to deregulation of carriers concerned with intermodal operations. This would not be necessary. Simply deregulating rates and tariffs could result in added efficiency with no added costs and yield easily quantifiable economic data on the effects of single-filed tariffs in intermodal movements (52, p. 21).

Probably the most progressive intermodal ownership policy of any agency is that adopted by the CAB in cases involving surface carrier participation in air freight forwarding. The CAB's policy has been evolutionary but with the expressed goal of protecting competition, not competitors. This evolution has been possible because, unlike the Interstate Commerce Act, the Civil Aeronautics Act does not contain specific provisions that demand congressional approval for modification (49, p. 98).

For example, piggyback service, which involves trailer-on-flatcar (TOFC) or container-on-flatcar (COFC) movement, is the most widely used form of domestic intermodal transportation. Although loaded trailers were moved on flatcars by rail as early as 1926, modern piggyback service did not begin until the late 1950s. According to AAR data, piggyback traffic between 1970 and 1978 (as a percentage of total rail carloadings) rose from 5.3 percent to 7.9 percent, though in 1974 this constituted only about 1 percent of the total intercity freight volume (39, p. 295). In recent proceedings, the ICC has settled on these basic conditions for rail control of motor carrier service:

1. Trucking may be performed to and from but not between specified key points or major traffic centers,
2. Operations must be limited to service at stations on the rail line,
3. Truck traffic must be connected with a prior or subsequent rail haul, and
4. Traffic must move on rail rates and rail billing (49, p. 59).

Although designed to ensure that any rail-contracted truck operation will be substituted service and traffic will not be taken from competing trucking companies,

the first two of these conditions inhibit TOFC service by limiting the potential of all-railroad-supplied TOFC to only those areas surrounding established railroad stations and by requiring a ramp at every key point.

Deregulation Policies

Regulatory reform could eliminate federal impediments to intermodalism in general and, at the same time, promote effective joint rates and through service within and among modes with the following policies:

1. Remove federal impediments to common ownership and to intermodal coordination and cooperation (although some restraints on common ownership may be necessary to preserve competition),
2. Adopt common definition of "through bill of lading,"
3. Eliminate differences between CAB, ICC, and FMC regulations affecting through rates, and
4. Further standardize cargo liability laws.

Impacts

Service is likely to improve under policies encouraging more extensive transport integration. In the event of poor TOFC service by intermodally controlled firms, independent truckers offering superior service could enter the affected market. With fuller cooperation between modes, options available to shippers would be increased. Thus, their ability to customize shipments according to need at prices reflective of costs would be improved.

It is probable that extensive transportation integration would lower consumer transportation prices. An example, already cited, is the savings experienced by Iowa shippers who use rail and barge under a single-rate tariff. Policy recommending a common definition of "through bill of lading" for federal agencies should significantly improve the opportunities for additional intermodal cooperation with similar reduction in rates.

In a 1975 study by Reebie Associates for the Federal Railroad Administration (FRA), it was estimated that a national intermodal network could save consumers up to \$163 million in transportation charges by 1985. However, these savings are heavily dependent on the effect that increased intermodalism will have on existing modes, equipment needs and use, and pricing policies (39, p. 444). Three factors have been noted that might limit the efficiency of increased intermodal traffic (especially TOFC): (a) overcapacity (both subsequent service problems and equipment shortages) related to an imbalance of traffic flows, (b) unclear impact on existing carload rail traffic and resulting rail revenues, and (c) unestablished impact on need for both intermodal equipment and other car types (39, pp. 298-299).

To the extent that encouragement of intermodalism would reduce modal discrimination in existing U.S. statutes, the recommended policies of the National Transportation Policy Study Commission would result in greater equity among modes. Three examples of modal discrimination in existing regulation are (a) Section 5(2)(b) of the Interstate Commerce Act that applies only to rail carriers seeking to integrate with existing motor carriers, (b) Section 5(14)-(16) that apply only to rail carriers and pipelines seeking to engage in water carriage, and (c) Section 408 of the Civil Aeronautics Act that applies only to surface carriers attempting to engage in direct air carriage (49, p. 187).

Protection of newer industries from competition has been a key to the interpretation of regulations limiting

intermodal ownership. Recently, however, there has been more active concern with protection of competition, even if that means losses for individual firms.

For example, trucking has traditionally opposed regulatory change to permit rail entry into motor carriage on the grounds that railroads might combine pricing and service changes to weaken the trucking industry. Experience with two western railroads and their trucking subsidiaries would tend to disprove this theory. Santa Fe Industries and Southern Pacific Transportation Company, both rail holding companies, are significant factors in western trucking operations. In their 40 years of operation, there has been no evidence that railroad involvement in motor carriage had damaging repercussions on trucking (49, pp. 163-164).

On the other hand, without the protective shield of federal legislation, there seems little doubt that several smaller, less profitable firms would be eliminated or relegated to rather limited types of carriage where their service has been shown to be inferior to that of the larger integrated companies (49, p. 166).

