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# *The Dynamic Interdependence of Transportation Pricing, Transportation Costs, and the Rates of Growth or Decline of the Various Modes of Transportation*

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This paper is concerned with the *interactions* of prices, costs, and rates of growth; it is especially concerned with the *cumulative effects* of such interactions. In view of the much-publicized recent difficulties of the American railroads—with emphasis on those serving official territory—it is still more particularly concerned with the possible dangers inherent in *cumulative decline.*

## *Statistical Background*

*Freight transportation as a whole has not kept pace with the economy.* The decline of passenger travel by rail is too well known to require any documentation. Moreover, passenger travel may often be noncommercial in motivation as it is overwhelmingly noncommercial in performance. So this presentation will confine itself to the most favorable example in terms of both rail service and commerical transportation generally.

The following table indicates that even intercity freight movements have lagged behind the growth of the economy:

| | *Index for 1962* | |
|---|---|---|
| | 1947 = 100 | 1957 = 100 |
| Gross national product (1962 prices) | 168.8 | 115.7 |
| Industrial production | 179.9 | 117.4 |
| Intercity freight, ton-miles[a] | 136.9 | 104.5 |

[a] Excludes coastal and intercoastal shipping. Includes estimated private carriage.
SOURCES: Gross national product and industrial production, from *Economic Report of the President*, January 1963, pp. 172, 210; freight ton-miles, from Testimony of A. E. Baylis, I.C.C. Docket No. 21989, Exhibit H- 23 in *New York Times*, September 1, 1963, Section 4, p. 10.

Inclusion of coastwise ton-miles would not appreciably change the freight indexes given above. If petroleum were excluded, coastwise ton-miles would even show a strong downward trend. It is tempting to blame the ton-mile record on the continuing decline of coal, but this explanation would not justify an assumption of a reversal of trend in the future. For traditional methods of transport are threatened from all sides in the critical electric power market for coal: not only by natural gas and coal pipelines, but also by higher and higher transmission voltages for electricity, and more and more efficient nuclear power plants. Therefore, it seems reasonable to predict that ton-miles by traditional methods of transport will, at the very least, have trouble holding their own against a changing economy and changing patterns of fuel use within this economy.

This conclusion should require no proof. The further trend which *does* require emphasis, for the purposes of this discussion, is the tendency for an *absolute decline* in railroad ton-miles. These ton-miles have never recovered their 1947 level; nor their 1956 level. Meanwhile, truck ton-miles are about three times as great as they were in 1947, and 20–25 per cent above 1956. The relative shift from rail to truck has not continued, during the last decade, at the pace set during the years immediately after World War II. But recent statistics do not indicate that the decline in the railroads' relative share will be halted, or even slowed enough to halt the absolute rail decline.

So much, then, for recent trends. But what was the economic position of railroads during the era of greatest railroad expansion? Does an examination of that period provide any clues to diagnosing their

present problems? It will be specifically argued here that every condition of differentiated oligopoly, of which railroading is surely an example, is likely to be *sui generis*. The annalist, therefore, must precede the analyst.

## *Dynamic Interdependence on a Rising Market*

That useful compendium, *Historical Statistics of the United States*, is full of surprises. Where else, for example, would one find depicted on the cover a town which can only be Lexington, Massachusetts mislabeled Hannibal, Missouri? Where else would one learn that—in apparent defiance of near-money, liquidity preference, and the precautionary and speculative motives—long-term interest rates in much of the nineteenth century were actually below short-term interest rates? And where else—to state the theme of this paper—would one discover that, during the golden era of railroad expansion in the generation after the Civil War, rates of return on the book value of railroad investment were below rates of return on the most nearly risk-free securities?

The stated value of outstanding railroad securities more than doubled between 1867 and 1870; more than doubled once again between 1870 and 1880; and almost doubled between 1880 and 1890. A doubling in ten years requires growth at a rate of 7 per cent, compounded; yet "net earnings" (a concept with a close affinity to "net operating income") rose above 5 per cent only in the first two years for which such earnings are reported: 1871 and 1872. As a percentage of stated value of railroad securities, these earnings never recovered from the panic of 1873. They averaged just above 3 per cent per annum during the late 1880's.[1] Interest on funded debt, which averaged just over 4 per cent throughout the 1876–90 period, was more than double "dividends paid" from 1885 on.[2] In general, the impression conveyed by the statistics is one of profitless prosperity carried to an extreme in both directions: extreme prosperity, extremely profitless.

