Volume Title: American Transportation in Prosperity and Depression

Volume Author/Editor: Thor Hultgren

Volume Publisher: NBER

Volume ISBN: 0-870-14086-8

Volume URL: http://www.nber.org/books/hult48-1

Publication Date: 1948

Chapter Title: Cost and Profit

Chapter Author: Thor Hultgren

Chapter URL: http://www.nber.org/chapters/c4619

Chapter pages in book: (p. 267 - 340)

CHAPTER 10

Cost and Profit

INTRODUCTORY

Theories about cost and profit

Changes in costs and profits per unit of goods sold have been thought an important factor in the generation of business cycles (Ch. 3). Various analysts of business have believed that a rise in unit cost occurs in many industries during the later stages of expansion, and that it contributes to the eventual onset of depression. They hold that declines in unit cost during contraction are common and help to bring about a revival of business. Advocates of 'purchasing power' doctrines, on the other hand, assert that expanding industrial production is typically accompanied by falling unit cost (at least if wage rates do not change), and infer that increases in wages or reductions in prices are not only a feasible but a necessary means of stimulating expansion and avoiding contraction.

In this chapter we shall try to learn what kind of changes in unit costs and profits have actually occurred in the railway industry. Of course the railroads are only one sector of private business, and whatever may be true of them is not necessarily true elsewhere. But they have resemblances to other industries that are pertinent to the problem. It is obvious from foregoing chapters that cyclical fluctuations in the physical volume of business have an important bearing on railway costs; and there is good reason to suspect that volume is similarly important in many other industries.

What the terms mean

Cost and profit are not self-defining expressions. We shall take the former to mean what, in the standard accounting rules prescribed by the ICC, is called railway operating expenses. They include charges for labor, fuel, materials, supplies and certain miscellaneous items. (Expenses charged to investment rather than to current operations, however, are not included.) As usually presented, they include also depreciation—almost entirely de-

preciation of equipment.[1] Finally, they include loss of and damage to the property of shippers and the public, personal injury payments, and insurance. On the other hand, operating expenses do not include taxes, rents for the use of equipment or railroad property owned by others, or interest on indebtedness.

Railway profits are computed in various ways, with varying results. In the standard system of accounts the difference between operating revenues from all sources (freight, passenger, mail, express, dining car, etc.) and operating expenses is called *net revenue from railway operations.* It does not all go to the owners of the railroads, as dividends or as increase in the value of their equity. On the contrary, net operating revenue, together with some income from other sources than operations, is shared with the government, the owners of rented equipment and property, and the holders of railway indebtedness. Sometimes, when all these other claimants have been provided for, what remains to the stockholders is a minus quantity.

Taxes chargeable to operations are deducted from net revenue to arrive at a second level of profit called *railway operating income.* Equal to operating revenues minus expenses and taxes, it represents the return from operations to property interests of all kinds after allowance for the government's claims.

Rents becoming payable for the use of rolling stock and joint facilities (such as a station owned by one railroad but used by another also), minus rents receivable on these accounts, are deducted from operating income to compute a third kind of profits, *net railway operating income.* It is equal to operating revenues minus operating expenses, rents, and taxes.

Since the three kinds of operating profit are defined in terms of successive subtractions, net revenue usually exceeds operating income, and net operating income is the smallest of all. Once in a rare while, however, accounting readjustments result in minus entries for taxes or rents and reverse this natural order for a month or two.

Depreciation

The inclusion of depreciation in operating expense as usually computed and published affects the meaning of the figures. The

[1] In the period covered by this study, it was not customary to depreciate road, or fixed structures, and charges to expenses on their account were small.

Table 94

Summary of Methods by which Depreciation was Estimated

Kind of property, and period	Method
All Property Subject to Charges	
January 1911–December 1915	As illustrated in Table 95, Part I
January 1916–June 1916	As illustrated in Table 95, Part II
July 1916–June 1920	As illustrated in Table 95, Part III
July 1920–December 1932	Sum of estimates described below
January, February 1933	One-half of difference between total for 1933 and total of figure for last 10 months, seasonally adjusted
March 1933–December 1938	Actual figures, seasonally adjusted
Freight Cars	
July 1920–December 1932	As illustrated in Table 96
Locomotives	
July 1920–June 1921	Method of Table 95, Part III, applied to annual totals for locomotives instead of to those for all property
July 1921–December 1932	As illustrated for freight cars in Table 96†
All Other	
July 1920–December 1932	Method of Table 95, Part III, applied to annual totals for all other

† The number of locomotives assigned to switching is not known. We assumed it varied in proportion to the number of locomotives assigned to road passenger and freight service. Annual depreciation on all locomotives was divided by this number to get the mid-year charge per locomotive. The consequent exaggeration of the latter was offset in the monthly estimate, since the unit charge was multiplied by a correspondingly understated number of locomotives.

aggregate depreciation charge depends solely on the dollar value of the stock of depreciable property and the percentage rates applied to it. Current operations have no effect except as they lead to acquisitions or retirements. In preceding chapters we have shown that the number of vehicles does not increase or diminish in proportion to traffic. Their aggregate ledger value also must be stable. The rates applied to the latter probably do not change very much. Consequently, the aggregate charge cannot vary closely with traffic—is unlikely to rise or fall as much in a few months or even a few years. Depreciation per traffic unit is therefore likely to fall sharply as the volume of business rises and vice versa—a quasi-automatic result of the accounting rules, which require a charge of so much per dollar of investment per month, whether cars and locomotives are used intensively or sparingly. If depreciation were a specified amount per mile run, the charge per unit of traffic would behave in a quite different manner. As matters stand, cost per unit, including depreciation, must fluctuate some-

Table 95

Computation of Estimated Depreciation
January 1913–December 1913, January 1916–June 1916, July 1918–June 1919

	Derivation	Depreciation ($ 000)
I		
(a) Year ended June 30, 1913	ICC	64,463
(b) Year ended June 30, 1914	ICC	77,188
(c) Middle month of 1912–13	(a) ÷ 12	5,372
(d) Middle month of 1913–14	(b) ÷ 12	6,432
(e) Increase	(d) − (c)	1,060
(f) Increase per half month	(e) ÷ 24	44
January 1913	(c) + (f)	5,416
February 1913	(c) + 3 × (f)	5,504
.....	...	...
December 1913	(c) + 23 × (f)	6,384
II		
(a) Year ended June 30, 1916	ICC	93,255
(b) Calendar year 1916	ICC	98,289
(c) Middle month of 1915–16	(a) ÷ 12	7,771
(d) Middle month of calendar year 1916	(b) ÷ 12	8,191
(e) Increase	(d) − (c)	420
(f) Increase per half month	(e) ÷ 12	35
January 1916	(c) + (f)	7,806
February 1916	(c) + 3 × (f)	7,876
.....	...	...
June 1916	(c) + 11 × (f)	8,156
III		
(a) Calendar year 1918	ICC	113,027
(b) Calendar year 1919	ICC	121,360
(c) Middle month of 1918	(a) ÷ 12	9,419
(d) Middle month of 1919	(b) ÷ 12	10,113
(e) Increase	(d) − (c)	694
(f) Increase per half month	(e) ÷ 24	29
July 1918	(c) + (f)	9,448
August 1918	(c) + 3 × (f)	9,506
.....	...	...
June 1919	(c) + 23 × (f)	10,086

what differently than cost excluding it. Since deduction of operating expense is the first step in computing any kind of profit, the latter also must be affected. We think it desirable to analyze both cost and profit before as well as after depreciation. Unfortunately we cannot do this with entire accuracy, since the depreciation charged monthly was not reported to and by the ICC for any period before March 1933. For earlier months we are obliged to estimate it by methods of varying crudity, which are summarized

in Table 94 and illustrated in Tables 95 and 96. Whatever their defects, we feel confident that the figures they produce can seldom differ by more than 2 or 3 percent from the grand total of those entered in railway accounts.

Table 96
Computation of Estimated Depreciation of Freight Cars
July 1925 and June 1926

Basic Data for Calendar Year 1925		
(a) Aggregate depreciation of freight cars	ICC	$107,389,000
(b) Freight car months[a]	ICC	28,415,000
(c) Depreciation per car, middle month	(a) ÷ (b)	$3.779
Basic Data for Calendar Year 1926		
(d) Aggregate depreciation of freight cars	ICC	$111,274,000
(e) Freight car months[a]	ICC	28,330,000
(f) Depreciation per car, middle month	(d) ÷ (e)	$3.928
(g) Change from 1925 in depreciation per car	(f) − (c)	$0.149
(h) Change per half month	(g) ÷ 24	$0.006
Estimate for July 1925		
(i) Depreciation per car	(c) + (h)	$3.785
(j) Number of freight cars owned	ICC[b]	2,371,000
(k) Aggregate depreciation	(i) × (j)	$8,974,000
Estimate for June 1926		
(l) Depreciation per car	(c) + 23 × (h)	$3.917
(m) Number of freight cars owned	ICC[b]	2,363,000
(n) Aggregate depreciation	(l) × (m)	$9,256,000

[a] Total of 12 monthly figures (January to December) for number of cars.
[b] Seasonally adjusted by NBER.

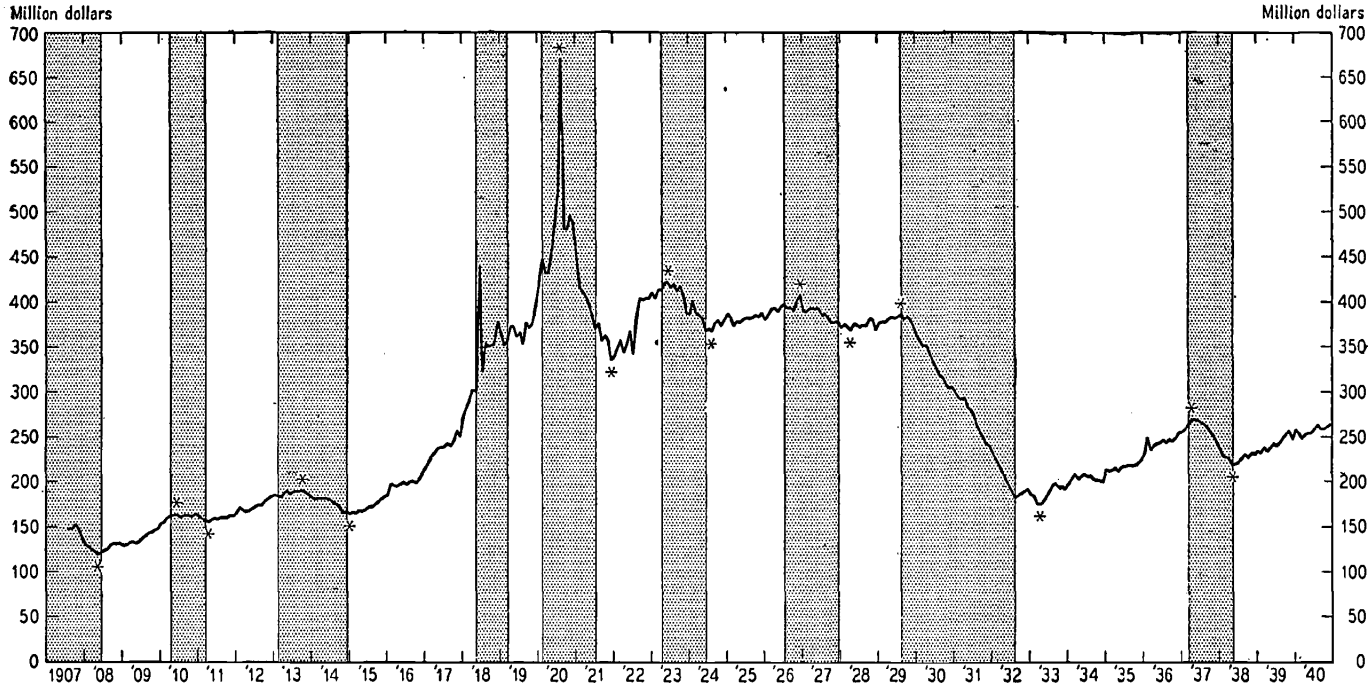
OPERATING EXPENSES

Lower unit cost at peaks than at troughs in traffic

When traffic grows, more men go to work on the railroads and the companies augment their consumption of fuels, materials, and supplies. If sellers of commodities used in transportation did not change their prices and if no new wage rates were negotiated, aggregate expense would increase in expansion and fall in contraction. Actually, changes in prices usually re-enforce the effect on expenses of fluctuations in traffic, although the course of wage rates is less regular (Ch. 9). Aggregate charges have increased in every expansion, diminished in every contraction except 1918–19 (Chart 104). The low and high points in expense were seldom reached at exactly the same time as those in traffic. In 12 of 17 cases, expenses continued to mount after traffic began to dwindle,

CHART 104

Railway Operating Expenses, July 1907—December 1940

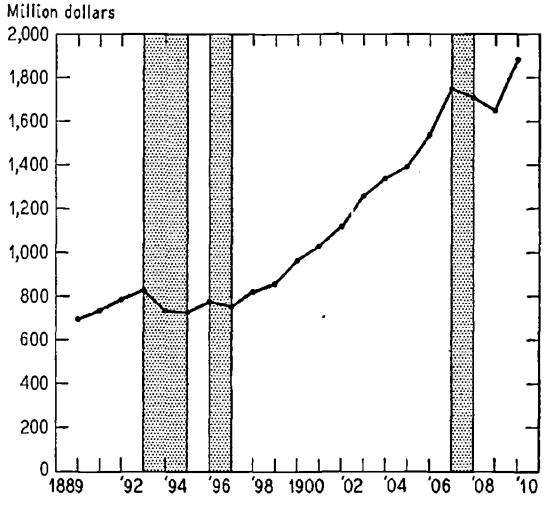


Shaded periods are contractions in traffic units.

or to decline after it began to revive; in 2 others (1918 and 1919), we recognize no turn in expenses. Aggregate costs were nevertheless higher at every peak than at the preceding trough, lower at every trough except March 1919 than at the preceding peak. This was also true of annual expenses before 1908–10 (Chart 105).