Intermodal cooperation, especially piggybacking has been consistently opposed by affected labor unions. Increased use of containerization tends to lead directly to reduced employment as capital expenditures (in the form of containers or trailers and the special equipment needed to move them) are substituted for labor.

The Federal Maritime Administration has examined the relation between containerization and unemployment at U.S. ports. The most severe drop in longshore employment between 1960 and 1976 was at the Port of New York, the largest container port in the world. Overall, since the introduction of the container to the shipping industry in the late 1950s, there has been a steady increase in labor productivity (50 percent between 1967 and 1975) but a decrease in longshore employment (23 percent between 1960 and 1976), according to the U.S. Maritime Administration's Office of Manpower.

Deregulation policies could be a preliminary step to formation of a broad national intermodal network. Studies of energy savings from such a system have been conducted. Annual savings of 300 million L (75 million gal) of fuel (0.4 percent of the predicted total consumption for intercity freight transportation) were forecast due to diversion of traffic to more fuel-efficient TOFC operations (39, p. 444). However, other, less extensive intermodal coordination may have little impact on energy consumption.

Again, speaking specifically about the easing of piggyback restrictions, any resulting reduction in intercity trucking operations would improve the levels of pollution, congestion, and safety performance (39, pp. 444-445).

INNOVATION

Innovative changes in transportation are affected by a variety of factors, including market structure, demand characteristics, capital availability, labor relations, and government regulation. Some argue that the pace of innovation is not as rapid as it should be, due in part to the impact of economic regulation. Although there has been no definitive analysis of the relation between regulation and innovation (53), recent examples suggest that regulation can adversely impact the implementation of new techniques and technology, especially for railroads. [The Office of Technology Assessment recognized the need for such an analysis in its 1979 list of 30 priorities. Priority 13 is to assess (a) the impact of technology on the movement of goods and (b) the degree

and manner in which federal policy can be expected to inhibit or promote the development and use of technology.]

Implementation is only half of the innovative process. Research and development are perhaps more crucial than implementation. Here, federal funding is a key concern rather than federal economic regulation.

Control of rail rate changes is believed to be a major impediment to innovation. The ICC decides whether proposed rates are "just and reasonable" based on historical average costs. Such costs do not reflect the savings available through innovation. By prohibiting a carrier from adopting lower rates that could generate a traffic increase necessary to justify an innovation, the ICC may have prevented some innovative changes (39, p. 114).

One frequently cited example of how economic regulation can distort investment decisions involves the introduction of 90-Mg-capacity (100-ton-capacity) rail freight cars. Carriers wished to use the larger cars even though standard-sized cars were adequate. Carriers wanted to reduce rates to major shippers to reflect the economies of bulk handling but feared ICC action against rate reductions.

The case of Big John grain-hopper cars is a striking example of the way in which regulation can delay introduction of an innovative technology. In 1961, the Southern Railway Company published tariffs for new Big John grain cars that were 60 percent below previous rates. Complaints from competitors delayed approval until 1962. The decision was subsequently reviewed and reversed by the ICC, initiating a series of court battles. Four years after the initial petition, rate reductions for Big John grain traffic were approved (39, p. 116). Aside from deterring one specific innovation, time delays such as this entail frustrations and costs that may discourage management from attempting to introduce new technology in the future.

Some investigators believe that the introduction of unit trains in the East was delayed by at least five years by the regulatory process (54). Cost studies of unit-trainload shipments of coal, grain, and iron ore indicated that substantial cost savings were possible over conventional operations. To introduce the service, lower rates were needed to induce shippers to maintain the larger inventories and to provide the loading facilities required by unit loads. On the basis of prior regulatory policy, carriers assumed that, if lower rates were offered for this service in one area, similar rate reductions would be required by the ICC in other areas, conceivably resulting in net revenue loss. Thus, there was no incentive to introduce cost-based rates for unit-train operations until demand increased to the point where service was profitable regardless of uniform rate requirements (39, p. 115).

Rate regulation is but one factor that inhibits innovation. Railroads are restricted in their ownership of other transportation modes; pipeline, water, and motor carriers are not. None, however, may acquire airlines. The ICC has the power to approve or reject railroad ownership of truck lines. This policy may have slowed the development of domestic piggyback service compared to the large-scale introduction of this service in Canada, which is unhampered by such restrictions (9, p. 51). The same policy may inhibit the large-scale use of two promising future innovations: specialized intermodal rolling stock and automated intermodal terminals.

The long history of economic regulation may have shaped the philosophy of rail management about innovation. Some argue that regulation, by transferring competition from marketplace to courtroom, has fostered

a management concerned more with legal maneuvering than with innovative change in equipment or procedures. Further, the attitude of labor may well have been influenced by regulation (55, 56).

Deregulation Possibilities

A case can be made that almost any regulation impacts technological change by impeding or forcing innovations or by channeling the course of such change. A revised federal policy would be to minimize regulatory impediments to innovation by assessing the extent to which the regulation (existing or proposed) inhibits or promotes the development and use of innovative technology. The gains or losses to innovation would thus be added to the calculus of regulatory benefits and costs.