The basic point is not much changed if the argument is related to "investment in railroad and equipment." This was not quite 10 per cent less than the stated value of securities in 1876, and had declined slightly in relative size to just under 14 per cent less by 1890.[3] But neither the small difference in percentage nor the even smaller difference in trend would affect the comparison to any meaningful degree.

[1] *Historical Abstract*, Series Q 33–42, p. 428.
[2] *Ibid.*
[3] *Ibid.*

It is tempting at this point to contradict the evidence of a rapid rate of growth combined with a low rate of return by denying the accuracy of the basic data. The financial antics of Jay Gould have thrown a lurid light across this whole period. Before the days of stocks with no par value, even the best-intentioned promoters must often have accepted physical assets in exchange for stock at inflated nominal prices. A full picture of this problem would require an endless sojourn among the Valuation Dockets. Meanwhile, Professor Melville Ulmer estimates that 21 per cent of the change in book value of railroad plant and equipment between 1880 and 1890 was a product of write-ups of assets.[4] Adjustment for these would raise the reported return on investment, but it might not lower the nominal rate of growth. It could even raise this nominal rate if the average write-ups in 1880 exceeded 21 per cent of recorded 1880 values.

Moreover, much railroad investment was not primarily intended to yield profits from the operation of the railroad itself. The economic history of the United States from independence to World War I could be written, with a surprising approach to completeness, as a series of variations on the theme of land speculation; and railroads were a source of higher property values that even the most unenlightened community fathers could appreciate.

Finally, railroads in the nineteenth century had an active, if not creative, role to play in relation to corporate accounting. In various ways, the railroad did more to create the accounting profession than the accounting profession managed to achieve in restraining the imagination of railroad entrepreneurs. But, if retirement accounting offered wide scope for the movement of earnings backward and forward through time, this same accounting tended to *increase* reported rates of return in a growing industry over anything that could be achieved by depreciation accounting. Holding asset values intact on the books until assets were discarded tended to inflate net property accounts by equating them with gross property accounts; but failure to depreciate meant that annual charge-offs were a function of some much smaller level of past assets rather than of the entire spectrum of assets in service.

All in all, if we indulge in qualitative guessing as a complement to quantitative but dubious "facts," the net result would still not be a high rate of return on assets used and useful in the public service: hardly 8 per cent; possibly 6 per cent; not impossibly even less than that.

[4] *Capital in Transportation, Communications, and Public Utilities: Its Formation and Financing*, Princeton University Press for National Bureau of Economic Research, 1960, Appendix J, Sources and Uses of Funds, p. 501.

This ability of a really major industry to raise very important sums of money from all kinds of sources in the face of extreme uncertainties can scarcely be explained in terms of persistent bullishness on the part of investors. Twenty-five years is too long to be bullish, even during the Gilded Age. Besides, a combination of world price trends and the continued movement of the United States toward resumption of specie payments produced a rapid and almost continuous decline of wholesale prices from 1865 through 1879, and on down right through 1890. This may help to explain a willingness to accept low immediate nominal rates on long-term securities; but it does not help to explain why liquid funds should rush to lock themselves up in a physical embodiment with an unusually long life-cycle and in an industry subject to a rapid rate of technical improvement.

So much for the various aspects of the problem. How may all of these be combined to throw useful light on the period of fastest railroad development in this country? This step requires a return to a familiar static concept—that of differentiated oligopoly. This concept keeps overflowing its economic box: sales expenses involve costs which in turn affect the demand curve; a firm's market position at time ($t$) will affect its policies and performance at time ($t + 1$), and so on. But these problems are normally overlooked in order to put differentiated oligopoly on the same logical plane as other forms of market organization. The familiar oligopolistic pecularity—that of mutual interdependence—is assumed to involve special uncertainties; but these are often supposed to be most significant for pure oligopoly, and to be amenable, in any case, to logical extensions of static analysis.

