

IV. POTENTIAL IMPACTS OF RESTRUCTURING THE U.S. RAILROAD INDUSTRY

This part of the report evaluates the potential impacts of restructuring the U.S. railroad industry. In particular, it focuses on the kind(s) of restructuring arrangements that might be necessary to sustain the overall viability of the industry during the coming decade. In view of the desirability of promoting adequate economic growth of the railroads, the federal government should encourage attempts to estimate the impacts of restructuring and evaluate both the potential growth areas and the problem issues that are currently on the railroad industry horizon. The available evidence on these issues is synthesized below, and is followed by a proposed methodology for quantifying the potential impacts of these issues and the various options for restructuring the industry with a reasonable degree of accuracy. These issues are discussed through:

- A series of options for restructuring the railroad industry. These range from a large-scale planning scheme on one end of the spectrum to purely voluntary integration on the other.
- A methodology for forecasting the impacts of restructuring the railroad industry, including available evidence on the issues of economies of scale and economies of density, and the presentation of a current methodology for estimating organizational economies of scale.
- A set of observations on the restructuring issue.

The history of merger waves in American industry and the fact that merger frequencies have fluctuated sharply over time are well-documented topics. Far less noted is the fact that merger frequencies tend to vary sharply among industries and that a temporal distribution of merging firms is highly concentrated in certain types of industries. One of these types is the railroad industry which, beginning around 1957 and continuing until the Penn Central bankruptcy proceedings in 1970, has experienced significant structural reorganizations stemming from its most recent wave of merger activity. Although some of the benefits from the organizational changes in the railroad industry could have occurred in the absence of merger, the extent to which mergers have induced structural changes and allocative impacts warrants serious investigation.

At present, those railroads desiring merger must submit formal applications and voluminous, supportive evidence to the Interstate Commerce Commission for processing, evaluation, and adjudication. One of the recent

public policy dilemmas is that the ICC has decided to adjudicate each merger on an ad hoc basis without developing any overall transportation criteria. This approach has had two undesirable features. First, some of the mergers which have been proposed and approved may not represent the best of the possible alternatives.¹ Second, in many cases the merger proceedings have created additional intra-industry litigation. Nonetheless, in several cases the primary goal of merger proceedings--improvement in internal efficiency with respect to both the minimization of railroad operating costs and public interest considerations--has been achieved.

A. Current Options for Restructuring the Railroad Industry

Over the years public policy has required the railroads to provide freight services under a complex array of rate, route, and safety considerations--many of which have been profit absorbing and even loss inducing. In order to offer some relief from these considerations and constraints, rail planners have been suggesting a variety of options designed to restructure the railroad industry. The leading options and combinations thereof that might be considered desirable to sustain the viability of the industry are listed briefly below:

- Procedures. This option involves the clarification of criteria for the approval of voluntary merger proposals on the part of the industry and the streamlining of approval procedures in order to avoid the extreme delays experienced in the past. This is essentially the "free market" approach which anticipates that efficient decisions will be made by private industry.
- Planning. This refers to proposals to create a planning apparatus on a national scale similar in approach to that taken by the USRA in its analysis of the Northeast and Midwest Regions. The federal planning role could be undertaken in combination with any of the other options.
- Dealing with Railroad Bankruptcy. This option has a federal role (that may be unavoidable) which involves a federal response to the bankruptcy of a railroad company. It can be an ad hoc response or part of a planned approach to the restructuring issue.

¹ A brief review of the recent history of merger activity in the railroad industry and the various criteria adopted by the Interstate Commerce Commission in adjudicating rail mergers is presented in Appendix B.

- Financial Leverage. This option envisions the use of federal funds (perhaps through a rehabilitation program) to promote or encourage specific merger activity, either in response to bankruptcy problems or as part of a wider plan.
- Massive Federal Restructuring. This is a combination of other options adding to the design and implementation of a national restructuring of the industry. It would undoubtedly involve a nationwide planning effort and the extensive use of federal dollar leverage. It may or may not include significant shifts in traditional ownership patterns (e. g. , Confac or nationalization).