Impacts

Relaxation of regulatory constraints on innovation may positively affect the pace of technological change and the variety of services available. Carriers able to reflect the costs of new technology in their rates have greater incentive to discover and meet the demand for new services (4, p. 91). As an example, expansion of intermodal services like TOFC and COFC is possible.

With greater freedom and more incentive to innovate, carriers are likely to choose methods that permit cost reductions. Thus, a positive impact on efficiency is expected, ensuring that future innovations are in society's economic interest (4, p. 92). As a consequence of improved efficiency, a positive impact can be expected on user fares or rates and on costs for providers of transportation.

Railroads may have the most to gain because evidence indicates that they are more inhibited by regulation than other modes. Increased innovation in the rail sector could lead to technological thrusts in competing modes—another spur to increase efficiency and service for the entire transport system.

Greater automation of railroad yard operations, monitoring, and control processes can be expected to reduce the labor force now required for those tasks. On the other hand, deregulation may create new employment opportunities in transportation as rates fall, if transport demand is elastic with respect to price.

SOCIAL REGULATION

Safety

Transportation safety has long been a government concern. As in all situations involving socially unacceptable risks, government regulation of transport safety has taken three basic forms, following designation of an agency to oversee the specific risk or accident cost reduction (57).

1. The agency can produce and disseminate safety information. This has rarely been used exclusively in transportation problems but has often been a complementary measure to mandatory standards (e.g., seat belts).

2. The agency can impose penalties, fees, insurance requirements, or quotas to deter the creation of unsafe conditions and the manufacture of unsafe products. The Federal Aviation Administration's (FAA's) establishment of quotas at peaks to control the concentration of air carriers over busy airports is one example.

3. The agency can promulgate mandatory standards. This has been the primary approach of the agencies

designated to solve transportation safety problems from rail car brakes, seat belts, and commercial air carrier instrumentation.

Deregulation Possibilities

In the long term, regulatory policies involving transportation safety would best be cost-effective relative to other life-saving programs, with objectives that are clearly stated and enforcement that is strict, effective, and applied equally for all modes and carriers. "It is by no means clear that we should always be increasing our spending exponentially to shave the last few percentage points off the risks we happen to care most about at the moment" (58).

Specific recommendations that will lead to these goals are

1. Retain DOT's central role in safety regulation and enforcement;
2. Provide federal matching funds to states for enforcement with penalties for ineffective enforcement;
3. Share costs among all levels of government, carriers, users, and others who benefit;
4. Increase penalties for carriers who do not maintain standards for rail cars, trucks, tracks, and so forth (for example, federal prosecutors in Wisconsin have begun to levy misdemeanor charges on executives of trucking firms for alleged safety violations, with possible felony charges for false statements) (59);
5. Tie certification of regulated carriers to verification of safety regulation compliance;
6. Require all certificated motor carriers to obtain insurance at levels sufficient to require on-site inspections by insurance firms;
7. Emphasize better maintenance of roads and bridges; and
8. Encourage training of local police and firefighters to deal with transportation accidents involving hazardous materials.

Impacts

There have been few government or private studies that have dealt with the balance of costs and benefits of existing or proposed transportation safety regulations. A well-documented analysis of the cost-effectiveness of 37 highway safety countermeasures was prepared by DOT in 1976. The National Highway Safety Needs Report (60) ranked the countermeasures by cost of implementation, fatalities forestalled, and cost-effectiveness over 10 years. Because of the methodology developed in the report, motor vehicle safety regulations have been scrutinized more than those of other modes. Other DOT studies include some mention of the costs and benefits of safety regulation (61, 62).

The FRA notes that, since May 1978, DOT has been conducting a zero-based review of its safety regulations and in December 1978 proposed a full-scale revision of its freight-car safety standards (63). The most troublesome problem in rail safety, deferment of track maintenance, has yet to be approached in a cost-benefit study, though FRA's A Prospectus for Change in the Freight Railroad Industry reports a \$4.15-billion accumulation of deferred maintenance over the past 10 years (63, p. 24). Recent FAA proposals to broaden controls on air traffic (64) and DOT proposals to revise regulations governing truck drivers' hours of service (65) have been met with cost-benefit arguments by industry spokespersons (66).

GAO estimated the costs of vehicle safety regulations administered by the National Highway Traffic

Safety Administration (NHTSA) to be \$40/automobile in 1966, rising to \$246/automobile in 1973 and \$386/automobile in 1974 (the 1974 figure includes \$122/automobile for the seat belt-ignition interlock system). Cumulative costs between 1966 and 1973 were \$13.4 billion (\$2.9 billion for 1973 alone). GAO concluded that in the earlier years these costs were well spent when measured against lives saved (67).

Later estimates include that of a 1976 NHTSA survey, which showed that automobile manufacturers claimed an average \$368 of added cost per vehicle resulting from safety standards (62, p. 10). Congress' Joint Economic Committee found costs of \$666/automobile in 1978, or \$7 billion in total for safety and environmental features (68). NHTSA claims costs of only \$250/automobile for safety equipment, or 5 percent of the overall price (4, p. 41).