When differentiated oligopoly appears in industries with such heavily-decreasing costs, and subject to so many internal and external influences for dynamic change, as nineteenth-century railroading, the result is not likely to be "mutual interdependence recognized" or an attempt to flee the rigors of competition by carving a small private market out of the larger general one. Instead, the result is likely to be a tendency toward out-and-out monopoly. If entry is difficult—for such obvious reasons as the gradual disappearance of public subsidies as local areas either achieved their transportation ambitions or lost out in the economic race because they had failed—then there must be some advantage in buying up competitors. But the stick may be employed along with, or prior to, the carrot: even if the competitor could not be driven out, he could be demoted from trunk-line to local status, deprived of other forms of economic importance and power, and bought out or leased at a lower price commensurate with his weakened position.

This monopoly goal was never achieved over any really wide area—with the possible exception of parts of the West Coast—during the late nineteenth century, although E. H. Harriman frankly described this as his objective early in the twentieth. But its interrelationship with the dynamic factors already mentioned may go far to explain the puzzling contrast of profits and expansion which has already been described.

For the outright loser in the corporate race for position, the profit record needs no explanation. This loser earned a low rate of return on a specialized investment which could not easily be withdrawn from the industry. Presumably the loser could not obtain capital for expansion. His fate was seldom abandonment, and often not even absorption by more prosperous and powerful rivals. Whether technically independent or no, the loser was relegated to branch-line status: low traffic density, low outlays for maintenance and capital purposes generally; slow technical progress; a continued existence more or less at the will of better-situated enterprises. This loser may not even have been the proverbial "weak" road, so dear to commentators on the Transportation Act of 1920, or to expounders of the justification for long- and short-haul discrimination. For "weak" roads were generally assumed to be competitive with, or in some sense comparable to, their stronger brethren. The losers we are discussing were more nearly complementary than competitive.

For the outright winners, the profit record sometimes also needs no explanation because it was high. The Pennsylvania and the New York Central were the classic money-earners of the late nineteenth century, and would have been even more outstanding if monopoly gains to predecessor interests had not become imbedded in the structure of asset valuations and leases of the successor concerns. But the New York Central also illustrates the vulnerability to existing competition of even a well-situated railroad. It also shows the particular vulnerability of such a railroad to new entries before the railroad map became frozen, due to the unwillingness of public interests to support new ventures. First, Gould engaged the Central in savage rate wars, even with a manifestly higher-cost property; Gould did not sell the Erie to Commodore Vanderbilt only because Vanderbilt thought he had bought it. Gould cheerfully met Vanderbilt's common stock purchases by conversion of debentures held in the Erie treasury, and thus kept voting control of that unhappy enterprise. Second, the Nickel Plate could not have been more of a threat to the Central if it had been designed solely with that purpose in view—which was obviously the

opinion of the Vanderbilts, who bought it on behalf of the New York Central immediately upon its completion. Third, the West Shore-South Pennsylvania stand-off, although not explicable in terms of sheer blackmail, contained elements of

> Mirror, mirror on the wall—
> Who is the fairest of them all?

Silvering the mirrors cost both the Central and the Pennsylvania a great deal of money.

The great bulk of railroad mileage, and of railroad capital, fell in between the "hopeless" low return and the high return, with more or less dilution. Ask the question—what do the following railroads have in common, aside from conspicuous relative profitability since World War II: Chesapeake & Ohio and Norfolk & Western; Southern; Santa Fe and Union Pacific? One answer would be that all were in reorganization during the 1890's. As the subsequent record has proved, these difficulties were not due to poor original choice of location, or particularly bad luck in the development of the territory served. Most were not due to bad management, or to speculative financing in the sense that more conservative alternatives could have been chosen. A very complex series of episodes in American transportation history may perhaps be summarized as follows: with the possible exception of the Union Pacific, all of the railroads listed above had seen that they would drift back into the short-line group in Category 1 unless they built, and bought, on a gigantic scale. A railroad which really started at Atchison and ended at Santa Fe would have done very little. Instead, roads like the Santa Fe, with particularly strong leadership, aimed at the rank of the New York Central and Pennsylvania—which was a long way from their unpretentious origins. These roads were able to raise the funds required to *aim* at this rank because of the rapidly expanding demand for the services of the industry. They were all driven aground by a sharp downturn of the business cycle, but were rapidly refloated on the incoming business tide at the turn of the century.