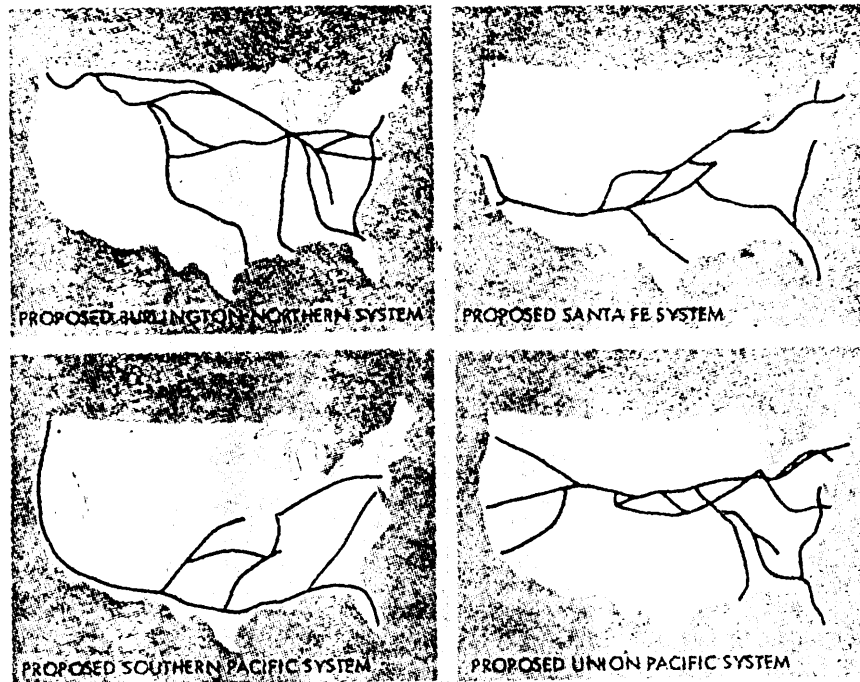
The idea of a federally planned, massive redesign of the nation's rail system has been suggested before (as far back as the Ripley Plan in 1920). Its advantages are appealing in view of the deficits facing the 20 Class I railroads that are in or near bankruptcy at the present time. One issue is clear: the industry will experience some type of restructuring during the next decade. The public policy issue is whether the changes will be involuntary (and perhaps inefficient) or voluntary in conjunction with some form of Federal Government assistance.

One recent scheme for a wide-scale restructuring of the railroad industry was suggested by Henry Livingston and promoted by James Blaze at the recent Transportation Research Forum meeting (1974). Essentially, the Livingston Plan envisions four transcontinental railroads, controlled by the Burlington Northern, Santa Fe, Southern Pacific, and Union Pacific systems. A general map of these proposed systems is presented in Exhibit IV-1. In order to support the attractiveness of consolidating railroads into four major forms, the economics of railroad mergers needs to be examined and evaluated. The following section, then, investigates the statistical evidence on the impacts of railroad mergers and offers additional information on current methodologies to verify and support conclusions of the Livingston Plan variety.

B. Methodology Restructuring the Railroad Industry

Given the state of the art on the issue of restructuring the railroad industry, it must be remembered that any forecasting of impacts can only produce tentative and qualified results. The discussion below will, first, synthesize evidence in the economics literature on the economies of scale research; second, present a current methodology for estimating merger impacts; and, third, offer more evidence on the methodology scheme.

EXHIBIT IV-1
THE LIVINGSTON PLAN FOR
RESTRUCTURING THE RAILROAD INDUSTRY



Source: James Blaze, "Towards a National Policy of Super Railroads." Proceedings of the Fifteenth Annual Meeting, Transportation Research Forum (San Francisco; October 1974). Map adapted by Blaze from Nancy Ford, "A Plan for Tomorrow," Modern Railroads, September 1973 (an interview with Henry Livingston, V. P., Clark, Dodge & Co.). Other railroad restructuring proposals can be found in U.S. DOT, Western Railroad Mergers, 1969; Herb Bixler, "Two Rival U. S. Rail Systems Seen Preferable to One AT&T-Type Setup," Traffic World, October 16, 1972; and Herbert Whitten, "Key to Railroad Economics--A Rail Common Market," Handling and Shipping, December 1973.