Revised safety regulation policies could have a mixed impact on service. Enforcement of track, road, bridge, and vehicle maintenance standards should improve reliability and speed but may discourage carriers from serving less-used routes (e.g., to small communities) because carrier costs increase to meet the standards.

Generally, it has been assumed that increased safety is directly related to increased expenditures, which eventually affect rates and fares. On the other hand, a DOT proposal to revise locomotive, track, and signal standards is expected to both reduce regulatory burdens and improve rail safety (63).

Revised policies will probably have a mixed impact in this goal area. The trucking industry has estimated that DOT's plan to limit duty hours of drivers to 12 h would cost 73 private fleets \$74 million, including higher labor and equipment costs (66). But studies of the automobile industry's response to the additional standards required since 1967 show that the ratio of net profit to net worth for the three major automobile manufacturers has not declined (General Motors Corporation averaged more than 15 percent/year), indicating the economic strength of the companies during this period of automobile regulation (62, p. 27).

Relations between safety policies and energy conservation are often unclear. An exception is the policy of supporting strict and effective enforcement that, if applied to the 88-km/h (55-mph) national speed limit, may have a direct positive impact on fuel conservation in reducing motor fuel consumption by 1 to 2 percent (69). Nonetheless, the cost-effectiveness of the national speed limit has been repeatedly challenged (70).

Revised safety policy requires that cost-effective standards and regulations be applied equally for all modes and carriers.

Energy

Energy is both an input to the transportation system and a commodity transported. Energy deregulation is likely to have a great impact on the transportation system. Today's U.S. energy policy is extremely complex. Adding to the complexity is the fact that foreign policy considerations play a major role in energy policy. Regulations affect energy supply, demand, and distribution. Prices at which old or new domestic crude may be sold are specified. A system involving entitlements equalizes costs to refineries to compensate for the varying controlled prices of domestic and foreign petroleum. Prices of gasoline, kerosene-based jet fuel, and aviation gasoline are controlled.

Deregulation Possibilities and Impacts

Impact predictions include the following:

1. Ending the petroleum-refining entitlements program would discourage consumption of imported oil (5, p. 798);
2. Ending ceiling prices on crude oil would permit additional U.S. production of about 1.1 million bbl/day by 1985 as producers respond to price incentives (5, pp. 816-817);
3. Eliminating price controls would inhibit producers from withholding products from the market solely to await the possible future end of price controls (5);
4. Welfare gain from ending too much consumption of petroleum at regulated (low) prices could equal \$1.5 billion (5);
5. Deregulated gasoline prices might rise 3.7 cents/gal higher by 1980 than if gasoline controls were maintained (71);
6. Deregulated gasoline prices might lead to increases of about 0.2 percent in carbon monoxide and other emissions (71, pp. IV20-IV29);
7. Deregulated gasoline prices that increase in the free market would reduce demand by 21 000 bbl/day for each cent/gal increase (71, p. IV57); and
8. The administrative costs of energy regulation that could be saved if regulation were eliminated equaled \$50 million in 1977 (5, p. 82).

Transportation is the largest consumer of petroleum (using 50 percent of total petroleum but only 25 percent of total energy consumed in the United States in a year). The automobile consumes 80 percent of the petroleum used by transportation. Thus, it is important to consider the extent to which deregulation of energy markets will produce price responses that in turn affect vehicle use and ownership. Such responses, or price elasticities, are important because, if consumers' responses are elastic with respect to price, overall price changes will elicit large changes in driving behavior. If consumers' responses are inelastic when fuel prices rise, the consumption of motor fuels will not fall, even with large price increases (72).

Various analyses of energy price versus automobile ownership and use are available. One report shows ranges of price elasticities for gasoline, jet fuel, and diesel fuel at short-run and long-run intervals, at 1972 and 1975 price levels, and for the automobile, truck, jet air, and rail modes (73). The figures were virtually all inelastic, more so in the short run. Demands for truck and rail diesel fuel were especially inelastic and in most cases very close to zero. In the long run, jet fuel purchases were shown to be slightly elastic at 1975 prices.

Another study reports a gasoline price elasticity of -0.2054 and predicts that a new five cents/gal federal fuel tax imposed in 1979, and increased at five-cent increments each year to reach 50 cents by 1988, would save 1 million gal of fuel per day by 1988, or 14 percent of what would otherwise have been consumed. The author's sensitivity analysis showed that a 1 percent decrease in gasoline sales due to voluntary conservation or unemployment would reduce his computed elasticity figure to -0.1624, although he believes voluntary programs have contributed very little to overall conservation (74).

Annually, NHTSA reports estimates of the impacts of its fuel economy standards. In at least one case, proposed standards were too stringent to be met by the vehicle producers according to the NHTSA timetable, so the standards were relaxed (69).