CHART 105

Railway Operating Expenses, 1890–1910



Shaded periods are contractions in traffic units

Some of the intervals between the turns in traffic and those in expense were short. In others the difference between the level of expense at its own turn and at that in traffic was slight. Between the traffic trough of 1932 and the expense trough of 1933 the general direction of change in both was similar—they rose for a few months, then fell again—although traffic finished higher, expense lower than it started. In two instances, however, growth of expense after the recession in traffic was both sharp and prolonged; for other reasons as well, these turns invite special comment.

When wages were raised in 1918, the awards included back pay at the new rates from January 1 onward. The accounts for earlier months, however, were apparently closed, and much of the back pay was charged to expenses in June. Consequently the curve

shows a needle-like upward projection in that month. In July it falls back, then resumes the less hectic rising movement it displays before June. We prefer to disregard the transient extreme level created by a peculiar accounting necessity. As no other month is outstanding, we do not designate any peak in this vicinity. In any case, there was a substantial increase in operating expense after the traffic peak in May.

A similar needle in August 1920 has a similar explanation. Wage increases retroactive to May 1 were announced on July 25; but apparently, in large part at least, the back payments were recorded in the expense accounts for August. In this case, however, there obviously would have been a peak somewhere in the neighborhood even if the accounting complication had not occurred. No other month looks more likely than August, which we have accordingly marked. There can be no doubt that the high point would have been reached considerably later than the traffic peak in February—perhaps in August, perhaps as late as November. Moreover, the excesses over the February level of expense are substantial.

But in view of the main problems we have set before ourselves in this chapter, variations in aggregate cost have merely an introductory interest. That it should rise and fall more or less with volume is not surprising; we want to know what happens to the average cost of rendering a unit of transportation service. To answer this question we must divide aggregate expenses by traffic units.

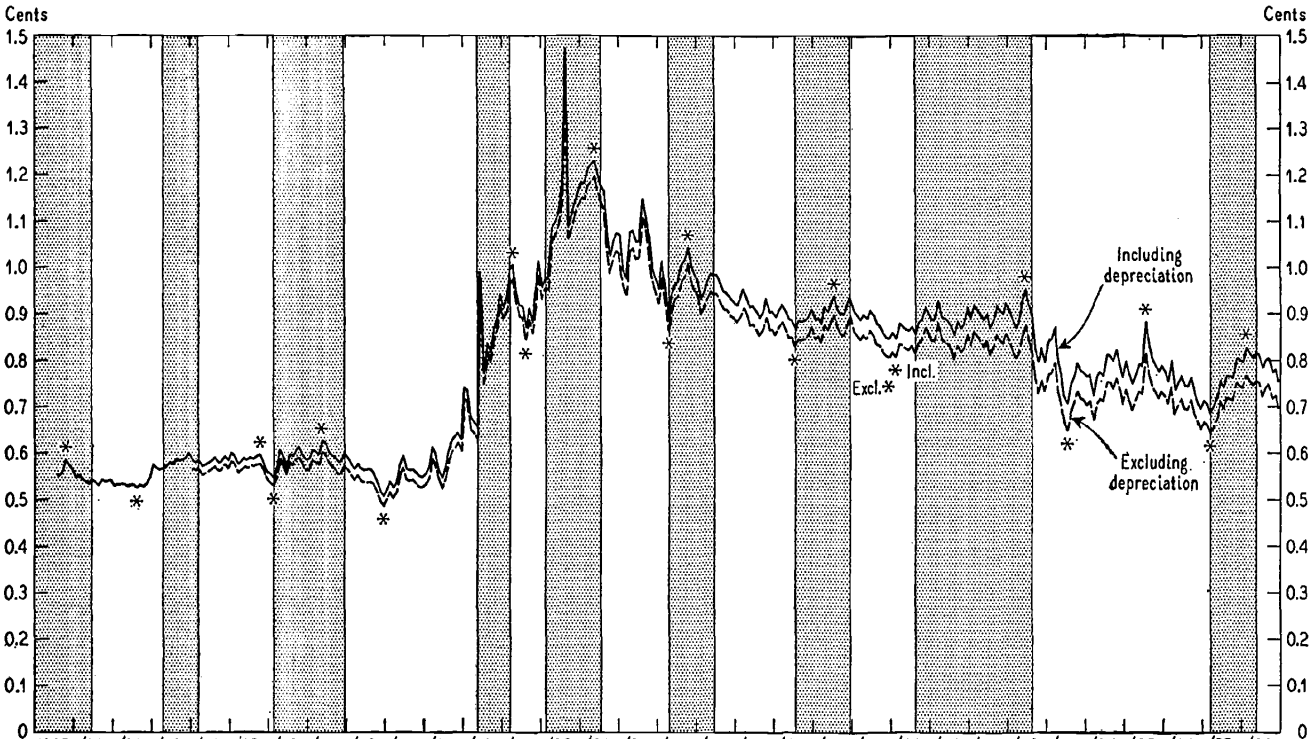
After doing so, month by month, we find that every expansion of traffic can be paired with a corresponding fall in cost per traffic unit, and every contraction with a corresponding rise (Chart 106).[2] Sometimes the change in traffic and the opposite movement of unit cost began or ended at about the same time. In other cases, there was a difference at one end or the other—noticeably during the first World War, when cost began to rise at the end of 1915 although traffic did not reach a peak until May 1918.

Although the direction of change in unit costs was reversed during many phases in traffic, in six of eight traffic expansions they were lower at the end than at the beginning. With one partial exception—expense excluding depreciation in 1929–32—

[2] We ignore an 'extra' phase in unit cost during 1932–37.

CHART 106

Operating Expenses per Traffic Unit, July 1907—December 1938



Shaded periods are contractions in traffic units.

Table 97

Operating Expenses per Traffic Unit

Averages for Stages of Cycles in Traffic Units, 1908–1938

(Cents)

Cycle, & kind of expense[a]	I	II	III	IV	V	VI	VII	VIII	IX
1908–11									
II	.5391	.5381	L.5299	.5494	.5664	.5752	.5869	H.5876	.5782
1911–14									
I	.5620	.5625	.5702	.5620	L.5391	.5722	H.5758	.5757	.5633
II	.5782	.5785	.5865	.5787	L.5556	.5906	.5967	H.5992	.5885
1914–19[b]									
I	.5633	L.5297	.5383	.6103	.6539	.7487	.8346	.9033	H.9495
II	.5885	L.5537	.5611	.6326	.6746	.7707	.8581	.9283	H.9765
1919–21[b]									
I	.9495	.9305	L.8690	.9459	.9452	1.0631	1.1035	H1.1732	1.1437
II	.9765	.9565	L.8944	.9726	.9702	1.0904	1.1318	H1.2104	1.1830
1921–24									
I	1.1437	1.0295	1.0274	.9786	L.9015	.9391	H.9690	.9232	.9453
II	1.1830	1.0676	1.0650	1.0115	L.9319	.9711	H1.0047	.9596	.9849
1924–27									
I	.9453	.9053	.8787	.8618	L.8413	.8519	.8590	.8697	H.8772
II	.9849	.9441	.9177	.9002	L.8789	.8903	.8994	.9124	H.9212
1927–32									
I	.8772	.8534	L.8238	.8245	.8278	H.8426	.8364	.8389	.8058
II	.9212	.8964	L.8656	.8660	.8694	.8893	.8919	H.9072	.8827
1932–38									
I	.8058	.7237	.7306	.7021	L.6546	.6854	.7281	H.7512	.7495
II	.8827	.7880	.7902	.7529	L.6975	.7298	.7792	.8108	H.8113

H indicates a high, L a low stage. Level of any stage not marked (except I, which is ignored because it is identical with IX of preceding cycle) is intermediate.

[a] Lines numbered I pertain to expenses excluding, and those numbered II to expenses including, depreciation.

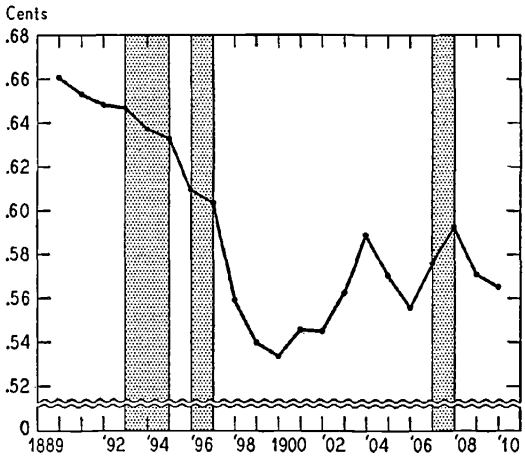
[b] The retroactive wage increases included in the accounts for June 1918 and August 1920 badly distort the reported figures for these months. In computing the averages for stages V and VI of 1914–19 and VII of 1919–21 we substituted hypothetical figures. Unable to ascertain the amount of the retroactive charges, we assumed that in their absence aggregate expenses including depreciation would have equaled the average of May and July 1918 in June 1918, and the average of July and September 1920 in August 1920. From the hypothetical totals we deducted depreciation to arrive at hypothetical expenses excluding depreciation. The four aggregates thus determined were then divided by traffic units in the usual manner.

they were higher at the end of each contraction than at its beginning (Table 97). If the experience of enterprises in other industries was like that of the railroad industry, cost per unit of

sales at the beginning of a majority of contractions in the output of those industries was lower than unit cost at the preceding trough. And the cost situation was almost invariably worse at the dawn of recovery than at the preceding onset of depression.

CHART 107

Operating Expenses per Traffic Unit, 1890–1910



Shaded periods are contractions in traffic units.

Annual data pertaining to five phases before 1908–10 present a somewhat different picture. Unit cost did fall, to be sure, in the two expansions—but it fell in two contractions also, rising only in 1907–08 (Chart 107). However, in the 1895–96 expansion the decline was more rapid than in 1893–95 or 1896–97; and the decline in 1897–1907 contrasts with the rise in 1907–08. Three of four comparisons suggest inverse conformity of unit cost to traffic.

On the other hand, the net decrease over the long expansion from 1897 to 1907 proceeded at an average rate of only .0027 cents per year, less rapid than in 1896–97 (.0062 cents). Its year to year course was very irregular: a fall to 1900, a rise to 1904 (most rapid after 1902), another fall to 1906, a small rise to 1907. The Babson ton-mile estimates and the fluctuations in the annual figures for coal suggest that monthly data on traffic and on unit expense might show an accelerated decline in the latter during an expansion from 1897 to 1903, a rise during a contraction from 1903

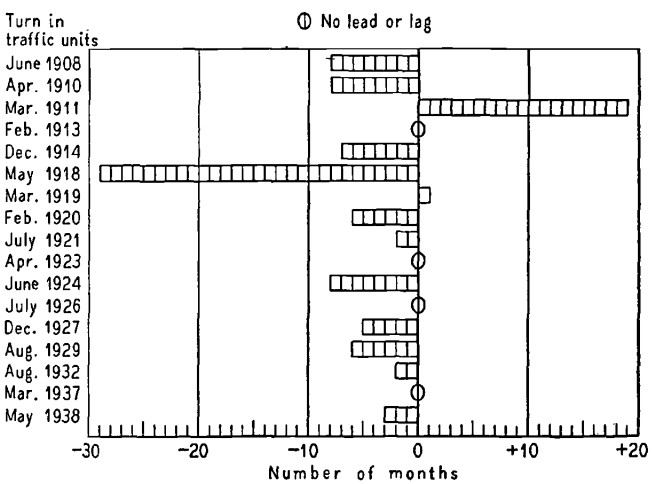
to 1904, and a net fall from 1904 to 1907. The inverse conformity would then appear unbroken from 1893 to 1908.

Is the end of expansion foreshadowed by rising costs?

Even though there is net improvement, from a managerial point of view, over an expansion as a whole, it may be concentrated in the earlier stages, and the situation may deteriorate toward the end. A late upward trend of costs may be discouraging to investment and business, whether or not it carries cost above the level that prevailed in the beginning. The expansion of 1927–29 illustrates such a state of affairs. Costs fell at first, then rose (Table 97). Conversely, even when unit expense increases over a contraction as a whole the rise might occur entirely during the early stages; later, it might be succeeded by a decline, which would be encouraging to business even if it did not bring unit cost all the way down to the level that prevailed at the end of prosperity.