The preceding comments offer a highly schematic version of a most "dynamic" stretch of transportation history. What analytical possibilities emerge from this record?

1. Present profits may be *subnormal* in a rapidly expanding industry, and not necessarily abnormal (in order to provide a flow of internal funds and attract finance from outside).

2. The first step toward explaining the apparent paradox of subnormal returns in an abnormally expanding industry is to make the

paradox even sharper by noting that an abnormal rate of physical expansion does not, in itself, furnish any promise of an abnormal rate of growth, or an eventual abnormal level, of profits.

3. The missing link in the argument must be a condition of decreasing costs on such a scale, for each firm, that aggressive tactics may be expected both to drive present lower-density firms to the wall and to act as a strong deterrent to entry—once the existing firms become able to develop volume and density by growth of the market and both parallel and end-to-end consolidation.

4. Such aggressive tactics were encouraged, in rail transportation, by the fact that one element in differentiation consisted of building private sidings to the premises of large shippers. Once these shippers became established, and committed fixed investment to the services of one railroad, this railroad could begin to earn abnormal returns without any possibility of entry—*as long as the shippers were not stimulated to encourage entry by their own efforts* (as Andrew Carnegie was stimulated to support the South Pennsylvania project).

5. As the scale of the market expanded longitudinally (rail shipment feasible for greater distances) as well as laterally (heavier density of rail shipments to and from given areas), the range of possible competition increased. The larger number of different routes for larger volumes over longer distances also increased the actual and possible degree of differentiation. This increase in the size of the available worlds to conquer also enhanced the risk of being conquered: but here, as in horse-racing, lengthening the odds possibly operated to *reduce*, or in some cases perhaps to reverse, the risk premium.

6. A view of market prospects from both sides—prospects of gain, and dangers of loss—indicates that new investment may have been rational even with low average and marginal returns on existing investment. The marginal productivity of new investment need not be positive in a *net* sense (after allowance for depreciation, or retirement and replacement, as the case may be) as long as it is positive in a *gross* sense (increment to gross flow of cash discounted by a *low* current rate possibly increasing with time, in excess of current cost of asset). In a static model, this would seem to amount to a recommendation to throw good money after bad. But the present case is not the profits treadmill of a purely competitive industry, with stationary profits possible only after unremitting effort. The profits prize might go not only to the greatest *amount* of capital investment per unit of length or area, but to the *fastest rate* of capital investment. Kalecki's "principle of increasing risk" may, in fact, have been reversed in this case.

7. This capital investment could take three very distinctive forms, yielding *three dimensions* of differentiation; intensive (higher capacity per unit of length), extensive (including more units of length *in a given area* already served), and qualitative (more efficient embodiments of capital). The first yields familiar "decreasing cost" conditions. The second involves every possibility, from an outward push on the collective demand curve to sheer cancellation because of duplicate effort. The third provides the most obvious relationship of differentiation to "progress."

Both the first and third of these dimensions would make rate decreases possible directly; the second might make decreases possible indirectly, by feeding increased volumes of traffic onto the "main line." In turn, rates could be—and were—differentiated, customer-by-customer, just as service was differentiated in typically larger units. Price differentiation may permit larger sales for a given rate of profit; which, in turn, may permit price *reduction*, further growth in volume, and so on.

8. Even without competition from the internal combustion engine after World War I, capital supply, "normal" rate of profit, and other railroad problems might have been affected by a combination of factors: more rigorous regulation; fewer additional gains to be made at the expense of railroad competitors; and possibly a slower rate of growth in "inherent" transportation demand, as the marginal physical product of extensive development slowed down and further extensions were not undertaken.

But these considerations are now leading us into the problems of maturity. Is there a critical rate of growth—year-by-year, or cumulative—below which internal repercussions begin to develop which slow growth even further?

## *The Point of No Return*

This title is necessarily metaphorical, since the "life cycle" of an industry is not a precise concept. But, unless the industry should be rejuvenated by a cluster of innovations or by other external influences, it will reach a point in its aging process when the cumulative, interacting forces making for growth will be overborne by retarding influences.

The simplest illustration of this concept is provided by the contrast between the learning curve and the featherbed.