Production of energy involves safety risks. Estimates of these risks have proved to be very controversial. When considering the risks inherent in producing energy by various sources, as well as in transporting

the energy, wide variations in predicted impacts are possible. One recent study reported the risk of wind-generated energy to be several times greater than that of nuclear power (75, 76). The wind figure was high because the machinery must be fabricated and installed, and back-up generating capacity provided. Another estimate of energy risk is that of the Rasmussen Report (77). It gives the chance of a nuclear power station disaster at one in a thousand million. Obviously, recent problems at the Three Mile Island nuclear facility will call these estimates into question.

Energy deregulation would be expected to favor the private development of U.S. energy resources. Given relatively free energy markets, but transportation markets constrained with existing regulatory structures, the expectation would be for hastened development of U.S. coal resources, rapid dieselization, and the introduction of synthetic petroleum plants in the northern Great Plains during the 1990s. The impacts of energy deregulation would suggest substantial movement of coal by rail, which implies possible bottlenecks and new investment needs, as well as consequences to the communities through which the traffic will pass. Bottlenecks on the U.S. inland waterway system are also possible as the result of increased movement of energy resources.

Although deregulated energy policies will stimulate new patterns of energy movement in the United States, largely through private market responses to price signals, deregulated transport policies should increase the likelihood that these new movements can be accommodated by private U.S. transportation systems. Thus, any community disruption associated with coal movement by rail could be assessed to shippers, whose payments would compensate these communities. Proper user fees that vary with peak demand could allow full reliance on existing systems and mitigate the need for new investment.

Transportation is uniquely dependent on petroleum-based fuels; other sectors of the economy have greater choice among fuel types for meeting their energy needs. Consequently, if higher petroleum prices cause other sectors to use less energy or switch to other fuels (for example, if electric generation relies on coal and nuclear fuel rather than oil-based residual fuel), more petroleum will be available for transportation.

The reliance by other sectors on coal for energy will impose the burden of moving massive amounts of coal on the transportation network, especially on the railroads. A large fraction of this coal is expected to come from mines in the West; this will involve great distances. To ensure adequate service to noncoal shippers, more capacity (and added capital expenditures) will be required.

It is difficult to determine how low-income persons who rely on automobiles would fare in a situation of rising fuel prices, although the U.S. Office of Technology Assessment has found that adverse impacts from deregulation could occur (78).

Deregulating energy prices would cause fuel prices to reflect true economic values more accurately than occurs under regulation. To the extent that more accurate fuel prices resulted, the various transportation modes would more accurately reflect their true costs, and energy policy would not act to subsidize less-energy-efficient modes, as probably already occurs to some extent.

Higher fuel prices should result in less fuel being consumed, other things being equal. There could be a higher rate of diesel engine penetration into the automobile market as a result of fuel and other costs that make these engines preferable to those powered by

gasoline. Additionally, it is anticipated by the U.S. Department of Energy (DOE) that less driving will occur. DOE expects that for each 1 cent rise in gasoline prices, demand will decrease by 21 000 bbl/day (71, p. IV16). Air travel will become more energy efficient partly as a result of technological developments spurred by higher energy prices.

Higher petroleum prices will cause other sectors to switch to coal and nuclear fuels to meet part of their needs. This will free petroleum for transportation, which will be dependent on liquid fuels for the remainder of this century. Higher prices also will prove an incentive for the development of syncrudes from coal and shale oil.

Environmental impacts are difficult to assess because of countervailing forces. On the one hand, higher prices should cause less travel, resulting in reduced aggregate emissions. On the other hand, higher fuel prices may increase pressure for relaxing environmental standards (or for not tightening them further) and may encourage misfueling of automobiles designed for nonleaded gasoline—if deregulation enlarges the gap between leaded and unleaded gasoline prices.

Increased oil extraction efforts will have environmental consequences. Greater amounts of drilling and exploration in frontier areas may occur if prices are allowed to reach market levels. The amount of oil production forecast for Alaska will require enlarging the pipeline across Alaska with some environmental damage.

Also, a shift to coal will have serious environmental effects. The extraction, transport, and burning of coal pose environmental problems. To the extent that the use of coal is encouraged because of petroleum price increases, the resulting problems need to be considered as part of the costs of allowing petroleum prices to rise.

Higher fuel prices, to the extent that they reduce travel, may reduce fatalities (73). Fuel conservation measures—such as the 88-km/h (55-mph) speed limit—may have collateral safety value (69, Appendix Q). However, it is possible that some efforts to reduce fuel consumption, such as reducing automobile weight or allowing larger truck sizes and weights, may adversely affect safety. Too, expanded coal consumption will pose safety problems. More grade-crossing accidents would be expected as a consequence of increased unit-train (coal) movements. This problem may be especially acute in the West, where many tracks go through towns and the amount of rail traffic could radically increase.

A major shift to coal and the development of large-scale synthetic fuel industries in areas that are currently sparsely populated may have negative effects on these communities and their residents. The desire to prevent boom-towns effects is prevalent in the West.

