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6. Financial Returns

Expense ratio and unit cost varied inversely with traffic

From 1919 to 1938, an expansion of traffic usually brought with it a greater percentage increase in railway operating revenues than in railway operating expenses; a contraction of traffic was accompanied by a greater percentage shrinkage of revenues than of expenses. The ratio of railway expenditures to railway gross receipts, usually called the operating ratio, generally declined, and the ratio of net receipts to gross receipts rose in expansion; the operating ratio rose, and the margin of profit declined, in contraction (Chart 25). There were exceptions in 1919-20 and 1927-28.¹

The operating ratio equals the average expense per unit of traffic, divided by the average revenue per unit of traffic. Unit expense therefore equals the product of unit revenue and the operating ratio.² We know what happened to the operating ratio; if we can learn what hap-

¹ For reasons advanced in an earlier section, we assume that in 1920-38 the expansions and contractions in a composite measure of all railway traffic would correspond to those in ton-miles. Since the operating ratio is available for many earlier years, we thought of investigating its relation to cycles in traffic during a long period before World War I. But when we look at the traffic figures for that period, we find that passenger traffic hardly ever changed in the same direction as freight traffic except when both were expanding. During every contraction in tons conveyed, the number of journeys increased; during every contraction in journeys, tonnage increased. There was only one exception; both contracted from 1911 to 1912. In all other years of opposite change, moreover, the kind of traffic that happened to be growing would likely preponderate over the other kind in any reasonably constructed index of composite traffic, except perhaps in 1867-68, 1891-93, and 1907-1908. As far as we can tell, there were few if any cycles (comparable in length to business cycles) in total traffic. Instead there was almost continuous growth.

We did compare changes in the operating ratio during *business* expansions with those during business contractions, but found no systematic variation.

² In formulating these equations we assume that the many varieties of traffic are somehow combined in a single measure. The equations are valid, however, whatever the measure employed. In any case, $\text{revenue} \div \text{expense} = \text{revenue per unit} \times \text{traffic} \div \text{expense per unit} \times \text{traffic} = \text{revenue per unit} \div \text{expense per unit}$. But in studying cyclical relations between prices received and costs it would be desirable

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pened to the unit revenue we will also know what happened to unit cost. The observed fluctuations in the operating ratio may mean that the average cost of handling traffic usually rises when traffic shrinks and falls when traffic grows. To determine whether they really have this meaning we must examine them in the light of the history of rates and fares in 1919-38.

During the 1914-18 war, when the railways were operated on lease to and for the account of the government, freight rates were kept stable, and remained at their prewar level in 1919. But rising wages and prices of railway material, together with the prospect of return to private financial responsibility, led the Minister of Transport to approve general increases in 1920. On January 15 rates on coal, coke, and patent fuel were advanced to 25 per cent above prewar. Rates on commodities in the lettered classes A, B, and C (i.e. commodities of low value per ton, shipped in large quantities) were raised to 30, 40, and 50 per cent respectively. Those on articles in the numbered classes (1 to 5) were raised to 60 per cent. On top of these percentage increases, flat rates per ton were imposed ranging from 3 pence on the less valuable to 12 pence on the more valuable commodities. On September 1 all freight rates were raised to 100 per cent above prewar. Passenger fares (other than workmen's fares and the prices of season tickets) which had been raised to 50 per cent on January 1,

to measure composite traffic in such a way that revenue per traffic unit would be influenced exclusively by changes in rates and fares (not by changes in the composition of traffic). Although we cannot construct such measures of traffic and of unit revenue, it may be illuminating to consider what they would be like if we could.