With age, every industry develops a staff of skilled laborers, sources for the collection and dissemination of technical information, facilities

for systematic education of its labor force, experienced suppliers of equipment and raw materials, and all the other desirable by-products of continued existence. Many of these by-products will retain their importance even if the individual firms in the industry come and go.

The other side to this maturing process is the development of habit patterns: how much can be done, how it should be done, who should do it, under what working conditions, in the context of what kind of hierarchy for enforcement of discipline and distribution of incomes, at what rates of pay or rates of pay increase. These habit patterns involve a mixture of the technical and the financial. In the extreme case, there may never be any technical loss from freezing the job structure, enforcing seniority rules, or prohibiting the introduction of new methods. But the "habit" aspect of maturing will still have caught up with the growth aspect, from the standpoint of this industry's competitive position in the entire economy, if even a normal rate of technical improvement is accompanied by a tendency for factor costs to rise at a faster rate than the average for industries in general. Leads in factor prices will have the same effect as lags in factor efficiencies on demand, and on the mutual interrelationships of demand, cost, and price.

The aeronautical analogy of "stalling speed" could be used, i.e., a rate of growth which, as it declines, adds power to the forces operating to slow the industry rate of growth, and thereby helps prevent a return to the previous rate of growth. But this concept is not truly independent. The relevant rate of growth of demand would vary with the age of the industry and hence the behavior of its costs.

The important questions, from the standpoint of this paper, are those relating to trends and not turning-points. Therefore, this intermediate stage will not be examined in detail, but it may be noted that the point of no return may come sooner, rather than later, under the following conditions.

1. It will come sooner if market dominance comes earlier. The high demand elasticity of differentiated oligopoly combines with a profusion of opportunities to shift the entire demand curve of the firm and capture previously unexploited segments of the market. Additional differentiation becomes pointless by definition once monopoly is reached, and probably more or less pointless in fact at some intermediate stage. Hence, there will be possibly less waste from duplicated facilities, but probably also less need on the part of the dominant firm for technical progress. Moreover, hope for a big new prize cannot attract new capital at low current rates of return. The prize, big or small, has already been won.

2. If regulation inhibits competition it can produce a facsimile of market dominance, but without the security for investors that market dominance provides.

3. It will come sooner if differentiation takes the form of near duplication of facilities instead of innovation.

Beyond this point, generalizations tend to become a guessing game. The next section will carry on the argument in more concrete terms.

## *Dynamic Interdependence on the Way Down*

The essential problem here is the savage reprisals of the capital market once an industry has disappointed its hopes. This may seem to introduce a paper dragon, since the main problem of a declining industry is to release embodied capital as rapidly and painlessly as possible. But the realities are:

1. A downward shift in the demand for an industry's services may *increase* the need for capital betterment to provide a cheaper or more efficient service, at the same time as it decreases the flow of funds available to meet the need;

2. Any going concern is caught in a web of contractual obligations and "legitimate expectations." Interest payments, and even dividends, tend to hold up longer than net operating income. Moreover, the acquisition of new capital from private sources bumps up against the historical fact of the existing capital structure. In the railroad industry, various devices for financing rolling stock have built a temporary detour around the balance sheet of each debtor railroad; but what is to happen if the whole industry faces a declining demand and a heavy outstanding debt in the form of equipment trusts and conditional sales contracts?

3. The discontinuity between returns expected on internal and external "new money" may actually increase. A hardy perennial of corporation finance is the proposition that new securities must sell at a discount. But, as we have seen, this discount when applied to an expanding industry may simply raise effective yields toward "normal profit." In a declining industry, with equities already selling well below book value, issuance of new stock at a discount from even this level would not be easy to explain to stockholders. Meanwhile, internally generated funds are dropping with the decline in sales, or much faster, since the short-run inflexibility of costs tends to become even more stubborn in an industry with long-run costs containing ingredients which are also inflexible. As a result, the rate of discount applicable to

yields from *better* investment begins soaring; an industry whose troubles may stem from low-quality investment thereupon says goodbye to improvement.