CHART 108

Number of Months by which Turn in Operating Expenses (including Depreciation) per Traffic Unit Preceded (−) or Followed (+) Turn of Opposite Character in Traffic Units



If we were to consider only the dates of peaks and troughs, we would be led to conclude that unit cost commonly does rise in the latter part of an expansion, and falls in the latter part of a con-

traction. In 11 of 17 cases, a trough in cost preceded a peak in traffic units, or a peak in cost preceded a trough in traffic (Chart 108). The turns coincided in 4 instances; twice, cost continued to decline up to and after a peak in traffic.

But an economic activity or ratio, as we have noticed before, does not always change in a fairly consistent direction after it has reached its turning point. No one, to be sure, could deny that cost on the whole rose during the last two-thirds of the 1914–18, or the last half of the 1919–20 expansion. On the other hand, in 1923–24, although unit expense declined after October 1923, it turned up again before the contraction was over. In some of the cases in which the turning points in cost preceded those in traffic the interval was only 2 or 3 months. To avoid the danger of resting conclusions on the outstanding position of a single month or on short intervals we may again resort to a device employed in preceding chapters—we may examine the progressive changes in averages for the groups of months we call stages (Table 97).

Approaching the question in this way produces a somewhat different impression. In 4 of 8 expansions, the lowest cost, including depreciation, was reached in the fifth or final stage. If we had figures excluding depreciation in the earliest cycle, the score for this variant of cost would be at least as high; for, with the 1911–13 phase missing, it is 4 of 7. On either basis, costs were most favorable to management when traffic was at its highest level, in at least half of the cases. The averages for stages suggest that while in some expansions costs behave in accordance with the theory previously described, in others nothing of the kind occurs; and that neither type of expansion is appreciably more common than the other. In contractions, on the other hand, cost excluding depreciation was highest at the end stage in only two of the seven, and cost including depreciation in only 3 of the 8 end stages for which there are data. In a fair majority of instances unit expense did begin to decline before the shrinkage of traffic ended. The low stage in costs never came *after* the high stage in traffic, nor the high stage in costs after the trough stage in traffic. (Later figures indicate that cost declined after the 1938 trough.)

It may be worth noting, moreover, that the changes in later segments were, on the whole, less uniform in direction than those in the first (Table 98). Unit cost including depreciation, to be

sure, increased in the second as well as the first segment of every contraction; but it fell in one of the third and in half of the fourth segments.

Table 98
Number of Segments of Cycles in Traffic Units in which Unit Cost Increased and Number in which it Decreased

Kind of cost & direction of change	Segment of expansion				Segment of contraction			
	First	Second	Third	Fourth	First	Second	Third	Fourth
Excl. depreciation								
Increase	1	3	3	2	7	6	5	3
Decrease	6	4	4	5	0	1	2	4
Incl. depreciation								
Increase	1	3	4	3	8	8	7	4
Decrease	7	5	4	5	0	0	1	4

Most rapid fall, or rise, came early

The data presented in preceding sections suggest that, under comparable conditions as to morale of labor, quality of fuel and materials, efficiency of management, prices and wage rates paid, a large volume of traffic would always be accompanied by a unit cost lower than that which would accompany a smaller volume. If so, a substantial rise in traffic might be accompanied by some fall in cost despite unfavorable changes in the other factors mentioned. And a fall in traffic might bring a rise in unit costs despite favorable changes in those other factors. The effect of volume could mask that of morale, etc. But if the situation in these respects deteriorates more rapidly in later than in earlier stages of expansion, and improves more rapidly in later stages of contraction, one might suppose that the fall in costs in the former, and the rise in the latter, would at least be retarded. From this point of view one would expect cost in the later segments of an expansion either to rise or to fall less rapidly than in the earlier segments. In later segments of a contraction one would expect either a fall in cost or a less rapid rise than in the earlier segments.

These expectations are more or less in accordance with the data (Table 99). In 5 of 8 expansions the most rapid fall in unit cost occurred during the first segment, in 2 others it occurred during the second. In every one of our 8 contractions, the most rapid rise came in the first segment.

The tendency of cost to fall at a diminished rate, or even to rise, as expansion progresses, and to rise at a diminished rate, or even to fall as contraction proceeds, was most noticeable in the second segment. As we pass from the second to the third, or the third to the fourth segment, we find it in a narrower majority of our 8 cycles, or even in a minority (Table 100).

Table 99
Operating Expenses per Traffic Unit
Change per Month during Segments of Cycles in Traffic Units, 1908–1938
(Cents per month)

Cycle, & kind of expense[a]	Segment of expansion				Segment of contraction			
	First	Second	Third	Fourth	First	Second	Third	Fourth
1908–11								
II	−.0002	−.0012	.0028	.0042	.0044	.0033	.0002	−.0047
1911–14								
I	.0001	.0010	−.0011	−.0057	.0083	.0005	−.0000[b]	−.0031
II	.0001	.0011	−.0010	−.0058	.0088	.0009	.0004	−.0027
1914–19								
I	−.0048	.0006	.0053	.0062	.0474	.0286	.0229	.0231
II	−.0050	.0005	.0053	.0060	.0480	.0291	.0234	.0241
1919–21								
I	−.0095	−.0176	.0220	−.0004	.0393	.0073	.0127	−.0098
II	−.0100	−.0177	.0223	−.0012	.0401	.0075	.0143	−.0091
1921–24								
I	−.0286	−.0003	−.0075	−.0193	.0150	.0066	−.0102	.0088
II	−.0288	−.0004	−.0082	−.0199	.0157	.0075	−.0100	.0101
1924–27								
I	−.0089	−.0033	−.0021	−.0046	.0035	.0013	.0019	.0025
II	−.0091	−.0033	−.0022	−.0047	.0038	.0017	.0024	.0029
1927–32								
I	−.0068	−.0046	.0001	.0009	.0023	−.0005	.0002	−.0051
II	−.0071	−.0047	.0001	.0010	.0031	.0002	.0013	−.0038
1932–38								
I	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
II	−.0100	.0001	−.0021	−.0058	.0129	.0110	.0070	.0002

Computed from data in Table 97.
[a] Lines numbered I pertain to expenses excluding, and those numbered II to expenses including, depreciation.
[b] Negative but [illegible] greater than −.00005.

Certainly the changes in cost toward the very end of expansion bore little resemblance to the sharp rises so characteristic of the first segment of contraction (Table 99). In 5 instances the rising costs in the latter succeeded falling costs in the last segment of

expansion. In the other 3, although cost was already rising before the turning stage the rate of rise was accelerated after it. The effect on cost of the passage from contraction to expansion was almost equally marked. In 3 cases rising costs in the last segment of contraction were followed by falling costs in segment one of expansion. In 3 others, a decline that had already begun was accelerated. We find only 1 instance (there are 7 in all) of anything else: a fall, then a rise in 1911.

Table 100
Unit Cost: Summary of Changes from Segment to Segment of Phases in Traffic Units

Number of expansions in which unit cost:	
In second segment, rose, or fell less rapidly than in first	6
In third segment, rose, or fell less rapidly than in second	5
In fourth segment, rose, or fell less rapidly than in third	3
Number of contractions in which unit cost:	
In second segment, fell, or rose less rapidly than in first	8
In third segment, fell, or rose less rapidly than in second	5
In fourth segment, fell, or rose less rapidly than in third	5

Derived from Table 99.

Conclusions similar for traffic and reference cycles

The reasoning that leads to the expectation of rising costs in late expansion and falling costs in late contraction applies in some respects to cycles in business at large rather than to those in the output of specific industries. Our files contain data on the relative levels of unit operating expense including depreciation during stages of the Burns-Mitchell reference phases, and on relative rates of change during segments of those phases. The conclusions to which they lead are similar, on the whole, to those we have drawn from the traffic-cycle averages. There was a net fall in cost during 5 of 8 reference expansions, a net rise in 7 of 8 contractions. The direction of change was more consistent in early than in late segments, but there was no consistent reversal of direction (Table 101). The most rapid change in the characteristic direction came early. The tendency of change to reverse itself *or* taper off, however, was somewhat more persistent in reference than in traffic phases.[3]

[3] Computations based on reference cycles are less pertinent to the problems discussed in the following sections, and are therefore not presented.

Equal changes in traffic accompanied by larger changes in cost in earlier stages

The foregoing discussion suggests that the influence of changes in other factors did not modify that of changes in volume in any very consistent manner toward the end of phases. But traffic itself does not rise (or fall) by the same amount per month in every stage, and uneven changes in volume may explain the lack of consistency. Instead of dividing the change in unit expense by the time elapsed during a segment we may divide it by the change in traffic units. Such computations tell us whether the changes in cost that corresponded to successive equal increments of traffic followed any consistent pattern.

Table 101
Operating Expenses, including Depreciation, per Traffic Unit
Change during Segments of Reference Cycles

	Segment of expansion				Segment of contraction			
	First	Second	Third	Fourth	First	Second	Third	Fourth
Number of cycles for which data are available	8	8	8	8	8	9	9	9
Number in which unit cost:								
Fell	7	4	5	4	0	0	5	4
Did not change	1	0	0	0	0	1	1	1
Rose	0	4	3	4	8	8	3	4
Fell more rapidly than in any other segment of same expansion	5	1	1	1	...	...	...	...
Rose more rapidly than in any other segment of same contraction[a]	...	...	...	...	5[b]	1	0	1[b]
Rose, or fell less rapidly than in preceding segment of same expansion	...	7	5	7	...	...	...	...
Fell, or rose less rapidly than in preceding segment of same contraction	...	...	...	...	...	6[a]	9	5

[a] Since there are no data on the first segment of the 1907–08 contraction, only 8, not 9, comparisons are possible.
[b] In addition, rate of rise was same in first and fourth, but higher than in second or third segment of 1910–11.

The outcome, in a general way, is like that of the previous calculations. In all expansions except one, the fall in unit cost, per billion units of growth in traffic, was greatest in either the first or the second segment; and in all contractions the rise in unit

Table 102

Operating Expenses per Traffic Unit

Change per Billion-unit Change in Aggregate Traffic Units during Segments of Cycles in Traffic Units

(Cents)

Cycle & kind of expense[a]	Segment of expansion				Segment of contraction			
	First	Second	Third	Fourth	First	Second	Third	Fourth
1908–11								
II	−.0007	−.0066	.0093	.0144	.0226	.0195	.0175	−.0285
1911–14								
I	.0019	.0075	−.0033	−.0102	.0240	.0036	−.0001	−.0102
II	.0011	.0078	−.0031	−.0103	.0254	.0060	.0016	−.0088
1914–19								
I	−.0102	.0017	.0170	.0094	.0398	.0445	.0393	.0193
II	−.0106	.0015	.0169	.0090	.0404	.0453	.0401	.0202
1919–21								
I	−.0114	−.0250	[b]	−.0002	.0621	.5050	.0074	−.0206
II	−.0120	−.0252	[b]	−.0006	.0633	.5175	.0084	−.0192
1921–24								
I	−.0872	−.0041	−.0074	−.0176	.0267	.0092	[c]	.0083
II	−.0881	−.0051	−.0081	−.0182	.0278	.0103	[c]	.0095
1924–27								
I	−.0197	−.0175	−.0097	−.0114	.0294	.0062	.0061	.0068
II	−.0201	−.0174	−.0101	−.0118	.0317	.0080	.0074	.0080
1927–32								
I	−.0267	−.0172	.0011	.0275	.0036	−.0009	.0003	−.0083
II	−.0279	−.0179	.0006	.0283	.0048	.0004	.0019	−.0061
1932–38								
I	−.0265	.0030	−.0051	−.0081	.0268	.0106	.0052	−.0018
II	−.0305	.0010	−.0067	−.0095	.0281	.0123	.0071	.0005

[a] Lines numbered I pertain to expenses excluding, and those numbered II to expenses including depreciation.

[b] Traffic diminished. [c] Traffic increased.

Table 103

Unit Cost: Change per Billion-unit Change in Traffic

Summary of Comparisons between Segments of Cycles in Traffic Units

Number of expansions in which change in unit cost, per billion-unit increase in traffic:	
In second segment, was a rise, or a smaller fall than in first	6 (of 8)
In third segment, was a rise, or a smaller fall than in second	4 (of 7)
In fourth segment, was a rise, or a smaller fall than in third	3 (of 7)
Number of contractions in which change in unit cost, per billion-unit decrease in traffic:	
In second segment, was a fall, or a smaller rise than in first	6 (of 8)
In third segment, was a fall, or a smaller rise than in second	6 (of 7)
In fourth segment, was a fall, or a smaller rise than in third	6 (of 7)

Derived from Table 102.

cost, per billion units of traffic lost, was greatest in one or the other of the first two segments (Table 102).