Each kind of traffic to which a distinct rate applies should be considered a distinct species. For comparing a base year, I (such as a peak or trough), with a later year, II, the traffic in each species (measured in whatever unit the railroads use in quoting rates on that species, e.g. the cwt.) could be weighted in each year by the rate applicable to it in the base year. Thus t_{a1} units of species A, carried in I at a rate of r_{a1} per unit would be counted as $t_{a1} r_{a1}$ traffic units, t_{b1} units of B in I at r_{b1} as $t_{b1} r_{b1}$ traffic units, and so on for all other species. Aggregate traffic in I would be $t_{a1} r_{a1} + t_{b1} r_{b1} + \dots$, or $\Sigma t_1 r_1$. It would be identical with aggregate revenue in I. Aggregate traffic in II would be $t_{a2} r_{a1} + t_{b2} r_{b1} + \dots$, or $\Sigma t_2 r_1$. It would *not* usually be identical with revenue in II.

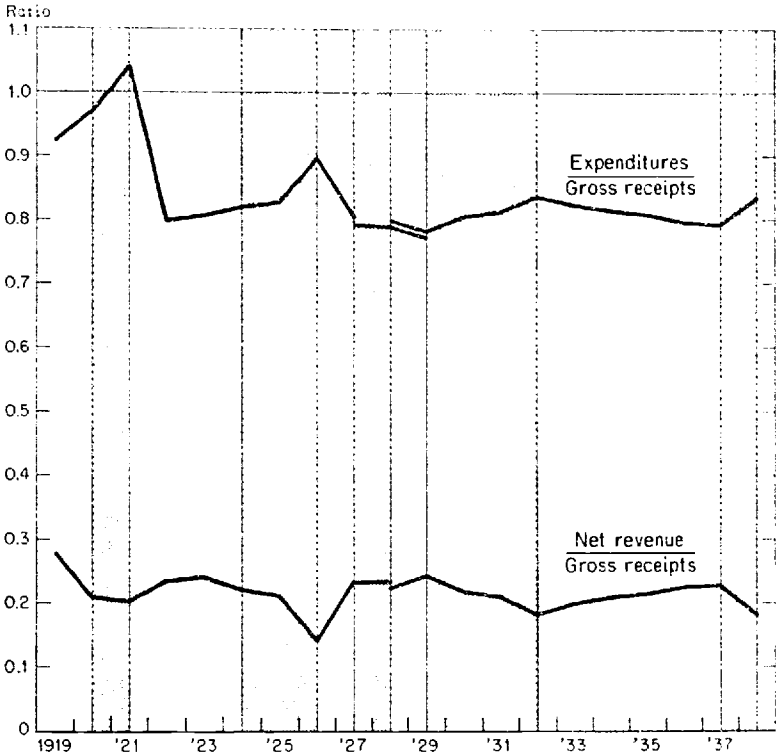
Revenue per unit in I would be 1. Revenue per unit in II would be $\Sigma t_2 r_2 \div \Sigma t_2 r_1$. Only changes in rates and fares could cause it to differ from 1.

These formulae conform to the rule that expense ratio = unit cost \div unit revenue. Let E_1 and E_2 be aggregate expense in the respective years. Then in year I, operating ratio = $E_1 / \Sigma t_1 r_1 \div 1$ = unit cost \div unit revenue, and in II, operating ratio = $E_2 / \Sigma t_2 r_2 = E_2 / \Sigma t_2 r_1 \times \Sigma t_1 r_1 / \Sigma t_2 r_2 = E_2 / \Sigma t_2 r_1 \div \Sigma t_2 r_2 / \Sigma t_1 r_1$ = unit cost \div unit revenue. Furthermore,

$$\frac{\text{unit cost in II}}{\text{unit cost in I}} = \frac{\text{operating ratio in II}}{\text{operating ratio in I}} \cdot \frac{\text{unit revenue in II}}{\text{unit revenue in I}}$$

CHART 25

Ratio of Railway Expenditures and of Net Revenue to Gross Receipts 1919-1938



Shaded periods are contractions in ton-miles.

1917 rose to 100 per cent on August 6, 1920. Season tickets had been raised 10 per cent for journeys under 12½ miles and 20 per cent for longer journeys in May 1918; they now rose to 50 per cent above prewar. Workmen's fares, which were still at prewar, went up by varying but substantial percentages on September 1, 1920.³

After the postwar depression developed, the railway companies found it inexpedient to retain all of these increases. Iron ore, limestone, and certain other raw materials for blast furnaces and steel works were

³ The changes in rates and fares are described in Railway Rates Tribunal, *Annual Report, 1922*.