4. Theoretically, "better" investment and "more" investment are two entirely different things. In practice—and especially in transportation practice—it may be almost impossible to segregate the qualitative from the quantitative. In so far as improvements are more capital-intensive, they are likely to add to capacity, *somewhere* and in *some* respect. A firm which must anticipate either a decline in physical use of its facilities, or a decline in receipts per unit of use as the price of continued utilization, may find itself facing two ways at once: toward increased capacity, as a by-product of "improvement"; and toward a decreased flow of internally generated earnings available to pay for this capacity.

5. With technical progress slowed down just when it is most needed, can or should the decline be arrested *economically*, or *financially*?

Before examining this dilemma, we must go further in establishing that it really exists. Specifically, by any customary measure, the technical progress of American railroads has been very considerable over the last twenty or thirty years. Is there any evidence of a vicious circle here—especially for an industry with a century of technical progress already behind it a generation ago?

It would be most ungracious to deride railroad technical achievements, especially when they are viewed against the background of the industry's difficulties with finances, operating rules, regulatory bodies, etc. This paragraph will merely suggest that the recent historical record of technical progress in railroading may be used to prove too much about the future. The diesel locomotive provided a very important source of productivity gains before, and especially after, World War II. This locomotive owed much of its success to the application of certain of the principles of automobile manufacture: standardization of production methods; standardization of product; and an approach to mass production. Elsewhere in railroading, the product was already more standardized—or more resistant to standardization. The peak of the shift to diesels occurred at about the time of peak optimism about prospects for rail tonnage and revenues: ergo, of peak marketability for rail equipment obligations. Even today, improvements in equipment are much more easily financed than improvements in way and structure; and standard equipment is more easily financed than highly specialized equipment which can be used in only one area or for a limited range of services.

So the record of technical change in railroading should not lull us into complacency about the future, especially since truck competition has been most sharp on the small-volume, light-loading, short-haul movements which were bound to depress railroad productivity indexes as long as they were an important element in railroad service.

To return, then, to the economic and financial prospects, *economically*, two possibilities exist: *marginal cost pricing* and *intensified price discrimination.*

## MARGINAL COST PRICING

Rigorously applied, this would have the advantage of eliminating accumulated areas of internal subsidy. It would have the further advantage of cushioning the downward shift of demand curves by intersecting each one at a level of lower price and higher volume.

The disadvantages would all stem from financial difficulties. Bankruptcy may not frighten an economist, but both the threat and the actuality may sometimes galvanize corporate managements. The long descent into bankruptcy is as demoralizing to employees as to stockholders. Bankruptcy is a temporary legal expedient appropriate to an economy in which one firm, more or less, is assumed to make practically no difference. The issue may lie between the former management and the current creditors; or it may turn on the continuation or liquidation of the firm itself. In a world of competitive firms, there is no economic difference. But in a world of decreasing costs, differentiated oligopolists, and long-run shifts in demand curves, marginal cost pricing under private ownership might eventually produce a tag-end service provided by the physical assets which cling to life most stubbornly. Assets with high opportunity costs could be shifted elsewhere or into other uses; assets with short life spans would have to be retired. Meanwhile, on the way down, shifts in demand curves would be accelerated by service deterioration affecting the form of transport whose popularity was tending to wane even with previous service standards. And the discontinuous character of the disinvestment process might plunge shippers directly down from quite good service by each of the competing forms of transport to no service at all by one or more of them.

## INTENSIFIED PRICE DISCRIMINATION

One of the obvious drawbacks of the aging process in an industry is the tendency to freeze yesterday's price structure in the face of today's costs. If both marginal cost pricing and public subsidy are ruled out, a decreasing cost firm is likely to increase its interest in price discrimination; and, if the demand curve for its services is shifting downward, it

must comb through its existing rate structure in search of opportunities to maintain volume, or net earnings, or both.

In a stationary world, this is well and good. A declining business should examine its demand structure as carefully as its cost structure—and act promptly on any discoveries it makes.

But in a dynamic world, "too late" cancels out everything. The high elasticity of demand which justifies a price cut may have been the end product of a minor share of the market; this, in turn, may have been the end-product of earlier price and service inflexibilities. All of which may simply prove that the best way to regain business is not to lose it in the first place.

Intensified price discrimination in the railroad industry faces two real problems: (1) For a wide range of commodities, the controlling rates are now truck rates; (2) trucking is a rapidly expanding industry in which the relevant costs, for purposes of examining rates, are *long-run costs*—of operation, of vehicles, of the highways themselves.