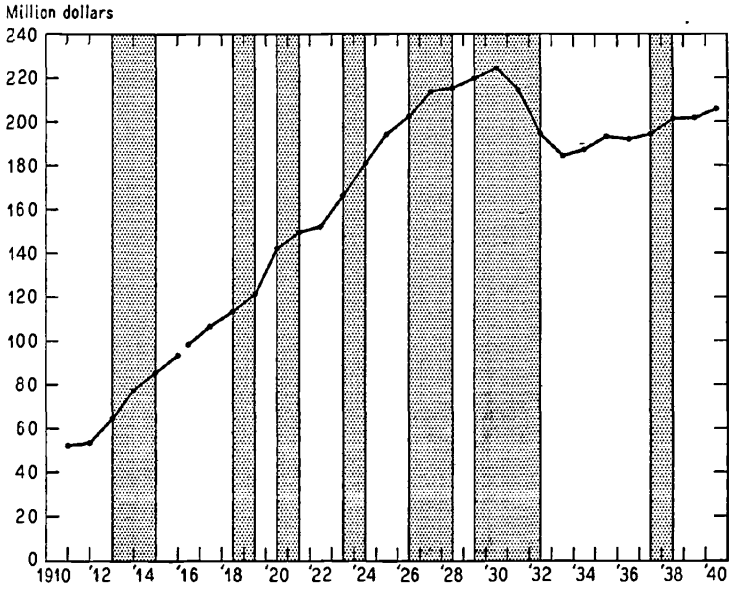
Evidence of tapering off in expansion once more emerges less frequently from later measurements. In contractions, however, falling costs, or smaller rises per billion units of traffic shrinkage, were at least as common in the third and fourth segments as in the second (Table 103).

Effect of depreciation

The foregoing sections reveal little difference between cost excluding and including depreciation. The addition of an allowance for the gradual consumption of durable items of investment did, however, somewhat affect the intensity of cyclical fluctuations in operating expense.

CHART 109

Aggregate Depreciation, 1911–1940



Shaded periods are contractions in traffic units.

Aggregate depreciation was insensitive to cyclical influences. The annual charges rose continuously from 1911 to 1930, declined to 1933, then rose again except for a very slight dip in 1936 (Chart 109). The monthly figures in our worksheets convey practically

the same impression (before 1933 this is a more or less automatic consequence of our methods of estimate). Contraction did not consistently retard the rate of growth, nor, for that matter, did it quicken the increase. Comparisons of adjoining phases indicate inverse conformity in only a slight majority of cases (Table 104).

Table 104
Aggregate Depreciation
Change per Month between Peaks and Troughs in Traffic Units, 1911–1938

Turn in traffic units		Months from prec. date	Depreciation[a]	Change from preceding date			Conformity suggested[b]
				Total	Per month		
Date	Level				To peak from trough	To trough from peak	
			(thousands of dollars)				
Mar. 1911	Trough	...	4,371	...	...	...	...
Feb. 1913	Peak	23	5,504	1,133	49	...	...
Dec. 1914	Trough	22	7,096	1,592	...	72	Inverse
May 1918	Peak	41	9,358	2,262	55	...	Inverse
Mar. 1919	Trough	10	9,912	554	...	55	None
Feb. 1920	Peak	11	11,193	1,281	116	...	Positive
July 1921	Trough	17	12,514	1,321	...	78	Positive
Apr. 1923	Peak	21	13,614	1,100	52	...	Inverse
June 1924	Trough	14	15,037	1,423	...	102	Inverse
July 1926	Peak	25	16,911	1,874	75	...	Inverse
Dec. 1927	Trough	17	17,868	957	...	56	Positive
Aug. 1929	Peak	20	18,325	457	23	...	Inverse
Aug. 1932	Trough	36	16,128	−2,197	...	−61	Positive
Mar. 1937	Peak	55	16,244	116	2	...	Positive
May 1938	Trough	14	16,826	582	...	42	Inverse

[a] Three-month average; date of turn is middle month.
[b] By comparison with preceding rate; e.g., 72 with 49.

Since aggregate depreciation did not regularly grow faster in expansions than in contractions of traffic, depreciation per traffic unit was likely to grow less rapidly or fall when the volume of business was rising, and to increase when it was shrinking. And in fact the charge per unit fell in every expansion but one (1911–13), rose in every contraction (Chart 110).

The percentage increase in the unit allowance for wear and tear was greater than that in other unit expense during every contraction except 1918–19 (Table 105). Consequently, cost including depreciation rose by a greater percentage, in all except one in-

CHART 110

Railway Tax Accruals, Depreciation, and Equipment and Joint Facility Rents, per Traffic Unit

Shaded periods are contractions in traffic units.

stance, than cost before an allowance for wear and tear was added. In expansions, however, the results of such comparisons vary from cycle to cycle. In 1919–20, 1921–23, and 1932–37 depreciation fell more than other costs; consequently, expense including it fell by a greater percentage than expense excluding it. But in 1924–26 and 1927–29 a lesser fall in depreciation than in other costs reduced the fall in the inclusive total. An actual rise in unit depreciation had a similar effect in 1911–13.

Table 105
Depreciation and Operating Expenses, per Traffic Unit
Percentage Net Change during Phases of Cycles in Traffic Units, 1911–1938

Cycle	1911–14	1914–19	1919–21	1921–24	1924–27	1927–32	1932–38
Expansion							
Depreciation	3.11	−18.18	−6.69	−22.39	−5.30	−5.45	−44.29
Operating expenses							
Excluding depreciation	−4.07	16.08	−0.45	−21.18	−11.00	−5.63	−18.76
Including depreciation	−3.91	14.63	−0.65	−21.23	−10.76	−5.62	−20.98
Contraction							
Depreciation	52.41	29.95	56.57	29.84	17.33	85.10	43.82
Operating expenses							
Excluding depreciation	4.49	45.21	21.00	4.86	4.27	−2.66	14.50
Including depreciation	5.92	44.75	21.93	5.69	4.81	1.53	16.32

Computed from three-month averages for peaks and troughs in traffic units. Averages for expenses are shown in Table 97.

On the other hand, in the one expansion in which cost before depreciation increased (1914–18), a fall in depreciation resulted in a smaller rise in inclusive than in exclusive costs. In 4 of 7 expansions, therefore, depreciation acted in the way one would expect an element of cost inflexible in the aggregate to act. Furthermore, the ratio of depreciation to total cost, and hence to other costs, conformed inversely to traffic in all comparisons of adjoining phases (Table 106). Although it increased in 1911–13, 1924–26, and 1927–29, the rise was less rapid than in the neighboring contractions. Apparently other than cyclical influences tended to enhance the relative importance of depreciation in both kinds of phase. They opposed the effect of rising and intensified that of falling traffic. It is difficult to tell what they were, but had they not been present, it seems likely that unit depreciation would have fallen by a greater percentage than other unit costs in these

expansions too. The growth of traffic was relatively small, and other influences could therefore more easily predominate. Traffic units increased 22 percent in 1911–13, 19 percent in 1924–26, and only 8 percent in 1927–29, whereas in 1921–23 and 1932–37, when depreciation did fall more than other costs, the increases in volume were 40 and 80 percent respectively.

Table 106
Ratio of Depreciation to Operating Expenses including Depreciation
Change per Month between Peaks and Troughs in Traffic Units, 1911–1938

Turn in traffic units		Months from prec. date	Ratio[a]	Change from preceding date		
				Total	Per month	
Date	Level				To peak from trough	To trough from peak
Mar. 1911	Trough	..	.0280	...	...	...
Feb. 1913	Peak	23	.0298	.0018	.0001	...
Dec. 1914	Trough	22	.0428	.0130	...	.0006
May 1918	Peak	41	.0278	−.0150	−.0004	...
Mar. 1919	Trough	10	.0276	−.0002	...	−.0000[b]
Feb. 1920	Peak	11	.0258	−.0018	−.0002	...
July 1921	Trough	17	.0332	.0074	...	.0004
Apr. 1923	Peak	21	.0327	−.0005	−.0000[b]	...
June 1924	Trough	14	.0402	.0075	...	.0005
July 1926	Peak	25	.0427	.0025	.0001	...
Dec. 1927	Trough	17	.0478	.0051	...	.0003
Aug. 1929	Peak	20	.0479	.0001	.0000[c]	...
Aug. 1932	Trough	36	.0871	.0392	...	.0011
Mar. 1937	Peak	55	.0615	−.0256	−.0005	...
May 1938	Trough	14	.0761	.0146	...	.0010

[a] Three-month average; date of turn is middle month.
[b] Negative but greater (algebraically) than −.00005.
[c] Positive but less than .00005.

The practice of including depreciation might be expected not only to widen the amplitude of fluctuations in unit cost but also to postpone its turning points or high and low stages. Since the aggregate charge alters rather slowly and evenly, on a per unit basis it should decline up to the end of an expansion and rise up to the end of a contraction. This was, more or less, what happened (Chart 110). As previously noted, the direction of change in other costs, on the contrary, was not infrequently reversed during a phase. In fact, however, the turning points in the two variants of cost were identical, and so, with one exception, were the high and

low stages (Table 97). This negative finding may be attributed to the relatively small importance of depreciation; even at the deep trough of August 1932 it was only 8.71 percent of all costs, and usually the percentage was considerably lower (Table 106). The exception accorded with the theoretical expectation. In 1913–14 cost before additions for consumption of capital equipment reached its highest level in stage VII, but, because of the continued growth of unit depreciation, cost including it was highest one stage later (Table 97).

Physical relations usually more important than prices paid

All operating costs may be conceived of as charges for commodities and services used in the performance of transportation. Aggregate costs are the sum of the expenses for these various items. Furthermore, one may think of the total charge for any one item as the product of an average price and the quantity of the item used. Thus expense for hourly labor may be regarded as the product of average hourly earnings and the number of hours paid for; cost of locomotive fuel as the average price per ton multiplied by the tonnage consumed. The conception may seem a little fanciful if carried rigorously through the whole range of railway outlays. Payments for accidental personal injuries of any specified kind, for example, would have to be thought of as the product of the average price for an injury of that type and the number of injuries. Nevertheless, in the main the idea makes sense.

With enough data it would be possible to compute for any period the cost per traffic unit of any kind of commodity or service. It would be equal to the total cost for the item divided by the amount of traffic. This in turn would be equal to the price of the item, multiplied by the quantity used per unit of traffic. Costs of all kinds per traffic unit would be equal to the sum of such products for all items. If we designate the quantities of the several items by q_1, q_2, q_3, etc., their prices by p_1, p_2, and so forth, and the number of traffic units by t, then total cost per traffic unit would equal

$$p_1 \frac{q_1}{t} + p_2 \frac{q_2}{t} + \cdots$$

Here the q/t items vary inversely with physical efficiency.[4] If one rises, the amount of some article or service used per traffic unit has increased—productivity of the item in terms of traffic has diminished. The p items represent wage rates and prices paid.

If there were a general rise in the q/t's from the beginning of a phase to the end, and no change in prices, total cost per traffic unit would rise. It would also rise if there were a general increase in the p items, with no change in the q/t's. Conversely, general improvements in efficiency would, by themselves, cause total cost per unit to fall, and so would general declines in prices. In fact, the change in unit costs during a phase is probably the net upshot of many somewhat conflicting changes in the individual factors. Some efficiencies improve, others deteriorate, and prices move diversely. Nevertheless it is often possible to form some judgment as to the preponderant direction of changes in efficiencies and in prices—or more exactly, rates of payment—and as to the relative importance of the two groups of factors.

In preceding chapters we have shown that the productivity of labor and fuel tends to rise in expansion and fall in contraction; in other words, that the important q/t's pertaining to them tend to fall in the former and rise in the latter. Changes in physical relations between traffic and these goods and services tend to reduce unit cost when traffic is growing and to increase it when traffic is dwindling. It seems likely that this is true of physical relations in the aggregate, especially since these two items account for about 70 percent of operating expenses excluding depreciation (Table 88, col. 8, Sec. B). On the other hand, as we have shown in Chapter 9, wage rates and prices rose in most expansions, although it is not clear that their combined total usually fell in contractions. Consequently, the influence of changes in physical relations on unit cost has usually opposed that of changes in rates of payment in expansions, although perhaps not in contractions. When they are opposed, is one commonly stronger than the other?

Since unit costs fell in 5 of 8 expansions it seems reasonable to suppose that in these cases physical relations were more important

[4] 'Efficiency' in a purely mechanical sense. It could deteriorate, as a result of diminishing traffic or other circumstances, in spite of increased diligence and intelligence on the part of management or workers.

than prices, etc. Two of the remaining phases, 1915–18 and 1919–20, were periods of sharp general rises in prices—indeed the only violently inflationary expansions covered by our data. In a serious inflation, therefore, the relative strength of the two sets of influences is likely to be reversed.

As we cannot tell in most contractions whether the $\dot{p}$ factors (including wage rates as well as prices) rose or fell on the whole, we can hardly tell whether their influence opposed that of deteriorating physical relations. But since unit costs rose in all contractions we can say with confidence that either the changes in price and wage factors reenforced those in physical factors or the former were not strong enough to prevail over the latter. In the great 1929–32 contraction we know there was a net fall in average hourly earnings as well as in prices; since unit cost nevertheless rose, it is clear that in this case declines in efficiency were more important than declines in rates of payment.

The foregoing remarks apply somewhat more realistically to cost excluding than to cost including depreciation. For in the latter case some of the pq/t's represent depreciation on various kinds of property. 'Quantity' would have to mean, for example, the number of freight cars used up, which is assumed by accounting convention to be virtually independent of fluctuations in the movement of equipment. 'Price' would mean the average value at which the rolling stock was originally entered on the books, which would often have little relation to current quotations. Consequently, fluctuations in this element of cost during any phase do not represent changes in quantities of goods physically and observably consumed or fluctuations in prices during that phase.