Environment

Deregulation would suggest that where environmental regulations are imposed, the free market should be allowed to operate so that prices may adjust to help recover the costs of meeting these regulations from those who create the costs or reap the benefits. Regional differences should be considered. The federal role should include monitoring environmental conditions, mediating disputes, providing information, and facilitating planning. DOT should coordinate such policies as far as they affect transportation. The impacts of existing regulations should be better known so that in the future more cost-effective regulations can be chosen.

Impacts

Air Pollution

On a national basis, levels of pollution generated by urban passenger vehicles have been projected to decline until 1990 and then increase due to increasing travel.

Existing federal efforts (Clean Air Act Amendments of 1977) that will continue to reduce air pollution in the future include vehicle certification, selective enforcement audits, recalls, warranties, inspection-maintenance programs, and transportation control plans. The benefits from all of these are largely unmeasured, but some indications exist of their costs. Certification of vehicles for emissions performance on the production line may cost manufacturers more than \$40 million/year; required design features on automobiles add 4 percent to the sticker price (79). According to EPA data, selective enforcement audits cost each domestic manufacturer between \$200 000 and \$600 000 annually for administrative costs; testing and adjustments add 0.2 percent to the sticker price of automobiles. Also, in recent years, 7 percent of the automobiles of a given model year have been recalled for environmental purposes, with costs to manufacturers averaging up to \$30/vehicle.

EPA studies show that inspection-maintenance programs can reduce emissions, from those vehicles covered, by 8 percent to 40 percent, at repair costs averaging between \$8 and \$20 per failed vehicle (80). Nine inspection-maintenance programs existed throughout the United States prior to 1979 (only New Jersey's was statewide). [Inspection maintenance programs are located in New Jersey and Rhode Island and in seven cities, including Los Angeles, Phoenix, and Cincinnati. Programs are planned soon for Philadelphia, Pittsburgh, and Connecticut and are expected to be required by EPA in most major urban areas by 1982.] As the Clean Air Act mandates establishment of such programs in areas that cannot meet ambient air quality standards by December 31, 1982, an increase can be expected.

Transportation control measures to reduce pollution identified by the EPA include the following:

1. Transit service improvements;
2. Preferential treatment for high-occupancy vehicles;
3. Ride-sharing programs;
4. Parking management (restrictions and/or parking fees);
5. Pricing strategies involving fuel taxes, bridge tolls according to automobile occupancy, or vehicle ownership taxes;
6. Traffic flow improvements (i.e., traffic signalization, or peak-period reversible lanes); and
7. Commercial vehicle control.

Analyses of these measures indicate that regional emission reductions of 1-3 percent might result if they were implemented individually (81). Reductions of up to 9 percent could be expected through a comprehensive approach (81). The average transportation control measure can be instituted for slightly more than \$1000/ton of pollutants removed, according to EPA (81).

Noise Pollution

The FAA uses benefit-cost analysis plus considerations of safety and technology in order to test the desirability of its proposed aircraft noise regulations. To determine the effect of its regulations requiring all civil subsonic aircraft to comply with FAR Part 36, the FAA

weighed capital and operating costs against monetary measures of the benefits of reduced noise pollution, as they accrue through the duration of the century (82). The FAA concluded that the benefits of its aircraft noise compliance regulations greatly exceed the costs.

The EPA, to regulate surface transportation vehicles, relies on an analysis of cost-effectiveness rather than on benefit-cost analysis. The EPA assesses the benefits of the regulations it considers in terms of reduced population exposure but does not provide a monetary measure of the benefits of reduced noise that can be weighed against the costs.

A fundamental problem for the EPA is determining where the regulatory emphasis should be placed in reducing noise from surface transportation vehicles. Due to constraints imposed by the physics of sound (i.e., sound levels from different sources add logarithmically), the EPA's approach to regulating noise generally recognizes that the noisiest vehicles need to be controlled first but at the same time allows for the complicated and synergistic effects of combined noise sources. Because of these interrelations, EPA gives great weight to the relative economic costs of controlling one source as opposed to another. These costs can be thought of as a measure of the sums necessary to comply with the regulations, and also as a measure of the political acceptability of the EPA's proposals.

Air

According to the FAA, as of 1976 the U.S. fleet consisted of some 2100 large jet aircraft, of which 1600 (about 75 percent) did not comply with FAR Part 36 noise standards. Based on a number of estimates, FAA believes that between 1300 and 1600 of these non-complying aircraft will remain in service throughout the 1970s and possibly some 50 percent would be in service by 1990, if there were no federal action requiring compliance of all aircraft (82, p. 5). The FAA has estimated that the discounted present value of capital investment needed between 1975 and 1995 to bring all civil subsonic aircraft up to FAR Part 36 standards ranges from \$176 million to \$2.12 billion, depending on whether the costs are estimated before or after taxes, whether aircraft are modified or replaced, and the assumed prices and discount rate used (82, pp. D42-D44).