There is nothing wrong with intensified price discrimination in principle; but, in practice, it may simply offer an excuse for locking the barn door after the horse is stolen.

## FINANCIAL SOLUTIONS

Financially, the problem is to find out whether an industry which has always believed in charging what the traffic will bear can benefit from yet another turn of the screw while external competition is steadily growing. Even with constant volume, the firm may still be able to check the downward spiral by massive rate readjustments which align the pricing structure to current cost of service. But this possibility of realignment assumes both that the market is strong enough to yield additional revenues and the regulatory authorities will permit a readjustment which must be rapid and drastic to be effective.

This same financial result may be approximated, within limits, by a realignment of service to gain more net revenue out of a frozen pattern of rates. The service spectrum may, of course, be too narrow to yield all the freedom available through rates themselves. The only feasible way to vary service may be to abandon large portions of it—passenger service, all service on certain lines—even at a cost of considerable decrease in volume of business, and possibly in volume remaining per mile of residual system.

The preceding paragraphs have only sketched in possibilities. This is partly due to the time dimension implicit in this section, which extends from the clear past into the overcast future. It is partly due to

the fact that regulatory policy is a much more important influence now than it was in the era of greatest railroad growth (one purpose of this paper is to abstract from regulation, per se, to the utmost degree compatible with some resemblance to reality). But it is mainly due to a belief that the road downhill may end at a precipice. The possible existence of this cut-off point, below which a downfall becomes a disaster, is precisely the cause of deepest anxiety about public policy for the industry. It is bad enough if decisions turn an orderly industry retreat into a rout; it is surely much worse if these decisions drive, or push, the industry to its own annihilation.

This kind of statement can be intensely irritating, because it intimates that radical policy changes may be essential and yet offers no clue as to the form these changes might take. But one thing, at least, can be said without departing from the present context: decisions based on static assumptions as to "most efficient," or "least cost," or "best service" are likely to produce only puzzlement, as the industry continually develops new symptoms which are not covered by the original diagnosis. Specifically, "what is wrong with the railroads" from the standpoint of public policy—either in themselves, or as they compete with other media of transportation—may be due in part to the fact that both regulation and promotion look too closely at past conditions and not closely enough at the nature, meaning, future course, and destination, of current trends. This backward-looking view may be inseparable from regulation. If so, it is an argument against regulation as such.

## *Conclusion*

Finally, this paper has not begun to live up to its title. The "transportation" so broadly promised turns out to be railroads, and usually just railroads hauling freight. At least something must be done to restore the balance.

The technical origin of interdependence in the early days of railroading was the existence of permanent way under the control of the firm operating the facilities and offering final transportation services to the consuming public. The permanent way was the outstanding single source of decreasing costs. The vertical integration was the outstanding source of the ability to carry elaborate forms of price differentiation right through to final consumers. These technical sources are not duplicated in any other major form of transportation. Airlines and shipping obviously do not require permanent way. Trucks and buses do not provide their own. As a matter of sheer technique, it

would be possible to have oligopolistic warfare between turnpike authorities, but this possibility has been foreclosed, supposedly for all time, by the institutional development of the highway "industry."

Conversely, modern methods of transport must adhere to schedules, or operate within maximum time limits. Nothing could have been farther from the freight practices of American railroads in the nineteenth century. Express lines sprang up, sometimes with railroad sponsorship, but the shipper who did not want to pay a substantial premium had to wait indefinitely to hear that the goods had arrived.

The necessity for scheduling also brings in the possibility of decreasing costs with additional capital investment, as more units of service per route or per firm may help to fill all units (better load factor) or to permit each unit to serve for longer hours on the average (utilization factor). In the infancy of the airlines, these could be very important considerations; on routes with low traffic densities, they still are. But this scheduling problem, at its worst, is not really identical with the decreasing cost situation of the early railroads. Scheduling involves load factors; and load factors bring in the possible relevance of joint costs and of peak and off-peak use. These present thorny problems of analysis and policy, but they are likely to have cumulative or dynamic attributes only in the early stages of growth—or the last stages of decline.