The effect of the accounting procedure is to make the factors in this kind of cost behave rather like those in other expenses. The quantity of equipment implicitly deemed to be used up, per unit of traffic, declines in expansion and rises in contraction. The quasi-prices are virtually averages of prices paid during the life, to date, of the oldest existing equipment, and changes in such averages during any one phase must be very mild. It seems unlikely that they conform either positively or inversely to traffic. But the quasi-physical input-output relations are the importantly variable factor, and they work toward inverse conformity of unit

costs. The three elements of cost—labor, road fuel, and depreciation—for which we know that the input-output relations are of this character comprise from 70 to 75 percent of all operating expenses including depreciation (Table 88, col. 8, Sec. C).

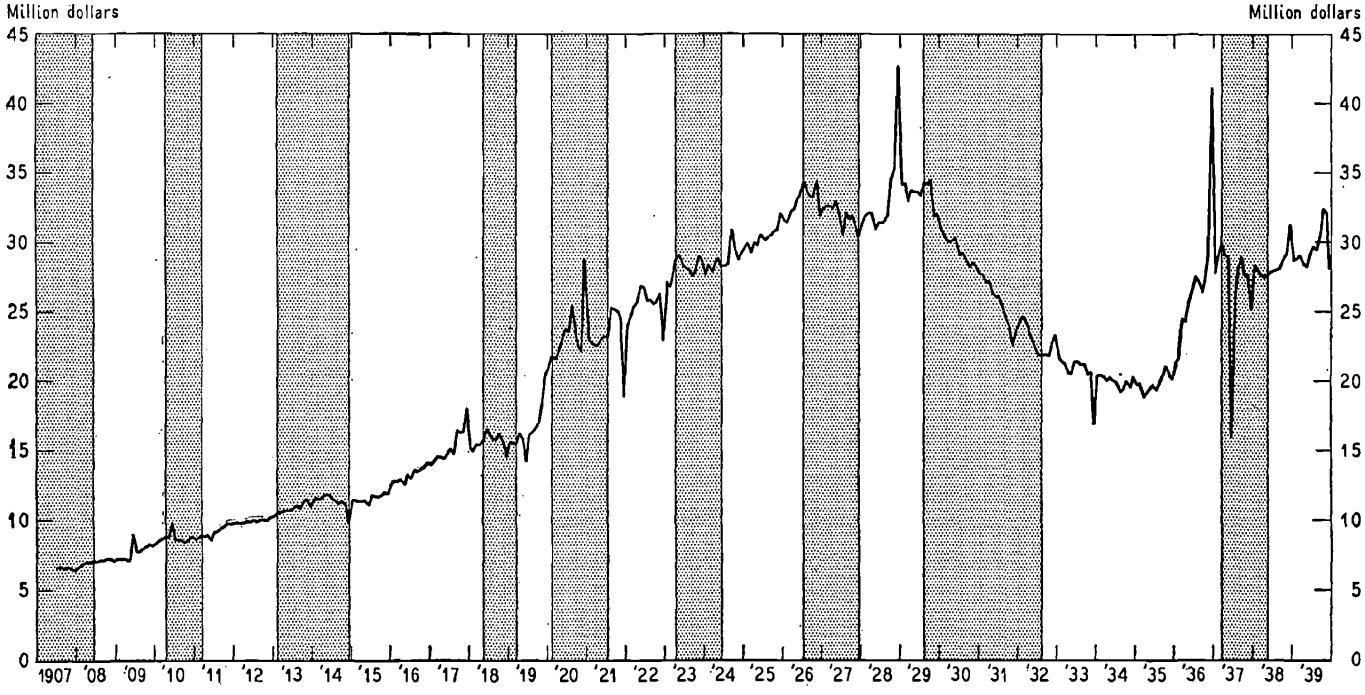
TAXES

Aggregate taxes positively related to traffic

Of the income left after payment for labor and materials and charges for depreciation, the railroad companies must contribute a large fraction to federal, state, and local governments. Some of the most important kinds of taxes are billed to them only once a year, or are levied on the business of a year as a whole. But if railway accountants are to prepare monthly statements of net earnings, they must allow something every month for payments to the government. For payroll taxes this does not present much of a problem. Taxable wages can be ascertained after the close of each month, but before the accounts for that month are prepared, and the rates applied to them. Property, income, and some less important taxes, however, make trouble. A fraction of an annual sum must be apportioned to each month although the total cannot be determined accurately until the year has ended. Assessors may change the valuation of property or legislators the rate applicable to it. Income taxes present an even harder problem; earnings for a year are much more difficult to predict than the probable valuation of property. The amount of profit is uncertain as well as the rate of tax, which may change after the beginning or even the end of the year. For example, the federal corporate income tax rate applicable to 1921 was not enacted until November 23. The act of February 26, 1926 raised the rate applicable to 1925 income from $12\frac{1}{2}$ (the rate which prevailed in 1924) to 13 percent. For these and other reasons, monthly tax accruals near the beginning of a year are very crude guesses. As the months go by, fuller information becomes available. It looks as though the accountants tend to be pessimistic about the size of the tax burden to be imposed on their companies, for in the figures before seasonal adjustment, accruals usually decline steeply in November and December. Apparently the rate of accrual on the books is cut sharply to make up for over-allowances earlier in

CHART 111

Railway Tax Accruals, July 1907—December 1939



Shaded periods are contractions in traffic units.

the year. Our process of seasonal adjustment greatly reduces these year-end corrections, but since they vary erratically from year to year, even the seasonally adjusted data we present in Chart 111 show an occasional dagger-like projection. At times, when the year-end revision was small, or involved raising instead of lowering expectations, the dagger points upward. Special circumstances may occasionally lead to wild fluctuations. Changing prospects concerning the necessity for ultimate payment of retirement taxes seem to account for the sharp increase in aggregate taxes at the end of 1936, and certainly explain the downward-pointing needle in June 1937.

Table 107
Railway Tax Accruals
Change per Month between Peaks and Troughs in Traffic Units, 1908–1938

Turn in traffic units		Months from [prec. date	Tax accruals†	Change from preceding date		
				Total	Per month	
Date	Level				To peak from trough	To trough from peak
			(millions of dollars)			
June 1908	Trough	..	7.0	...	...	...
Apr. 1910	Peak	22	8.7	1.7	.08	...
Mar. 1911	Trough	11	8.8	0.1	...	.01
Feb. 1913	Peak	23	10.5	1.7	.07	...
Dec. 1914	Trough	22	10.8	0.3	...	.01
May 1918	Peak	41	15.9	5.1	.12	...
Mar. 1919	Trough	10	15.7	−0.2	...	−.02
Feb. 1920	Peak	11	21.5	5.8	.53	...
July 1921	Trough	17	23.9	2.4	...	.14
Apr. 1923	Peak	21	28.5	4.6	.22	...
June 1924	Trough	14	28.5	0.0	...	.00
July 1926	Peak	25	33.7	5.2	.21	...
Dec. 1927	Trough	17	31.0	−2.7	...	−.16
Aug. 1929	Peak	20	33.9	2.9	.14	...
Aug. 1932	Trough	36	21.9	−12.0	...	−.33
Mar. 1937	Peak	55	29.3	7.4	.13	...
May 1938	Trough	14	27.7	−1.6	...	−.11

† Three-month average; date of turn is middle month.

Another striking feature of Chart 111 is the growth of taxes over a number of cycles from 1907 to 1929—much greater than the growth of traffic or revenue in the same long period. At the beginning the monthly contribution to public revenue was about

$7,000,000, at the end $33,000,000. The main reason, of course, was the tremendous broadening of the functions of government. The rise in the general level of salaries and prices, however, would probably have led to a more rapid rise in railway taxes than in traffic, even if there had been no broadening of functions.

Partly because of erratic adjustments and partly because of rising trend we feel unable to mark off cyclical peaks and troughs in taxes. Consequently, we cannot say that taxes vary in cycles corresponding to those in traffic units. But we can determine whether they conform to the cycles in traffic. They rose in every expansion, but rose in three contractions also, remained unchanged in one, and declined in four. Even when they rose in contraction, however, they never did so as rapidly as in the adjacent expansions. There was complete positive conformity from 1908 onward (Table 107).

Cyclical differences among kinds of taxes

This regular relationship is the upshot of variations in the several types of impost, which have dissimilar fluctuations. Available statistics permit us to divide them, over a long period, into three major classes: federal taxes (except those on payrolls), state taxes (except those on payrolls but including imposts levied by towns, counties, and other political subdivisions), and payroll taxes. As there are no monthly data on these individual categories until the 1930's, we must confine our examination to annual figures.

Before the federal government imposed a corporate income tax in 1909 (then called an excise), practically all railway contributions were paid to the states and their subdivisions. Despite the later growth of federal and payroll levies, state taxes remained larger than the others (Chart 112).[5]

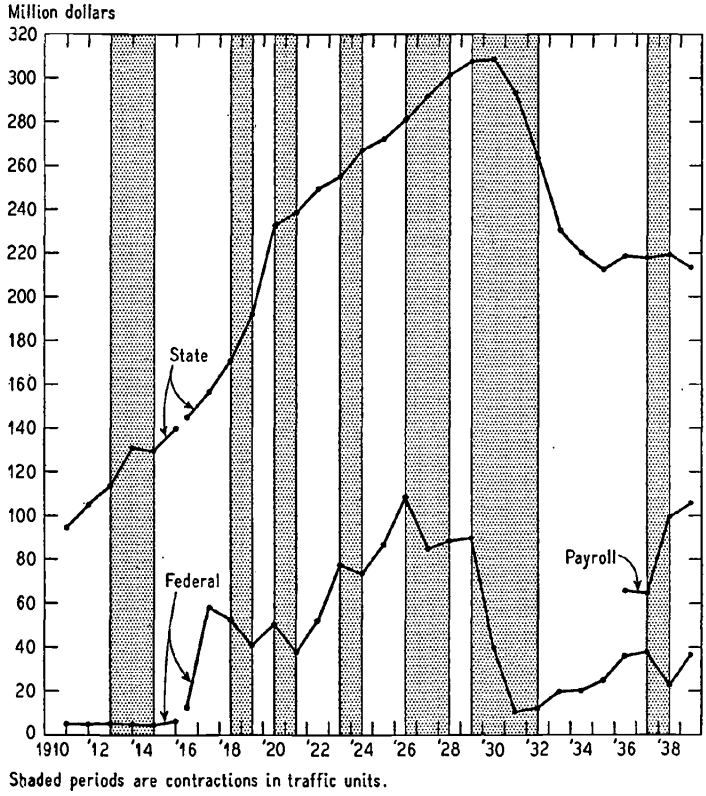
Except for slight declines from 1895 to 1896 and from 1914 to 1915, state taxes increased every year from 1890 to 1930 (Charts 112, 113). They grew not only in every expansion except 1932–37, but also in every contraction except 1929–32. Our usual method of computation indicates little conformity to cycles in traffic. Eleven comparisons suggest inverse, seven positive conformity (Table 108). It is not likely that monthly figures would yield a more consistent score. For state taxes are composed largely of

[5] Data, except for federal taxes 1913–16, pertain to Class I line-haul roads.

property taxes (Table 109),[6] and neither the rates nor the valuation change from month to month. Charges in the income accounts represent merely a distribution by railway accountants of annual levies.

CHART 112

State, Federal, and Payroll Taxes, 1911–1939



Shaded periods are contractions in traffic units.

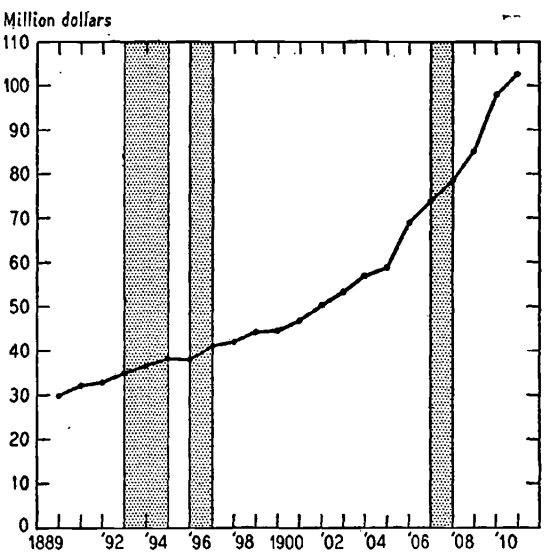
It should not be inferred from the poor showing of conformity that state lawmakers and assessors are wholly unresponsive to business conditions or changes in the fortunes of the railroads. Of the two interruptions in the period of growth ending in 1930,

[6] Data similar to those in the table are not available for more recent years than 1916. However, the Bureau of Railway Economics made a special study (*Railway Taxation*, Washington, D. C., 1934) in which it obtained "nearly complete" data for 1930 or 1931 pertaining to 41 states and the District of Columbia. It found that taxes on rolling stock and other property amounted to 83 percent of all the state taxes reported.

one coincided with the last year of a contraction in business and revenue. After 1930 state taxes declined sharply; the decline continued past the 1933 trough in income through 1935. Although the following rise continued not only through the peak year 1937 but also through the depression year 1938, taxes turned downward slightly in 1939. The legislative and administrative processes necessary for revision are slow. By the time action can be taken, the occasion for it, except as a matter of retroactive justice, may have passed. Thus a brief and mild contraction may bring no adjustment, while a severe and prolonged decline may eventually lighten the burden. Once rates and valuations have been reduced, some time may elapse before they are again revised upward.[7]

CHART 113

Railway Tax Accruals, 1890–1911



Shaded periods are contractions in traffic units.