The FAA estimates domestic aircraft purchases between 1975 and 1995 would range from \$6 to \$8 billion (1975 dollars). Compliance solely by modification would result in sales to aircraft manufacturers with a net present value of \$295 million, whereas compliance involving replacement and modification would result in sales with a net present value of \$1.49 to \$1.7 billion (82, pp. D18-D19).

The FAA analyzed the impacts of its compliance program on employment in the aerospace industry from 1977 to 1986. A program involving only modifications of noncomplying aircraft would generate 1900 employee-years of new work. Combination replacement and modification programs would generate new employment in excess of 106 000 employee-years (82, pp. D20-D21).

Airline operating costs depend on the type of modifications or replacement of existing aircraft. The FAA states that the high-bypass turbofan technology now being placed in use has been demonstrated to produce 12-15 percent reductions in fuel consumption and improved noise levels, compared to older aircraft. New but unused technology involving improved materials and aerodynamic efficiency is expected to lead to a further 10-15 percent reduction (82, pp. D14-D15).

If aircraft were modified only in order to comply with FAA noise standards, airlines would experience

negative net benefits and an approximate 1 percent increase in out-of-pocket operating costs due to a 15 percent fuel penalty from added weight. However, if airlines opt to replace aircraft, positive net benefits will accrue due to increased fuel efficiency and likely reductions in crew and maintenance expenses (82, D16).

One bill (H. R. 8729), passed by the House in the 95th Congress to finance replacement or retrofit of aircraft, placed a 2 percent surcharge on domestic passenger air fares and freight waybills; a \$2 surcharge per international departure from the United States where fares are less than \$100; and a \$10 surcharge for international departures where fares are \$100 or more. In other bills considered, the ticket surcharge used to finance airport development would include the amount that ticket prices need to be raised to pay for aircraft noise control (H. R. 11986 and S.3279). Some argue—including Alfred E. Kahn, presidential advisor—that, given the airlines' profitability, there may be no need for special financing to retrofit or replace noisy aircraft. Regardless of how the quiet aircraft are financed, noise regulation is likely to increase direct air travel costs in the short run. However, long-run operating savings from the use of quieter, more fuel-efficient aircraft may reduce costs to users of air transport. It should be noted, however, that in the long term airlines would tend to purchase quieter aircraft, regardless of federal noise regulations, because of their lower operating costs.

Reduced population exposure to noise due to compliance with FAR Part 36 will result in benefits of reduced annoyance and reduced hearing loss. The monetary value of these benefits can be inferred from the expected reduction in damage awards from lawsuits and the increase in property values near airports. The FAA estimates that compliance with its noise standards would result in benefits of reduced damage claims during the years from 1979 to 2000 worth from \$3.5 to \$12.8 billion (with discounted present value ranging from \$1.2 to \$3.4 billion) depending on the noise reduction strategy. The range of the total increase in the value of property near airports is estimated to be from \$92.6 million to \$1.14 billion (82, p. D34).

Monetary estimates of costs and benefits of noise reduction can be weighed against one another. Comparing airline capital and operating costs of noise control to the benefits of noise reduction measured in terms of reduced lawsuits and increased property values, the FAA concluded that, even in the least effective case of achieving noise reduction by only modifying aircraft, the benefits are three times the costs. In this case the 1975 present value of costs to achieve compliance equaled \$440 million compared to the estimated present value of \$1.2 billion in benefits from reduced noise (82, pp. D9, D25). If, however, airlines were to replace rather than modify their JT-3D-powered aircraft, operating savings would offset capital costs in the long run, and in effect there would be a \$350 million benefit (82, p. D9). These net savings, when added to the benefits of reduced population exposure (with a present value of \$3.6 billion), amount to a total net present value equal to \$3.95 billion (82, pp. D9, D25).

Although the FAA's analysis indicates that there are net benefits in complying with its regulations, there is great uncertainty concerning future aviation noise levels. It is uncertain whether air carriers will opt for replacement or modification of the aircraft. Further, growth in aviation and population is not known with precision. Future scenarios with very different levels of aviation activity and population in impacted areas may emerge due to a variety of factors, including regulatory reform, a reversal of recent trends of

declining urban population, and increasing fuel prices.

Trucks, Railroads, Buses, and Motorcycles

The Noise Control Act of 1972 requires that any regulations the EPA sets for surface transportation vehicles reflect the degree of noise reduction achievable through application of the best available technology, taking into account the cost of compliance. By cost of compliance, the EPA interprets Congress to mean the cost of identifying what action must be taken to meet the specified levels, the cost of taking that action, and any additional cost of operation and maintenance incurred. The costs of future replacement parts may also be considered. For example, EPA has promulgated two sets of regulations to control noise from medium and heavy trucks. The first includes standards that manufacturers must satisfy before the trucks are sold to motor carrier operators. The second set of standards applies to motor carriers already in use.

Automobiles and Light Trucks

The EPA has not yet identified automobiles or light trucks as noise sources to be regulated. [EPA is required by law to publish noise control regulations within two years of identifying a noise source.] EPA has become concerned that automobile and light-truck noise is becoming an increasingly dominant source of noise as other modes are regulated and there is a shift to diesel and four-cylinder automobiles. Diesel and four-cylinder engines are approximately 5-6 dB(A) noisier than standard-sized eight-cylinder automobiles (83).