1. Evidence on Economies of Scale in the Railroad Industry

The conventional interpretation of "economies of scale" is decreasing unit costs with increases in firm size. In technical terms it refers to any firm size smaller than the minimum point on the long-run average cost (LRAC) function. Operations which increase firm size will necessarily increase unit costs since the (LRAC) function is upward, turning to the right of the optimum-size firm. Operations in this range produce "diseconomies of scale." This topic is extremely important, because of both its empirical fascination and its public policy implications. For example, if economies of scale do exist in the industry (i. e. , a decreasing cost industry), the traditional policy implications are the justification of subsidies and the demands for marginal cost pricing. In addition, the existence of economies of scale implies that larger size firms can deploy their resources in a more efficient manner, a factor which lies at the heart of any restructuring arrangement in the railroad industry.

A companion issue to economies of scale is that of economies of density. This measure refers to a concentration of traffic on "denser" routes as a cost-saving effort. Instead of using output as a measure of size, the researcher who is studying density usually deploys gross ton-miles per mile of track as its measure.¹ While some efficiency gains can undoubtedly be produced by rerouting into denser mainlines, evidence on the benefits of pursuing density economies as a product of a restructuring has not been compelling.²

Research studies in recent years have generally supported the notion originally introduced in the well-known Doyle Report,³ of allowing more intermodal mergers and intra-industry combinations on a provisional basis.⁴ Yet,

¹ See U. S. Department of Transportation, "Western Railroad Mergers" (Washington, January 1969).

² Railroad Route Rationalization and Fixed Plant Maintenance? Association of American Railroads, AAR Staff Studies Group, Staff Memorandum 75-20 (September 30, 1975).

³ National Transportation Policy, U.S. Senate Report 445, 87th Congress, 1st Session, 1961.

⁴ Freight Transportation: A Study of Federal Intermodal Ownership Policy, Robert C. Lieb (New York, Praeger publishers, 1972).

these recommendations were not based on any empirically strong evidence suggesting that larger companies would be more efficient and thereby more profitable.

The pioneering study for measuring scale economies in the railroad industry was provided by Healy,¹ who used correlation analysis to relate the size of railroad firms to rates of return. He specifically argued that the higher the rate of return for a given size railroad, the more likely it would be in a smaller size group. Furthermore, based on pre-1960 data, Healy claimed that any size railroad exceeding 10,000 employees was likely to experience diseconomies of scale.

Other studies in that era concentrated on the estimation of cost functions in the railroad industry, most notably those studies by Borts's² and Meyer's group³ at Harvard. More recent analyses in rail merger effects and on rail cost functions have been developed by Gallamore,⁴ Moore,⁵ and Griliches.⁶ Very recent rail cost studies that rely on underlying production function methodologies have been presented by Keeler⁷ and Kneafsey.⁸ The general conclusions

¹The Effects of Scale in the Railroad Industry, Kent T. Healy (New Haven, Connecticut, Yale University Press, 1961).

²"The Estimation of Rail Cost Function," George H. Borts, Econometrics, XXVIII (January 1960), pp. 108-131.

³The Economies of Competition in the Transportation Industry, John R. Meyer, Morton J. Peck, John Stenason, and Charles Zwick (Cambridge, Massachusetts, Harvard University Press, 1959).

⁴"Railroad Mergers: Costs, Competition, and the Future Organization of the Railroad Industry," Ph.D. dissertation, Robert E. Gallamore (Harvard University, 1968). (This source, although unpublished, has been widely quoted on the scale economy issue.)

⁵Freight Transportation Regulation? Thomas G. Moore (Washington, The American Enterprise Institute for Public Policy Research, 1972).

⁶"Cost Allocation in Railroad Regulation," Zvi Griliches, Bell Journal of Economics and Management Science 3 (Spring 1972), pp. 26-41.

⁷"Railroad Costs, Returns to Scale, and Excess Capacity," Theodore E. Keeler, Review of Economics and Statistics 56 (May 1974), pp. 201-208.