Workmen's tickets were designed to provide cheap transportation to manual workers between their homes and places of employment. On the way to work they were good only on early morning trains, and their use was restricted in other respects.

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reduced to 75 per cent above prewar on November 1, 1921. 50 per cent on May 22, 1922, and 40 per cent on December 1, 1922. Coal, coke, and patent fuel came down to 75 per cent on January 1, 1922 and 60 per cent on August 1, 1922. Special reductions were made on various other commodities. Rates on A and B commodities, not specially reduced, were lowered to 75 per cent above prewar on May 22, 1922, and those on C and Class 1 to 5 commodities were reduced to the same level on August 1, 1922. Some of the superimposed flat charges were reduced. Passenger fares other than workmen's fares and season tickets came down to 50 per cent above prewar on January 1, 1923.⁴

There were only two other general changes, and they were of less consequence. The Railway Rates Tribunal approved a general increase of $6\frac{2}{3}$ per cent effective February 1, 1927, and another, 5 per cent, effective October 31, 1937.⁵

More piecemeal changes, intended to correct particular inequities, to attract or retain particular kinds of traffic, etc. constantly occur. The collective effect of such change over an interval of time is difficult to gauge. Data on average revenue per ton-mile and average revenue per journey are the only evidence readily available. They are affected by changes in composition of traffic as well as changes in rates and fares; in particular, revenue per journey is affected by changes in the average length of journeys. The averages are shown for peak and trough years in Table 27. Unimportant kinds of passenger traffic are omitted. Third class "ordinary" journeys are the most important; they contributed 72 per cent of all revenue from passengers, and 56 per cent of all passenger train revenue (including mail, parcels, etc.) in 1938, and the proportions were not greatly different in the other years.

Anyone who cared to travel early could buy one, however; they are now called early morning tickets.

In many cases the prewar workmen's fares were very low compared with other fares and were not systematically related to distance. Equal percentage increases were therefore not recommended. Instead, a new scale was prescribed, rising with distance and uniform for the country. No workman's fare, however, was to be increased by more than 200 per cent. See the discussion in the Rate Advisory Committee's report, reprinted in *Railway Gazette*, July 30, 1920, pp. 161 ff.

⁴ *Railway Gazette*, 1922: May 19, pp. 820-1; July 14, p. 68; December 8, pp. 741-2, 767; 1923: April 27, p. 642.

⁵ *Railway Returns, 1927*; Railway Rates Tribunal, *Annual Report, 1937*. All of the general increases were subject to various exceptions, maxima, minima, or other qualifications.

TABLE 27

Ratio of Railway Expenditures to Railway Revenues and Revenue per Ton-mile and per Journey at Peaks and Troughs in Ton-miles, 1921-1938