[7] The continuation from 1932 to 1935 of the decline that began after 1930 should probably not be interpreted merely as a delayed governmental response to the contraction of 1929–32. In the first place, there were minor declines in traffic during the early years of the 1932–37 expansion. In the second, after contraction gave way to intermittent expansion it became clearer that the railroads were suffering from something more than business depression, namely, a loss of competitive position. The readjustments after 1932 may represent increasing recognition of this fact by the fiscal authorities.

Table 108
State Taxes
Change per Year between Peaks and Troughs in Traffic Units, 1893–1938

Turn in traffic units		Years from prec. date	Taxes	Change from preceding date		
				Total	Per year	
Date	Level				To peak from trough	To trough from peak
			(millions of dollars)			
1893	Peak	..	35.1	...	...	...
1895	Trough	2	38.1	3.0	...	1.5
1896	Peak	1	38.0	−0.1	−0.1	...
1897	Trough	1	41.1	3.1	...	3.1
1907	Peak	10	73.7	32.6	3.3	...
1908	Trough	1	78.7	5.0	...	5.0
1913	Peak	5	117.9†	39.2	7.8	...
1915	Trough	2	134.2†	16.3	...	8.2
1913	Peak	..	113.7	...	...	...
1915	Trough	2	129.6	15.9	...	8.0
1918	Peak	3.5	170.9	41.3	11.8	...
1919	Trough	1	191.8	20.9	...	20.9
1920	Peak	1	232.3	40.5	40.5	...
1921	Trough	1	238.6	6.3	...	6.3
1923	Peak	2	254.9	16.3	8.2	...
1924	Trough	1	267.0	12.1	...	12.1
1926	Peak	2	280.7	13.7	6.8	...
1928	Trough	2	301.4	20.7	...	10.4
1929	Peak	1	307.2	5.8	5.8	...
1932	Trough	3	263.2	−44.0	...	−14.7
1937	Peak	5	217.9	−45.3	−9.1	...
1938	Trough	1	219.2	1.3	...	1.3

Figures in the 1893–1915 section pertain to all line-haul roads. All taxes assumed to be state taxes, 1893–1908.

Figures in the 1913–38 section pertain to Class I line-haul roads only. Small amounts paid to foreign governments or not allocable by taxing jurisdictions included, 1918–38.

† Estimated by applying to total for Classes I and II the ratio, in 1912 (1.0065), of (I + II + III) to (I + II).

On the other hand, the sharp fluctuations in federal taxes conformed positively to cycles in traffic. Since they began to be important they have always risen in expansion and fallen in contraction.[8] The marked and regular fluctuation reflects the predominance of income taxes (Table 110). All other types were a small part of the total even in years when income tax accruals were

[8] Satisfactory data on federal taxes of Class I roads alone are not available before calendar year 1916. Accordingly, those shown on Chart 112 pertain to all line-haul roads. Since traffic of the latter did not contract in 1911 we present no data for years before 1911. None of the earlier figures exceeded $5,000,000.

low. Total federal taxes therefore fluctuate in much the same way as income taxes. But the base on which the latter are imposed of course rises and falls with profits, which, as we shall demonstrate, are usually related positively to the volume of railway business.

Table 109
State Taxes, Property and Total, 1901–1916 (thousands of dollars)

Year ended June 30	Ad valorem real & personal property (1)	Total taxes and assessments (2)	% property (1) ÷ (2) × 100 (3)
1901	34,575	49,726	69.5
1902	37,337	53,193	70.2
1903	40,120	57,798	69.4
1904	43,410	61,658	70.4
1905	46,159	63,325	72.9
1906	54,261	74,602	72.7
1907	60,586	80,108	75.6
1908	64,702	84,564	76.5
1909	70,778	90,334	78.4
1910	78,176	99,423	78.6
1911	72,935	94,080	77.5
1912	82,797	104,803	79.0
1913	87,901	113,661	77.3
1914	99,488	130,795	76.1
1915	102,216	129,618	78.9
1916	109,928	139,559	78.8

All roads, 1901–08; all line-haul roads, 1909–10; Class I line-haul roads, 1911–16.

Table 110
Federal Taxes, 1933–1942 (millions of dollars)

Year	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942
Income taxes	12.7	14.3	18.9	30.7	32.0	18.9	32.8	59.9	173.8	755.1
All other federal taxes†	6.6	5.5	5.8	5.0	5.1	3.5	4.1	5.1	11.4	24.5
Total federal taxes†	19.3	19.8	24.7	35.7	37.1	22.4	36.9	65.0	185.2	779.6

Class I line-haul railways.
† Except payroll taxes.

It is too early to examine statistically the cyclical variation in payroll taxes. They did not exist at the beginning of the 1932–37 expansion. The first attempt to provide funds for the retirement of elderly railroad workers was a levy of 4 percent on payrolls, effective August 1, 1934. Some companies, if not all, entered such taxes in the accounts from that month through March 1935. But early in May the law was declared unconstitutional; minus entries

were made for April and other months of 1935.[9] On January 1, 1936 railroads, like other employers, became subject to a tax of 1 percent, the proceeds of which were to be used for unemployment compensation. Beginning March 1 a new retirement tax was imposed. Although the railways contested this law also in the courts, and made few actual payments under it, accruals jumped. On January 1, 1937 the employment tax became 2 percent.

During the contraction of 1937–38 social security imposts were still in flux. Taxes at the rate of $3\frac{1}{2}$ percent on 1936 payrolls were forgiven, and so were those in excess of $2\frac{3}{4}$ percent on 1937 wages, which became the rate under superseding legislation. The remissions led to large negative accruals in the June 1937 accounts. On January 1, 1938 the unemployment tax rose to 3 percent.

Since the traffic trough in 1938 there have been further changes. The retirement levy rose to 3 percent in 1940, $3\frac{1}{4}$ in 1943, $3\frac{1}{2}$ in 1946, $5\frac{3}{4}$ in 1947. It is to be 6 percent in 1949 and $6\frac{1}{4}$ after 1951. The unemployment tax, however, has remained at 3 percent.[10] Unless the rates are revised by new laws, total payroll taxes due from the railroads will amount to approximately $9\frac{1}{4}$ percent of wages. They will regularly rise and fall with traffic, as total wages do, and should fluctuate by a smaller percentage than other federal taxes, since payrolls are less unstable than profits.

[9] Neither the tentative accruals nor the reversals got into the annually reported totals. Consequently no payroll taxes are shown for 1934 or 1935 on Chart 112.

[10] Sources of information on payroll taxes:

For retirement: Railroad Retirement Act of 1934, approved June 27, Section 5. *Railroad Retirement Board et al. vs. Alton Railroad Company et al.*, decided May 6, 1935 (295 US 330). An Act to Levy an Excise Tax on Carriers and an Income Tax on their Employees, and for other Purposes, approved August 29, 1935, Section 4. Carriers Taxing Act of 1937, approved June 29, Section 11. *Annual Report, Railroad Retirement Board, 1940*, p. 13; *1941*, p. 138; *1944*, p. 13; and its *Monthly Review*, Aug. 1946, p. 128. Public Law 572, approved July 31, 1946.

For unemployment: Social Security Act, approved August 14, 1935, title IX. Railroad Unemployment Insurance Act (transferring administration of unemployment benefits for railroad workers from the Social Security Board and the states to the Retirement Board), approved June 25, 1938. *Annual Report, Secretary of the Treasury, 1938*, pp. 171–2; *1939*, p. 157. *Annual Report, Railroad Retirement Board*, as above.

Under all the retirement legislation, taxes at the same rates were levied on workers, except that under the 1934 law they were required to pay only 2 percent.

Under the Social Security Act any excess over $3,000 per employee per year, and under the retirement and railroad unemployment laws any over $300 per month, was not taxed.

Taxes less variable than traffic

Although taxes always rose with traffic, more often than not the rise in the former was less rapid than that in the latter. In 6 of 8 expansions for which we have monthly figures, there was a net decline in taxes per traffic unit (Table 111), although the change during the phase was often quite irregular (Chart 110). In the other 2, the rise was less rapid than in the neighboring contractions. And although taxes sometimes fell with volume, they never fell as much. In the 4 contractions in which aggregate taxes declined, the reduction did not equal the fall in traffic; taxes per unit rose anyway. In the 3 contractions in which aggregate taxes increased and in the one in which they were unchanged, taxes per traffic unit of course increased. On the whole there was less cyclical variation in the contribution of the railroads to government than in the movement of freight and passengers.

Annual figures for cycles before 1908–11 point to a similar con-

Table 111
Railway Tax Accruals per Traffic Unit
Change per Month between Peaks and Troughs in Traffic Units, 1908-1938

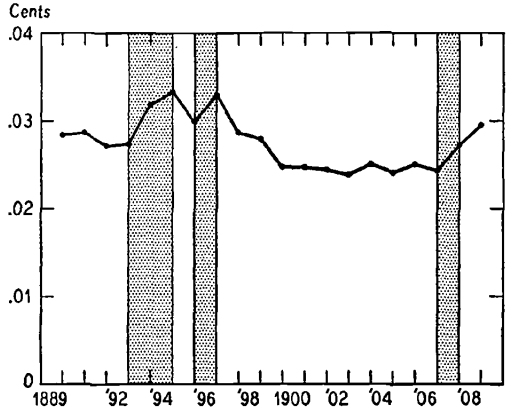
Turn in traffic units		Months from prec. date	Taxes per traffic unit[a]	Change from preceding date		
					Per month	
Date	Level			Total	To peak from trough	To trough from peak
June 1908	Trough		.0311	...		
Apr. 1910	Peak		.0305	−.0006		
Mar. 1911	Trough		.0325	.0020		
Feb. 1913	Peak		.0315	−.0010		
Dec. 1914	Trough		.0385	.0070		
May 1918	Peak		.0351	−.0034		
Mar. 1919	Trough	10	.0427	.0076	...	.0008
Feb. 1920	Peak	11	.0481	.0054	.0005	...
July 1921	Trough	17	.0750	.0269	...	.0016
Apr. 1923	Peak		.0637	−.0113		
June 1924	Trough		.0751	.0114		
July 1926	Peak		.0748	−.0003		
Dec. 1927	Trough	17	.0761	.0013	...	.0001
Aug. 1929	Peak	20	.0770	.0009	.0000[b]	...
Aug. 1932	Trough	36	.1045	.0275	...	.0008
Mar. 1937	Peak		.0774	−.0271		
May 1938	Trough		.1015	.0241		

[a] Three-month average; date of turn is middle month.
[b] Positive but less than .00005.

clusion (Chart 114). The unit burden of taxes was lightened in every expansion, became heavier in every contraction from 1893 to 1908.

CHART 114

Railway Tax Accruals per Traffic Unit, 1890–1909



Shaded periods are contractions in traffic units.

EQUIPMENT AND JOINT FACILITY RENTS

What they are

A railroad company ordinarily uses some freight cars which it does not own, in addition to those it does. To avoid the expense and delay of transferring goods from car to car, it was arranged long ago that a carlot shipment destined for transportation over more than one road should normally go through to its final destination in the vehicle into which it was initially loaded. Sometimes a car belonging to the railroad on which the shipment originates is used, sometimes a 'foreign' car which the originating line wants to return to its owner. Each company must pay others a standard daily rent for the use of their cars on its lines.[11] Much traffic, however, moves in equipment that does not belong to any railroad, but to shippers or to enterprises that make a business of furnishing cars. (The capital stock of some is jointly owned by two or more railroads.) The railways must pay for the use of these

[11] From November 1, 1920 through January 31, 1945, this 'per diem' charge was one dollar per car per day. 268 ICC 659, 664.

freight cars also, usually a specified amount per mile of travel. Less frequently, a railroad uses passenger cars or locomotives belonging to others. Payments for the use of rolling stock are called equipment rents.[12]

In many places two or more railroad companies make joint use of fixed facilities. Often one of the users is also the owner. For example, the New Haven operates trains into and out of New York City over tracks and through stations owned and used by the New York Central. Payments to the owner are called joint facility rents.[13]

Rents payable by Class I railways go partly to other Class I lines, partly to railroads not in the Class I category, and partly to nonrailroad owners such as the private car companies. Our figures are net; in their computation receipts by Class I from Class I cancel payments by Class I to Class I. The national totals represent the excess of payments by Class I to non-Class I roads and to private owners over receipts from the same two sources. On a monthly basis they are not available before January 1917.