⁸"Costing in Railroad Operations: a Proposed Methodology," James T. Kneafsey, M. I. T. / F. R. A. Studies in Railroad Operating Cost Economies, Vol. 13 (March 1975).

emanating from these studies are either that the evidence suggests constant returns to scale or that there are no strong positive scale economies. The only exceptions are certain economies for individual railroad firms, for certain line-haul and terminal operations, and even perhaps for regional operations (although sufficient empirical tests have not yet been thoroughly developed).¹ It is anticipated, however, that additional evidence will be shown on this matter in the future" with the linkage of cost and production function methodologies, especially on those suggested in the recently completed studies mentioned above.

2. Current Methodology

The conditions under which gains from economies of scale may follow from merger in the railroad industry are ambiguous. One way is to relate the frequency of mergers in the railroad industry to the types of other industries in which high merger rates are found. At this point it is imperative to clarify assumptions which must be made to limit the scope of this discussion. Demand considerations obviously play an important role in determining the optimum size of a firm in any industry. However, demand conditions facing the railways in the short run will be considered given and constant throughout. This assumption of constant demand allows attention to be focused on the railroad's production function.

Under competitive conditions the optimum size of a railroad is limited by the absence of cost incentives which would encourage the railroad to grow and by the presence of cost forces which would discourage growth. If increasing returns to scale exist, a railroad should expand its scale of plant to take advantage of lower cost. In order to transfer this analysis to the production function, from which the cost functions are derived, it should be assumed that for the small scale of plant the production function exhibits increasing returns, and for the larger than optimum scale of plant it exhibits decreasing returns. Therefore, at some point on the production surface there is a boundary line where increasing returns diminish and decreasing returns set in. The optimum scale of plant will be located along this boundary line.

The production function will also yield information on the expansion path that the railroad will follow in increasing its output through increasing plant size, as long as pertinent information is available concerning the cost of the factors of production. Assuming given production service and non-factor costs,

¹ "Mergers, Technical Change, and Returns to Scale in the Railroad Industry, " James T. Kneafsey, Proceedings of the Transportation Research Forum 13 (November 1972), pp. 439-458.

both the expansion path of the firm and the boundary line between decreasing and increasing cost can be derived. If this is the case, the optimum scale of plant can be determined directly from the expansion path by analyzing, through the first-order conditions, the effects on output incurred by the change in size due to movements along the expansion path. The issue in this case is: To what extent have mergers increased the size of railroads?

a. Technical Change and Growth Rates. In industries other than railroads where markets are fairly evenly divided among many small sellers, the increase in monopoly power through a few acquisitions will be too small to increase prices and profits. This suggests that in order for merger rates to be high, a few firms must account for a substantial share of industry output. In the railroad industry, relatively few Class I railroads account for a substantial share of the industry output. Also, the larger the barriers to new entry, the longer a gain in earnings from reduced competition is likely to continue and, thus, the greater the incentive for merger. This condition is clearly the case in the railroad industry, where substantial entry barriers exist.

On the economies-of-scale hypothesis, one would predict that in the sectors where mergers are an adaptation to changes in the relative efficiencies of various sizes of railroads, there will be a concurrent change in the average size of the railroad. In other words, if changes in the shape of the long-run average cost curve are sufficient to induce numerous mergers, a sufficient number of old firms can be expected to grow, and any new firms entering the industry will be required to do so on a larger scale than previously, so that the average size of the firms in the industry will increase.

If economies of scale are significant, merger activity should be inversely related to industry growth. ¹The reason for this hypothesis is that with rapidly growing demand, it is easier to achieve the requisite size for the minimum-cost firm through the construction of new capacity. If the scale of output that corresponds to minimum cost is larger, it will probably be difficult to provide quickly the requisite market for an efficient level of output in the absence of rapid growth and demand. Thus, the smaller the rate of growth of an industry, the greater the likelihood that mergers will be more attractive to growth in firm size. Because the growth rates of firms in the railroad industry have been relatively low in recent years, the preconditions for mergers as an avenue to effective restructuring in the industry appear to exist.