DATE	LEVEL OF TRAFFIC	EXPENDITURES		REVENUE PER TON-MILE, PENCE.		REVENUE PER PASSENGER JOURNEY, PENCE		
		+	-	Merchandise	Coal	Ordinary ^a	Workmen	Season tickets, third class ^b
				ABSOLUTE AMOUNTS		First class	Third class	
1921	Trough	1,041	3,249	1,708	1,267	67.17	20.61	3.47
1924	Peak	.820	2,311	1,129	0.999	65.52	18.21	3.23
1926	Trough	.896	2,277	1,157	1,062	70.40	18.42	3.32
1927 ^c	Peak	.802	2,354	1,159	1,062	69.41	17.87	3.27
1927	Peak	.793	2,401	1,155	1,057	69.39	17.87	3.27
1928 ^c	Trough	.791	2,346	1,123	1,059	70.99	17.58	3.26
1928 ^d	Trough	.798	2,344	1,122	1,058	74.57	18.73	3.30
1929	Peak	.781	2,267	1,103	1,043	72.42	17.43	3.36
1932	Trough	.837	2,161	1,028	1,046	64.76	15.64	3.53
1937	Peak	.794	1,948	0.966	1,037	62.81	15.83	3.55
1938	Trough	.836	2,004	0.960	1,075	66.57	17.16	3.68
		PER CENT CHANGE FROM PRECEDING DATE						
1924	Peak	-21.2	-28.9	-33.9	-21.2	-2.5	-11.6	-6.9
1926	Trough	9.3	-1.5	2.5	6.3	7.4	1.2	2.8
1927	Peak	-10.5	3.4	0.2	0.0	-1.4	-3.0	-1.5
1928	Trough	-0.3	-2.3	-2.8	0.2	2.3	-1.6	-0.3
1929	Peak	-2.1	-3.3	-1.7	-1.4	-2.9	-6.9	1.8
1932	Trough	7.2	-4.7	-6.8	0.3	-10.6	-10.3	5.1
1937	Peak	-5.1	-9.9	-6.0	-0.9	-3.0	1.2	0.6
1938	Trough	5.3	2.9	-0.6	3.7	6.0	8.4	3.7

^a At full fares and at reduced fares.

^b Average price of season tickets, adjusted to one-year basis, divided by 600.

^c For comparison with preceding year.

^d For comparison with following year.

After considering the history of general change in rates, and the data on revenue per ton-mile and per journey, we have formed a judgment as to the direction of change in rate level during each expansion or contraction. From the same information and the known changes in the operating ratio (Table 27), we have formed a further judgment as to the direction of change in unit cost (Table 28). In general it seems that unit cost fluctuated inversely with traffic. The exceptional rise in 1919-20 can be accounted for by the extremely rapid rise in prices of materials and supplies and in railway wage-rates. The exceptional fall in 1927-28 may be illusory and, in any case, the contraction was a very mild one. Table 28 suggests that the level of rates declined somewhat in 1929-32, but it is not clear whether the decline is enough to explain the 7.2 per cent rise in the operating ratio, or whether a rise in unit cost may also be inferred.

Effect of changes in wage rates

Unit cost is affected partly by changes in quantities of labor and materials (including fuel, etc.) used per unit of traffic and partly by changes in prices of materials and in wage-rates. Previous sections have suggested that the quantity of labor and of locomotive fuel used per unit of traffic tends to fall in expansion and rise in contraction. We have found no index of prices of railway materials, but the history of wage rates can be traced. At the beginning of 1919 they were commonly 33 shillings per week above prewar levels. In the latter part of that year and in 1920 management and unions worked out a series of agreements that standardized rates for each occupation, or "grade," at roughly twice the prewar average for each grade. The agreements provided that wages should rise and fall with the Ministry of Labour's index of the cost of living. In many grades the weekly wage was to change one shilling for each 5-point change in the index. Declines in the cost of living, however, were not to reduce the rate paid below the standard rate. These provisions brought further increases in rates during 1920 and reductions during 1921 and 1922.⁶ Thereafter the cost of living occasionally raised or lowered rates a shilling or two per week, or brought standard rates into effect, but on the whole there

⁶ On the changes in wage rates and arrangements see the *Railway Gazette* for 1920, especially January 9, pp. 44-6; January 23, pp. 115-6; February 20, p. 266; February 27, p. 301; May 2, p. 514; June 11, p. 858; October 8, p. 475; December 13, p. 727; also December 28, 1923, pp. 831-2.