Rents less variable than traffic

From then until 1931 aggregate charges rose fairly steadily, and few if any cycles corresponding to those in traffic are readily discernible (Chart 115). There was a net rise in every expansion, however, and a net fall in three contractions, 1918–19, 1929–32, and 1937–38. In two, 1923–24 and 1926–27, the rise was less rapid than in the neighboring expansions. Only in 1920–21 did rents rise more rapidly than in the adjoining phases (Table 112). On the whole aggregate rents conformed positively to the cycles in traffic.

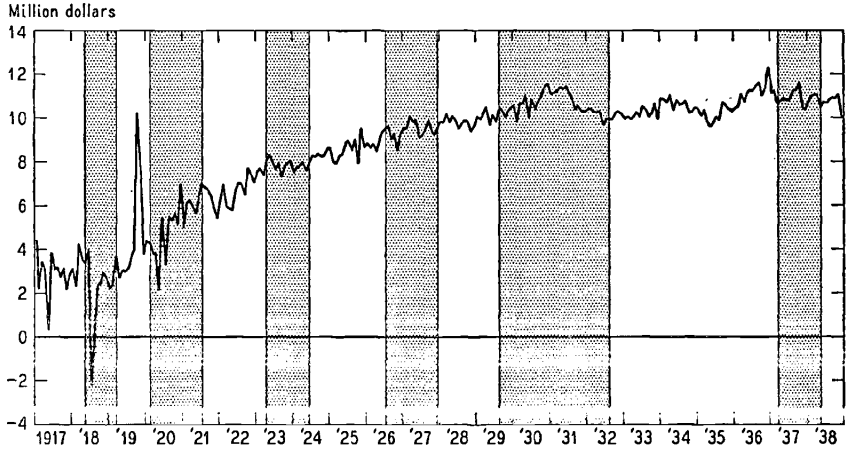
But they tended to fluctuate less than the volume of railway business. In every contraction except 1918–19, there was a readily apparent rise in rent per traffic unit (Chart 110). There was a net fall in three of five expansions (Table 113). Although aggregate rent conformed positively to traffic, rent per traffic unit conformed inversely, with one exception.

[12] Payments for the use of equipment leased for a year or longer are not included.
[13] The uniform system of accounts draws a distinction between the amounts that cover a share of the expense incurred by the owner in operating the facilities and amounts that may be regarded as pure rent. The former are included in operating expenses of the lessor-user, and only the latter in the figures discussed here.

The tendency of unit rent to vary inversely with physical volume is largely explained by changes in the composition of the latter. More rent is paid for freight cars than for fixed facilities and other equipment; and most of the freight car rent is paid for equipment used to carry perishable foodstuffs or petroleum and its products. In 1942 (there are no figures for earlier years) owners of cars rented to railroads received $75,000,000 for the use of refrigerator cars, $73,000,000 for petroleum and tank cars (an abnormally high figure, however), and only $7,000,000 for all other freight cars. Both kinds of traffic tend to grow less in expansions and diminish less in contractions than freight traffic in general. Fluctuations in the movement of the cars containing them, and in the payments made for their use, must likewise be mild. When aggregate rents, most of which are paid in connection with perishables and oil, are divided by total traffic units, the charge per unit is likely to be related inversely to cycles in aggregate traffic.

CHART 115

Equipment and Joint Facility Rents, January 1917—December 1938



Shaded periods are contractions in traffic units.

Although unit rent tended to fall with growing traffic, no expansion reduced the figure as much as the preceding contraction raised it. At every peak since 1918, it exceeded its level at the preceding peak. Changes in the composition of traffic help to explain this feature of its history also. Except from 1918 to 1920,

Table 112

Aggregate Equipment and Joint Facility Rents

Change per Month between Peaks and Troughs in Traffic Units, 1918–1938.

Turn in traffic units		Months from prec. date	Aggregate rents[a]	Change in aggregate		
				Total	Per month	
Date	Level				To peak from trough	To trough from peak
			(millions of dollars)			
May 1918	Peak	..	3.62	...	...	...
Mar. 1919	Trough	10	2.92	−.70	...	−.07
Feb. 1920	Peak	11	4.14	1.22	.11	...
July 1921	Trough	17	6.69	2.55	...	.15
Apr. 1923	Peak	21	7.90	1.21	.06	...
June 1924	Trough	14	7.94	.04	...	.00[b]
July 1926	Peak	13	9.52	1.58	.12	...
Dec. 1927	Trough	17	9.53	.01	...	.00[b]
Aug. 1929	Peak	20	10.18	.65	.03	...
Aug. 1932	Trough	36	9.95	−.23	...	−.01
Mar. 1937	Peak	55	10.89	.94	.02	...
May 1938	Trough	14	10.76	−.13	...	−.01

[a] Three-month average; date of turn is middle month.

[b] Positive but less than .005 million dollars.

Table 113

Equipment and Joint Facility Rents per Traffic Unit

Change per Month between Peaks and Troughs in Traffic Units, 1918–1938

Turn in traffic units		Months from prec. date	Rents per traffic unit[a]	Change from preceding date		
				Total	Per month	
Date	Level				To peak from trough	To trough from peak
			(cents)			
May 1918	Peak	..	.0080	...	...	...
Mar. 1919	Trough	10	.0080	.0000	...	.0000
Feb. 1920	Peak	11	.0092	.0012	.0001	...
July 1921	Trough	17	.0210	.0118	...	.0007
Apr. 1923	Peak	21	.0177	−.0033	−.0002	...
June 1924	Trough	14	.0209	.0032	...	.0002
July 1926	Peak	25	.0212	.0003	.0000[b]	...
Dec. 1927	Trough	17	.0234	.0022	...	.0001
Aug. 1929	Peak	20	.0231	−.0003	−.0000[c]	...
Aug. 1932	Trough	36	.0475	.0244	...	.0007
Mar. 1937	Peak	55	.0288	−.0187	−.0003	...
May 1938	Trough	14	.0395	.0107	...	.0008

[a] Three-month average; date of turn is middle month.

[b] Positive but less than .00005.

[c] Negative but greater (algebraically) than −.00005.

the ratio of fruits and vegetables to all tonnage increased somewhat from each peak to the next. Again with an exception from 1918 to 1920, the relative importance of packing house products has not diminished much from one to another (Chart 17). Oil traffic, about as large at the beginning as the two foodstuffs combined, has steadily gained in relative position, rising from 1.8 percent of all tons originated in 1918 to 5.8 percent in 1937 (Chart 18). Tonnage of these commodities, considered as a group, was growing more rapidly than that of all traffic, and the payments so distinctively associated with them were likely to increase more rapidly.

OPERATING PROFITS

Heavy traffic, high profits

As we have shown, unit cost was usually lower when traffic was at its highest level than when it was lowest. The first variant of profit, net revenue, is computed by deducting cost from operating revenue. If operating revenue per traffic unit had never changed, unit profit before taxes and rents would usually have been higher at traffic peaks than at troughs.

Actually, as noted in Chapter 9, there was often a net fall in unit operating revenue during an expansion, a net rise during a contraction. The changes in average 'price' tended to offset those in cost. But in practice they were not usually strong enough to do so. Unit profit was greater at the end than at the beginning of every expansion for which we have monthly data except 1911–13 and 1914–18, and lower at the end than at the beginning of every contraction except 1920–21.

The rise in unit profit usual in expansions came about in various ways in different cycles (Table 114). In three phases, revenue fell, but cost declined more than enough to offset the fall in revenue; profit therefore rose. This was the most common combination of changes. In contraction the combination of changes in cost and revenue that produced the usual fall in profit was more uniform. In five phases, cost and revenue rose, but the rise in revenue was insufficient to prevent a decline in profit. The change in profit was frequently the opposite of that in average 'price' received.

The foregoing remarks pertain to net revenue. But there was practically no difference among the variants of profit in their

direction of change. In the first place net revenue itself, before depreciation, always changed in the same direction as net revenue after depreciation. The fluctuations in the other four variants (operating income before and after, and net operating income before and after) corresponded to those in net revenue. Whenever any one of the 6 variants showed a net rise in any phase, so did all the others. When one fell, the others fell (Table 115, col. I, V, IX). This would necessarily be true if unit depreciation, taxes, and operating rents were constant. They were not constant in fact, but the changes in them were never important enough to upset the harmony among the variants.[14]

Table 114
Revenue, Expense, and Net Revenue, per Traffic Unit
Direction of Net Change during Phases of Cycles in Traffic Units

	Revenue	Expense		Net revenue	
		Excluding depreciation	Including depreciation	Before depreciation	After depreciation
Expansions					
1921–23	−	−	−	+	+
1924–26	−	−	−	+	+
1932–37	−	−	−	+	+
1919–20	+	−	−	+	+
1927–29	+	−	−	+	+
1908–10	+	...	+	....	+
1911–13	−	−	−	−	−
1914–18	+	+	+	−	−
Contractions					
1910–11	+	...	+	...	−
1913–14	+	+	+	−	−
1918–19	+	+	+	−	−
1923–24	+	+	+	−	−
1937–38	+	+	+	−	−
1929–32	−	−	+	−	−
1926–27	−	+	+	−	−
1920–21	+	+	+	+	+

Derived from Tables 78, 97, and 115.

[14] In the earlier phases we are certain of this only for the smaller number of variants on which we have data. We have none on any variant before depreciation prior to 1911–13, and none on net operating income either before or after until 1918–19.

Table 115
Profits per Traffic Unit
Averages for Stages of Cycles in Traffic Units
(Cents)

Cycle, & kind of profit[a]	I	II	III	IV	V	VI	VII	VIII	IX
1908–11									
4	.2596	.2712	H.2824	.2812	.2745	.2618	.2572	L.2551	.2629
5	.2286	.2415	H.2522	.2509	.2441	.2295	.2262	L.2232	.2304
1911–14									
1	.2791	.2772	.2680	H.2792	.2533	.2463	L.2444	.2549	.2528
2	.2466	.2441	.2335	H.2466	.2218	.2124	L.2073	.2157	.2142
4	H.2629	.2612	.2517	.2624	.2368	.2279	L.2235	.2314	.2276
5	H.2304	.2281	.2172	.2299	.2053	.1940	L.1863	.1922	.1891
1914–19									
1	.2528	.2955	H.3088	.2453	.2282[b]	.2748[b]	.2155	.1973	L.1756
2	.2142	.2580	H.2718	.2071	.1931[b]	.2372[b]	.1766	.1584	L.1329
3				.2000	.1850[b]	.2356[b]	.1704	.1522	L.1249
4	.2276	.2715	H.2860	.2230	.2075[b]	.2529[b]	.1920	.1723	L.1487
5	.1891	.2341	H.2490	.1848	.1724[b]	.2152[b]	.1531	.1335	L.1060
6				.1776	.1644[b]	.2137[b]	.1468	.1272	L.0980
1919–21									
1	.1756	.1827	H.2079	.2090	.2003	L.0629	.1723[b]	.2509	.2963
2	.1329	.1425	H.1675	.1599	.1523	L.0095	.1152[b]	.1823	.2213
3	.1249	.1350	H.1548	.1472	.1429	L.0009	.1021[b]	.1641	.2003
4	.1487	.1567	H.1825	.1823	.1753	L.0357	.1440[b]	.2137	.2571
5	.1060	.1165	H.1422	.1332	.1273	L–.0177	.0869[b]	.1451	.1820
6	.0980	.1089	H.1294	.1205	.1179	L–.0263	.0738[b]	.1269	.1610
1921–24									
1	.2963	.3194	H.3336	.2879	.3306	.3185	L.3096	.3312	.3216
2	.2213	.2472	.2560	.2232	H.2668	.2529	L.2392	.2610	.2464
3	.2003	.2280	.2370	.2050	H.2492	.2344	L.2199	.2419	.2256
4	.2571	.2813	.2959	.2550	H.3001	.2864	L.2739	.2947	.2820
5	.1820	.2092	.2183	.1904	H.2364	.2208	L.2035	.2246	.2069
6	.1610	.1900	.1994	.1722	H.2187	.2024	L.1841	.2054	.1861
1924–27									
1	.3216	.3505	.3548	.3627	H.3823	.3693	.3527	.3600	L.3318
2	.2464	.2771	.2822	.2885	H.3075	.2949	.2780	.2847	L.2556
3	.2256	.2563	.2617	.2678	H.2864	.2744	.2558	.2622	L.2323
4	.2820	.3117	.3158	.3242	H.3448	.3309	.3122	.3172	L.2878
5	.2069	.2383	.2432	.2500	H.2699	.2565	.2376	.2420	L.2116
6	.1861	.2175	.2227	.2204	H.2489	[illegible]	.2154	.2196	L.1883
1927–32									
1	.3318	.3636	.3902	.3924	H.3960	.3589	.3467	.3219	L.3241
2	.2556	.2874	.3105	.3160	H.3189	.2811	.2637	.2262	L.2195
3	.2323	.2635	.2880	.2932	H.2958	.2548	.2298	.1846	L.1719
4	.2878	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	L.2472
5	.2116	.2443	.2687	.2745	H.2773	.2344	.2085	.1580	L.1427
6	.1883	.2204	.2462	.2516	H.2541	.2082	.1746	.1163	L.0950

Table 115—*Concluded*

Cycle & kind of profit	I	II	III	IV	V	VI	VII	VIII	IX
1932–38									
1	.3241	H.3549	.3177	.3309	.3316	.3058	.2707	L.2649	.2955
2	.2195	H.2668	.2430	.2512	.2542	.2378	.1863	L.1662	.1940
3	.1719	.2240	.2038	.2166	H.2253	.2083	.1527	L.1272	.1545
4	.2472	H.2905	.2580	.2800	.2887	.2614	.2195	L.2054	.2337
5	.1427	.2024	.1834	.2004	H.2113	.1934	.1352	L.1066	.1322
6	.0950	.1596	.1442	.1657	H.1824	.1639	.1015	L.0676	.0928

For explanation of H and L see Table 97.