¹See "Economic Disturbance Theory of Mergers," by Michael Gort, The Quarterly Journal of Economics, LXXXIII, November 1969.

b. Managerial Talents. A frequent reason for mergers seems to be the difference between two firms in the quality of managerial skills. These differences are often independent of the size of the firm. In the short run, however, the total supply of managerial talent of high ability is fixed. But the larger the firm, the more intensively this fixed supply of superior managerial talent is utilized. In periods when there is a shift of managerial talent within the industry, some of the superior managerial talent will leave the railroads and go elsewhere, and there will be a more than proportional rise in the number of managerial talents with untested abilities. As a result, the dispersion among firms in the railroad industry in the quality of managerial skills should increase and, in turn, lead to conditions where a rise in merger activity could be expected,

C. Econometric Analysis. With new trackage construction having been barred to the railroad companies long ago, the most dramatic means of growth available to railroad management since the late 1950's has been through merger.¹ An important issue in analyzing merger impacts and in attempting to provide a foundation for recommending future restructuring involves pre-merger and post-merger performance tests. For mergers to have been historically attractive on the average, post-merger performance should have outranked pre-merger performance by a significant magnitude.² In order to test this hypothesis, two research groups (at M. I. T. and Harvard) have independently been conducting analyses on merger impacts and scale economies in the railroad industry.

The theory underlying these analyses can be labeled the "economies of organizational scale" and is based on neoclassical economic production function theory. Briefly stated, this theory relates measures of output (like gross ton-miles) to a set of organizational inputs (like managerial expenses, technological innovations, and financial base) and conventional factors (like labor inputs and fuel). This theory is based on a specification in functional form of

$$Q_t = f(AK^M K^T, K^F, L^\alpha, E^\beta, \dots)_t$$

where Q is output; t is the time period; L is labor; E is energy; K is capital; M, T, and F represent the management, technological, and financial variables, respectively; and A, α , and β are parameters. This model has been econometrically tested with a set of railroad data (time series) for pre-merger conditions

¹ For a thorough documentation of this topic, see "Railroad Mergers, Costs, Competition and the Future Organization of the American Railroad Industry," by Robert E. Gallamore, op. cit.

² This test can be conducted in accordance with standard statistical practices.

(3 and 5 years preceding merger) and post-merger conditions (3 and 5 years after merger) to generate separate coefficients for M, T, and F in both cases.

The theory further implies that economies of scale should be split into three organizational factors of managerial, technological, and financial attributes. That management quality is important to the success of a merger is unquestioned. In the most spectacular failure of a merger, note the following:¹

The immensely profitable freight operations of PCT's [Penn Central Transportation's] predecessors became unprofitable almost overnight following the disastrous PRR-NYC-NH [Pennsylvania Rail Road-New York Central-New Haven] mergers. The mergers caused this sudden collapse by undermining managerial morale and swelling the scope of operations to an inefficient level.

Similar arguments can be generated for the separate technological and financial effects that might be attributed to mergers. For example, a railroad firm that is in or near bankruptcy may represent, among other reasons, an attractive financial investment to a solvent acquisition-minded railroad. In this sense, and under appropriate conditions, mergers might be considered a partial remedy to certain bankruptcy cases. The inference of this approach, then, is that if any or all of these factors are important in the statistical analysis, estimates can be made of the future impacts (or cost savings) attributable to restructuring.

The preliminary evidence indicates that these organizational scale economies are significantly different by the equivalent of a growth rate differential of approximately 1.2 percent. In other words, the post-merger effects exceeded the pre-merger impacts, on the average, by 1.2 percent. Applying this differential to restructured railroads in 1985 requires the use of a 1985 forecast for rail ton-miles and revenues. Using the Chase Econometrics Associates, Inc. macroeconomic forecast of economic variables and the M. I. T. railroad ton-mile model produces an outside estimate of \$24 billion in rail revenues for that year. Applying the 1.2 percent organizational scale to this number suggests that, under ideal conditions, the 1985 impact of a restructuring of the industry could yield up to an additional \$300 million in revenue.

¹ "Consolidated Rail Corporation: Phoenix or Albatross." by Charles M. Rice, ICC Practitioners' Journal (May-June 1975), p. 405.

C. Merger Impacts

The organizational impacts of mergers were considered in the preceding sections. This section addresses the restructuring of physical plant, which is frequently cited as another major benefit to be gained from merger. Because there are two archetypical forms of merger, namely (i) parallels and (ii) end to end, each must be addressed separately.