TABLE 28

Direction of Change in Operating Ratio, Rate Level, and Unit Cost during Traffic Expansions and Contractions, 1919-1938

	DIRECTION OF CHANGE		
	<i>Operating ratio</i>	<i>Rate level</i>	<i>Unit cost</i>
Expansions			
1919-20	+	+	+
1921-24	-	-	-
1926-27	-	+	-
1928-29	-	little change	-
1932-37	-	-?	-
Contractions			
1920-21	+	+	+
1924-26	+	little change	+
1927-28	-	little change	-
1929-32	+	-?	little change?
1937-38	+	+	+

For derivation, see text.

was little change in the going rates.⁷ During most of the ten years beginning August 1928, however, it was agreed that, after each wage payment had been computed in accordance with the going rates and rules, a percentage should be deducted from the sum so obtained. But the percentages were small, and the changes in them did not correspond closely in time with traffic or business cycles (Table 29). We conclude that changes in wage-rates tended strongly to raise unit cost in the 1919-20 and to reduce it in the 1921-24 expansion, but that in other expansions and contractions they had little effect on unit cost.

Return on investment varied directly with traffic

With one possible exception, in 1929-32, the direction of change was the same in the operating ratio as in unit cost (Table 28). Rises and falls in unit cost, therefore, were not accompanied by proportional rises or falls in the average charge for railway services. The latter were inflexible enough to cause changes in unit cost to be reflected in opposite changes in the ratio of railway net receipts to revenue.

Even if net receipts were a constant proportion of gross, aggregate

⁷ We base this remark on detailed study of the grade-by-grade data on "rate of wages payable" or "average weekly salary or wage" in the various issues of *Railway Returns - Staff*.

net receipts would rise in expansion and fall in contraction, for aggregate gross receipts usually rose and fell with traffic. Since the aggregate net receipts fluctuate more than the gross, their rise and fall is more pronounced. Net receipts are not the same thing as net revenue, to which railway security holders must look for a return on their investment. To arrive at net revenue, one must add to net railway receipts

TABLE 29
Percentage Deductions from Earnings of Railway Employees, 1928-1937

DATE FIRST EFFECTIVE	CONCILIATION GRADES ^a		MECHANICS AND ARTISANS
	Per cent	Extra Per cent ^b	Per cent
August 13, 1928	2½	0	2½
May 13, 1930	no deduction		
March 28, 1931 ^c	2½	2½	4½ ^d
October 1, 1934 ^e	2½	1¼	3⅓
January 1, 1935 ^e	2½	0	2½
August 26, 1936 ^e	1¼	0	1¼
August 16, 1937 ^e	no deduction		

^a In 1907 a system of boards for the conciliation of disputes between railway companies and their employees was established. Occupations embraced in these arrangements came to be known as Conciliation Grades. The term includes most railway employees other than mechanics and artisans.

^b On excess of earnings over 40s. per week (wage earners) or £100 per year (salaried workers).

^c Effective in first full pay period after this date, except conciliation grades in 1937.

^d i.e. 10 pence in the pound.

^e Mechanics and artisans, July 1.

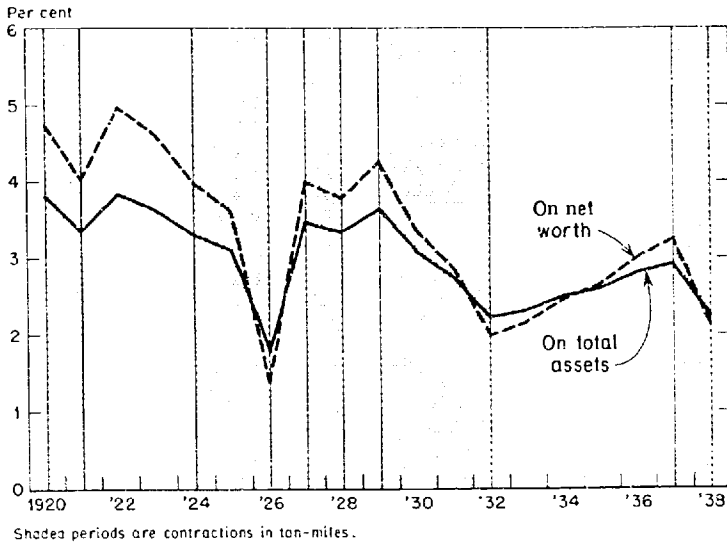
Compiled from information in *Railway Gazette*, August 3, 1928, p. 134; March 13, 1931, p. 422; March 20, 1931, pp. 465, 502; August 17, 1934, p. 284; October 5, 1934, p. 559; July 3, 1936, p. 17; August 7, 1936, pp. 220, 222; August 13, 1937, pp. 297-8. See also *Railway Returns, Staff*, 1931, 1938.