The future of the railroads may be foreshadowed with startling clarity by the history of coastal shipping. As a general carrier of coastal cargo, shipping is approaching a watery grave. This is true in spite of the fact that practically all of the arguments for the superiority of railroad efficiency to truck are also arguments for the superiority of sea to land efficiency. The trouble obviously is a combination of high terminal costs and slow and relatively unattractive service. Once the decline is well under way, the hiatus between calls tends to lengthen; the job of profitably operating any liner service tends to become more difficult; and the stage is set for a further decline of the industry. In view of present railroad problems, there may be at least some poetic justice in the fact that the past decline of coastwise "liner service" was hastened by aggressive pricing and service tactics on the part of the railroads.

What does this discussion have to contribute to public policy?

1. An emphasis on the necessity for continuous exploration of future solutions, on the basis of reasonable alternative hypotheses, and with the aid of models which incorporate the *interrelationships* of demand, cost, price, and service.

2. Possibly, also, an argument for de-emphasis of regulation under just those conditions of industrial age and converging industrial problems which seem to make regulation most secure and most necessary. For age tends toward inflexibility, even in the absence of regulation. New competition, from new quarters, may require greater flexibility if the original service is to maintain itself. And regulation may therefore weight the scales against flexibility just when this flexibility is most required.

## COMMENT

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Nelson attempts to explain the large flows of private capital into the American railroad system during the late 19th century, despite seemingly subnormal returns. His paper is also concerned with the current capital needs of railroads. Nelson stresses that, in the absence of suitable demand conditions, railroads may experience difficulties in obtaining adequate revenue for current capital requirements with either marginal cost or discriminatory pricing policies. He seems skeptical as to whether elasticity of demand is sufficiently high to effectively contribute to capital needs through rate cutting. In the absence of policies which will have the effect of shifting the demand curve for rail transportation upward, Nelson expresses doubt that even the most aggressive system of discriminatory pricing will enable the railroads to obtain a supply of capital adequate to make full use of modern technological possibilities.

Nelson's paper is specifically addressed to the relationship between price and investment in transport facilities. But I regret that he conceived of his problem so narrowly and that the ingenuity he demonstrates in analyzing investment motives influencing private capital flows into the rail system was not directed to analysis of basic determinants of flows of capital into other significant areas of the transportation plant.

In short, I am criticizing his failure to provide the breadth of analysis, the analytical framework against which to adequately judge the pressing pricing policy issues of today. What are these issues? What is this unmet challenge to price analysis?

In the 1870's, the Windom Committee reported that the transportation problem of that day was unsatisfactory rail service and unsatisfactory railroad rates. The Committee's report proposed that the problem be dealt with by construction of government railroads and

waterways which would bring competitive pressures on the railroads to reduce their rates and improve their service. This policy was not immediately adopted. Instead, in 1887, Congress passed legislation providing for regulation of railroad rates. Shortly after this, however, the federal government began to promote competitors for the railroads, beginning with waterways, then highways, and finally air transportation. Today, national transportation policy is a mixture of the policies recommended by the Windom and Cullom Committees in the 1870's and 1880's. The Doyle Report provides evidence that present policies are producing instabilities in the transport system. Existing policies tend to produce large government investment in transport facilities, creating a chronic tendency toward a total supply of transport facilities in excess of the demand which exists for transport service. More serious may be the tendency of present policies to produce an imbalance in the mix of transport facilities. This, in essence, is the railroad problem. Moreover, there is evidence that pricing and other aspects of present policy discourage efficient utilization of existing transport facilities and do not tend to promote the best quality of service.

The fundamental question for pricing policy is whether, by suitable changes, a pricing system can be developed which will help to correct imbalances in transportation investment while encouraging a more rational utilization of existing facilities, lower cost and better quality service. The emphasis which the Doyle Report places on cost-related pricing is designed to emphasize the need for development of transportation policies which will produce rates that contribute to development of a more efficient and better coordinated transportation system. This involves a consideration of the effect of rate policies on investment, on use of existing facilities, and on the cost and quality of service produced by the existing system.

The challenge for transportation economists is to clarify understanding of how alternative price policies will affect all of these vital areas. We need to know much more than we do about what these effects are, and we need to be able to evaluate specifically the implications of different pricing policies both for use patterns of existing facilities and for transportation investment.