Parallel mergers are reputed to allow the consolidation of traffic onto a single line, the abandonment of the released mainline track, and the consolidation of rail classification operations into a single yard with the abandonment of duplicate facilities and a reduction in the overall work force. These benefits have proved to be extremely elusive. First, union agreements on work rules and staffing have generally frustrated any substantial attempts to realize these work force reductions, except in cases like the Baltimore and Ohio/Chesapeake and Ohio consolidation. Second, 'the yards do not appear to be duplicated facilities. Each yard served is the point of origination or termination of a substantial amount of local traffic, and it is difficult to close them down entirely. Where the yards are large, the diversion of traffic from one to the other is likely to cause an excess in capacity. To build a consolidated classification yard which is larger, automated, and efficient is expensive and requires capital that many financially weak railroads cannot easily assemble. Finally, abandonment of the excess mainline is extremely difficult because those industries and communities served by the line will fight the abandonment process due to the adverse economic impact that such an abandonment would have on them directly.

Therefore, few short-term benefits can be realized by the merger. There may also be (as there was in the case of the Penn Central) a degree of management confusion on procedures, computer systems, and operating protocol which must be overcome before the merger begins to reflect efficient operations. Thus, parallel mergers are currently in disrepute.

End-to-end mergers are alleged to be a different case entirely. The Livingston Plan, mentioned previously, with its four transcontinental lines is a good example. By placing carriers end to end to achieve a single line from origin to destination, only one carrier is involved instead of the two or more which are frequently used today. This type of merger would allow run-through trains to be scheduled which bypass yards, only stopping to pick up or drop off pre-blocked sets of cars. By avoiding classification, both terminal time and switching costs would be eliminated. Transcontinental times would be competitive with trucks, and traffic could be attracted.

The problem with this view is that very little traffic travels transcontinentally. In fact, a very high percentage of total carload shipments travel less than 1,500 miles. To achieve the volumes needed to make up efficient trains, present management contends that it is necessary to consolidate cars going in the same general direction and to reclassify along the route as branching cars drop off and new cars appear.

Another problem for the industry which may not be alleviated by merger is the ability of shippers to control the routing of traffic. This power, granted to shippers specifically by the Interstate Commerce Act, tends to spread traffic out over the possible routes between the origin and destination of the shipment.¹ For example, there are more than 200 separate routes listed in the tariff between Washington, D. C. , and Chicago. If 25 to 30 of these routes are commonly used, the volume of flow between the two cities is so low that direct trains are out of the question. This may also be caused partly by railroad freight offices which solicit traffic for their railroad even if it causes extremely circuitous travel. Although this solicitation guarantees a railroad a portion of the total revenue, it may not cover variable costs on this movement of traffic.

Thus, the role of mergers to improve efficiency, lower costs, consolidate traffic, improve service, and attract new revenues appears to be cloudy.

D. Summary and Observations

Although an industry-wide restructuring is hailed by some as the answer to the problems of the railroad industry, it seems clear to the study team that it is not. It is likely, however, that some federal involvement in restructuring is desirable, if not inevitable, at least at the level of individual weak railroads. Observations arising from this review include the following:

- In the near term, massive and federally directed restructuring of the industry would have a limited impact on projected industry problems, particularly in view of the time required to plan and implement such action.

¹ James Sloss, Thomas S. Humphrey, and Forrest N. Krutter, Chapter 3, "The Opportunity for Rationalization of Railroad Networks Through Reduction in Circuitry and Multiplicity of Authorized Routes, " An Analysis and Evaluation of Past Experience in Rationalizing Railroad Networks, Studies in Railroad Operations and Economies, Volume 16, M. I. T. Report No. R-74-54, Department of Civil Engineering, February 1975.

- Merger activity might be a productive response to the problems of individual railroad bankruptcies.
- In the longer run, massive restructuring will probably be necessary if the financial conditions of the railroad industry deteriorate below the levels currently projected.
- If there is to be a significant federal role in restructuring, planning on a nationwide scale should yield more effective outcomes:
 - procedural reform should be accompanied by the clarification of criteria for approval of voluntary mergers.
 - Use of federal dollar leverage to promote or encourage mergers should be related to some overall perspective.
 - Merger as a solution (or, better, as a preventive measure) to a bankruptcy problem can be facilitated with prior planning efforts.