the net receipts from the various but less important other enterprises of the railway companies (e.g. steamboats, hotels) and certain miscellaneous kinds of income, and one must deduct certain miscellaneous charges. But railway net receipts are by far the largest element in net revenue, and the ratio of net revenue to railway gross receipts has usually varied inversely with traffic, like the ratio of railway net receipts to gross. (Chart 25. The ratio of railway net receipts to gross is measured by the vertical interval between the expense ratio and unity.) A salient exception in 1920-21 will be explained in a moment.

The investment in the railways, on the other hand, was more stable than their revenue, and the companies earned a higher rate of return

CHART 26

Return on Total Assets and on Net Worth, 1920-1938



on their transportation property and other investments in times of good business and heavy traffic (Chart 26).⁵ From 1920 onward, peaks and troughs in the ratio of net revenue to total assets coincided with those in the reference chronology and in net ton-miles, except in the 1921-24 expansion, when earnings reached a peak very early. The net decline in this phase, however, is smaller than in the next contraction. Fluctuations in the rate of return on net worth coincided in time with those in return on total assets, but were greater in amplitude, since interest charges on funded debt varied little from year to year.

⁵ The customary statistical balance sheet for British railways did not include among the assets the entire quasi-permanent investment; instead it showed the excess of "capital expenditure" over "capital receipts" from bonds, debentures and stocks, none of which appeared as a liability. In our computations, total assets = capital receipts + capital expenditures in excess of capital receipts + other balance sheet assets. Net worth = total assets - bonds and debentures ("amount on which interest is payable") - balance sheet liabilities except "balance available for dividends and general reserve. . . ." Year-end figures thus computed are averaged to derive the base on which the return for each year is computed. Return on total assets = net revenue ÷ average assets for year × 100. Return on net worth = (net revenue - interest on bonds and debentures) ÷ average net worth × 100.

All figures used include through 1932 the railways taken over by the London Passenger Transport Board, exclude them thereafter. Computations for 1928-32, leaving them out, indicate that the effect of inclusion or exclusion on the rate of return is very slight.

Because of financial arrangements with the government, the net revenue of the railway companies does not reflect the low level of operating profits in 1920 or the deficit in 1921 (Table 30). If we

TABLE 30
Income Account of Railways, 1920-1922

	1920	1921	1922
	(thousands of pounds)		
(1) Gross receipts from operations	257,974 ^a	256,312	238,224
(2) Operating expenditure	252,036	246,156	191,075
(3) Net receipts, (1) - (2)	5,938	-9,844	47,149
(4) Government compensation ^b	41,030 ^c	51,339
(5) Miscellaneous receipts ^d	4,392	4,515	6,216
(6) Miscellaneous charges ^d	1,945	2,005	2,019
(7) Net revenue, (3) + (4) + (5) - (6) ^e	49,417	44,005	51,346
(8) Net revenue before government compensation, (7) - (4)	8,387	-7,334	51,346

^a Includes £1,492 thousand, estimated value of services rendered to government without specific charge.

^b Continuing under wartime arrangements in 1920, the railroads operated for the account of the government, which paid them their prewar earnings as rent for the use of their properties. In 1921 they operated for their own account but with a transitional guarantee of earnings.

^c Compensation in excess of estimated value of services, note a.

^d Net rents, miscellaneous interest, etc.

^e Does not appear in official financial statement before 1927, but computable as indicated.

deduct government compensation from net revenue, the remainder—line (8)—is equivalent to 0.65 per cent of total assets in 1920 and to a negative return, -0.56 per cent, in 1921. Deducting government compensation from net revenue minus interest on funded debt yields a negative return on net worth in both years, -0.44 per cent in the first, and -2.42 per cent in the second.