The EPA has studies in progress to determine the major sources of noise from automobiles and light trucks. Too, EPA is developing baseline data for 1977 vehicles and is attempting to develop a means of quantifying vehicle operation in an urban environment in order to refine light vehicle noise measurement procedures. EPA is reviewing the results of an impact analysis based on 1977 vehicle data. The outcome of this analysis, the results of a similar analysis for 1978 vehicles, as well as a discussion of various alternatives, will be forwarded to the EPA administrator for a decision on whether to identify light vehicles as a major source of noise. It is expected that, if a regulation were issued, it would be early in 1981 and would become effective with the 1983 model year vehicles.

SUMMARY OF DEREGULATION IMPACTS

Despite the extensive description provided of the impacts of economic and social deregulation estimated by various researchers, it is safe to conclude that much remains to be learned about deregulatory changes. In particular, however, the impact of changes will vary with the staging of those revisions into effect. Such staging in the United States depends not only on Congressional action but also on the action of the states as they amend their regulatory laws and other legislation regarding finance and promotion of the transportation modes.

ISSUES FOR STATE PLANNING AND PROGRAMMING

This paper has brought to light a good deal of research information about the effects of regulatory changes. The monitoring of airline deregulation should produce more facts. However, the exact direction of changed regulation is extremely difficult to foretell. Policy researchers

and those who advise policymakers need to pay close attention to the result of further research in the regulatory field. What, then, should be the reaction of state transportation agencies?

It is reasonable to believe that transport regulation will gradually become less at the national level and that state regulation will be subject to similar pressures and relax rather than increase. The outlook for energy regulation and for social regulation is less certain, but relaxation of federal controls in those fields appears more likely than is the maintenance of the status quo. The general atmosphere in transport markets will thus become more competitive. Special state issues will likely include the following:

1. How to ensure transport safety with new, perhaps less profitable, perhaps smaller, and possibly more, innovative firms;
2. How to analyze and supply subsidies for desired public purposes in the absence of internal cross subsidy by transportation firms;
3. How to produce neutral public policy toward transport rights-of-way and infrastructure;
4. How to plan and allocate public facilities needed by transport firms in the changed markets resulting from deregulation; and
5. How to obtain and distribute information of interest to consumers plus information needed for planning in a fast-moving deregulated atmosphere.

As regulatory changes occur, there will be a transition period as the formerly regulated test their freedom. Shippers, carriers, and public agencies alike will be affected. If Canada serves as an example, the period may be long; it took nearly half a decade for the Canadian railroads to offer innovative rate and service proposals once regulatory restrictions were lifted over a decade ago. State agencies will find that issues will arise gradually as locational and marketing changes proceed from business decisions.

Although complete deregulation may still be visionary and the timing of its elements are uncertain, state officials can well use the interim to learn and to prepare their responses to the issues raised by the prospect of reduced controls.

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Structure of the Nation's Future Freight System

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It is frequently said that the U.S. transportation system is now mature. That is, with the completion of the Interstate highway system and a few major inland navigation projects now under way, the infrastructure is basically in place. Investment in the system over time will merely involve maintenance and replacement.

I believe, by contrast, that the system is a product of the forces that have shaped it over the years and that, if these basic forces change, the system will change in response. The key questions, then, concern the nature of these basic forces that are shaping the system and whether these forces are likely to change in the near future.

Freight transportation is, of course, a derived good. It is only needed to transport goods from the place where they are produced to a place where they can be consumed. There are many intermediate uses of goods by industry; some goods are also used in the building of the productive system, including the transport system, but it is clear that the final use is to enhance the utility of people. This takes place through the operation of the economy.

For purposes of this discussion, I would like to classify the basic forces shaping the system into one of three general categories: economic growth and development, economic regulation, and technology. The basic forces may also be summarized by noting that the operation of the economy is the game that is played, economic regulation states the rules of that game, and the current state of technology furnishes the physical devices with which the game is played. I would like to briefly review how

these forces have shaped the U.S. freight transportation system in the past, and I would like to speculate on what changes are likely to occur in these forces that will impact the future freight transportation system of the nation.

ECONOMIC GROWTH AND DEVELOPMENT

The long-term development of the U.S. economy has been characterized by the following trends:

1. Steady growth in population. Since well before its founding, the United States has experienced a continuous growth in population. The rate of urban population growth has been even larger than that for the country as a whole. This has led to specialization in the work force and improved efficiency.

2. Substantial economies of scale in production. A steady decrease in the per unit cost of production as the result of learning and increased efficiency can only be realized if the gains are not eaten up by the increased transport cost of serving the larger hinterland that can now be supplied. Thus, low transport costs make economies of scale realizable.

3. A decline in the share of employment found in agriculture and mining. This is paralleled by an increase in the share used in manufacturing, services, and government. It is a natural consequence of mechanization in the agricultural and mining sector. This has,