[a] Numerals refer to the various kinds of profit:

1 Net operating revenue before depreciation.

2 Operating income before depreciation.

3 Net operating income before depreciation.

4 Net operating revenue after depreciation.

5 Operating income after depreciation.

6 Net operating income after depreciation.

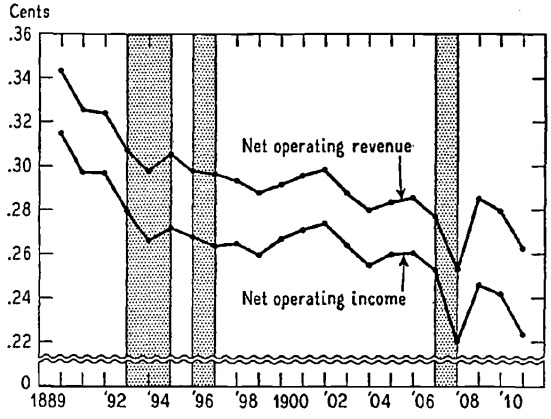
[b] Profits for June 1918 and August 1920 were recomputed on the basis of the hypothetical cost figures described in Table 97, note b.

The 1914–18 and 1920–21 exceptions to the general rule that unit profits show a net rise in expansion and fall in contraction are largely if not entirely traceable to extraordinary dislocations in the national structure of prices. In 1914–18, when profits failed (on net balance over the phase as a whole) to grow as usual with traffic, prices of materials and supplies increased very rapidly relatively to prices received for transportation services. In 1920–21, when profits rose although traffic was contracting, prices paid fell very swiftly relatively to prices received, at least during the last two-thirds of the phase (Ch. 9).

It must be confessed that yearly figures before 1908 indicate, on the whole, an inverse, not a positive, relation between unit profit and traffic. The former declined in every phase from 1893 onward (Chart 116). The net fall in the contractions of 1893–95 and 1896–97 was less rapid than in the intervening expansion. The decline in net revenue in 1896–97 was also less rapid than in 1897–1907, although net operating income fell more gradually in the long expansions. Falling traffic did not bring a steeper downward tilt in both forms of profit until 1907–08. (There are no data on the intermediate form, operating income.)

CHART 116

Operating Profits per Traffic Unit, 1890–1911



Shaded periods are contractions in traffic units.

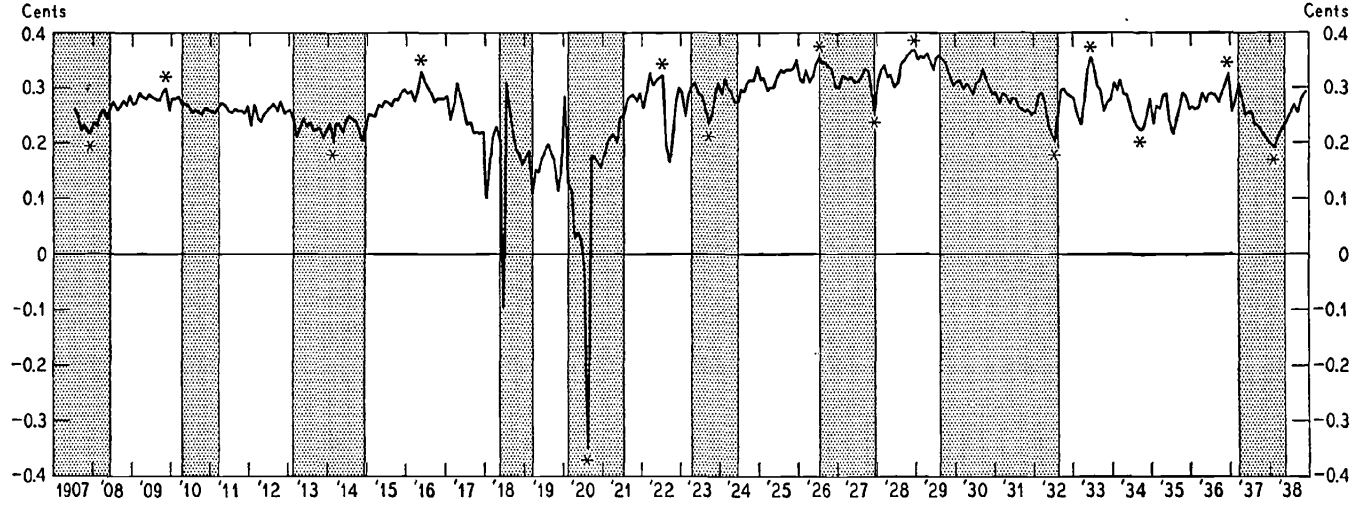
Do profits begin to fall before expansion ends?

The fact that unit profits were higher at the end of an expansion of traffic than at the beginning, as they usually were after 1907, does not necessarily mean that they rose steadily throughout the phase. They could increase for a while, then fall, yet not lose all their initial advance. Likewise, a net decline during contraction is quite compatible with some recovery during the later portion. A downward trend in late expansion might be discouraging to new investment even if it left profits higher than at the initial trough. An upward trend late in contraction might be encouraging even if it did not bring them back to their level at the preceding peak. Despite our findings in the foregoing section we still have to determine whether such reversals of direction were frequent.

The simplest way to answer this question would be to divide the curve of unit profits into rising and falling phases by inspection and compare the turning points that separate those phases with the turns in traffic. When we try to do this, however, we encounter difficulties, illustrated by the curve for net revenue after depreciation (Chart 117), especially in the confused years during and for some time after World War I. There was a sharp but temporary decline in profits in January 1918. Shall we deem this month the foot of a cyclical slope? From the transient character of the decline

CHART 117

Net Revenue from Railway Operations (after Depreciation), per Traffic Unit, July 1907—December 1938



Shaded periods are contractions in traffic units.

we judge otherwise. Furthermore, we disregard the sharp downward projection in June, which was largely a result of the retroactive wage award, and a somewhat less sharp, transitory upward thrust in July. We would mark off a trough in profits early in 1919, and a peak in the summer of that year, if the fluctuations in neighboring parts of the curve were less hectic; but the rise from March to July looks too mild in its actual surroundings. We accept August 1920 as a trough month, although the extreme depth is accounted for by another retroactive wage adjustment, because the tendency was clearly downward in the months preceding it and upward in those following. We ignore a sharp dip in 1922 because it was probably caused by the shopmen's strike, which apparently raised unit operating costs, and pass over a deep nick in February 1923. In consequence of the last two decisions we find a cyclical decline running from July 1922 to October 1923.[15]

We find an extra peak and trough early in the traffic expansion of 1932–37, and might designate more in that vicinity, but the resulting intervals would be shorter than those we customarily recognize as specific phases. As we have observed elsewhere, there were several fairly pronounced minor waves in traffic itself during this phase; the sub-cycles in profits correspond to them rather closely.

The curves for the other five variants, as far as we have data for them, look so much like the one for net revenue after depreciation that it would be a waste of paper to reproduce them here. As far as figures are available, the peaks and troughs in all six, as determined by processes similar to those just described, were usually identical. Around 1923 and again around 1928, there were some differences in this respect, but every kind of profit was at its highest some months before the peak in traffic. Around 1937, on the other hand, the highest points in three kinds coincided with the traffic peak, although the highest points in three others came earlier.

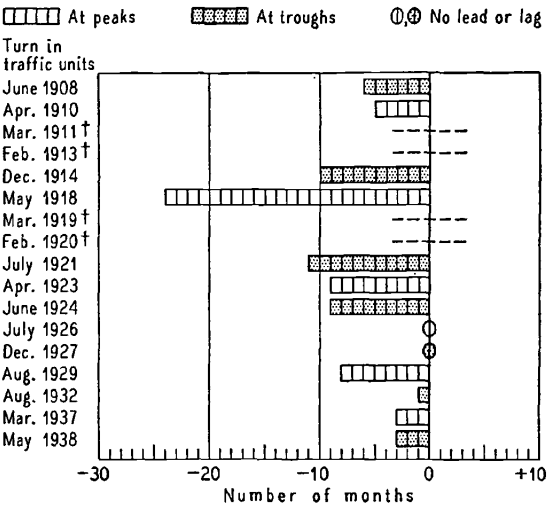
If we accept the rather precarious evidence of the turns, they appear to support the view that unit profits begin to decline before traffic has reached the climax of its growth and to rise before it has fallen to its most depressed level. In 10 of 12 instances (not

[15] Not from March 1922. Our judges of these matters think the higher level in that month too isolated.

counting 1937) the turn in profit preceded the corresponding turn in traffic; in 2 they coincided (Chart 118).

CHART 118

Number of Months by which Turn in Net Operating Revenue Preceded (−) or Followed (+) Turn in Traffic Units



Derived from Chart 117.
† No corresponding turn in profits.

If, however, we are distrustful of conclusions based on the location of individual, perhaps arbitrarily chosen months, we may turn our attention to averages for successive groups of months, as we have done previously in considering similar problems. In three expansions all variants (except one in 1921–23) attained their highest level in the final stage of traffic growth (Table 115). A fourth phase, 1932–37, presents a problem of classification. Three variants were highest in stage II, but, after declining to III, rose to their second highest level in V. It would not be fair to say they declined from II onward. The other three were highest at the end. In each of the four earliest expansions, on the other hand, every variant of profits was at its highest in some stage before the final one. In three contractions, every variant was lowest at the end; but in the other five, each came to its low point earlier.

On the other hand, rising profits were at least as common as

falling profits in every segment of expansion, and falling at least as common as rising profits in every segment of contraction (Table 116, last two lines).

Falling profits did, however, occur somewhat more frequently in the second than in the first, and in the third and fourth than in the second segments of expansion. And rising profits were more frequent in the later than in the earlier half of contraction.

Table 116
Profits per Traffic Unit
Direction of Change from Stage to Stage of Cycles in Traffic Units

Cycle	I-II	II-III	III-IV	IV-V	V-VI	VI-VII	VII-VIII	VIII-IX
1908–11	+	+	−	−	−	−	−	+
1911–14	−	−	+	−	−	−	+	−
1914–19	+	+	−	−	+	−	−	−
1919–21	+	+	−†	−	−	+	+	+
1921–24	+	+	−	+	−	−	+	−
1924–27	+	+	+	+	−	−	+	−
1927–32	+	+	+	+	−	−	−	−
1932–38	+	−	+	+	−	−	−	+
Number +	7	6	4	4	1	1	4	3
Number −	1	2	4	4	7	7	4	5

Derived from Table 115. All known variants changed in the same direction, except as noted.
†Net revenue before depreciation, +.

We are more impressed by the analysis of stages than by the turns. In the railroad industry at least, an ominous narrowing of the profit margin while the physical volume of business is still growing, and an auspicious widening while volume is still diminishing, were not highly characteristic of the cyclical course of events. Yet even according to the stage averages, the maximum level was reached before the end in more than half the expansions if we leave the hard-to-interpret case of 1932–37 out of the count, and certainly the minimum level was reached before the end in more than half of the contractions, although in some instances the rise was not continuous after the low point. We never find a continued widening of the profit margin *following* a peak in traffic or a continued narrowing of the margin after traffic began to increase. The maximum and minimum were sometimes early, never late.

Most rapid rise, or fall, came early

Although unit profits often grow even in late expansion and decline even in late contraction, such changes might become progressively slower as a phase wears on. We found that operating expense per traffic unit in the later segments of expansion commonly rose, or declined less rapidly than in the first or second, and that in the later segments of contraction it commonly fell, or rose less sharply than in the first. If unit gross receipts did not change, exactly the opposite would be true of profit. It would usually decline or rise less rapidly than before in the second segment of expansion, increase or fall less rapidly in the second of contraction. In later segments its behavior from cycle to cycle would be less consistent, just as that of unit cost was. For net revenue is computed by deducting operating expense from gross receipts. Furthermore, since operating income and net operating income are computed by making successive deductions from net revenue as a starting point, alterations in the direction and rate of change in unit expense must influence the direction and rate of change of these variants of profit also. But on these levels the course of unit taxes and rents as well as that of unit gross revenue may modify the inverse reflection of cost in profits.

But in fact the several variants of unit profit did not differ very much with respect to their time of quickest change (Table 117). In any one expansion, the segment of most rapid growth was the same for all. In 1914–18, for example, it was the first, for all four known variants; in 1921–23 it was the fourth, for all six. In each contraction, except 1923–24 and 1937–38, the segment of most rapid decline was the same for any one variant as for any other. In most cases the highest rate of change occurred in the first or second segment. All variants had their speediest rise during the first segment in 5 expansions, and during the second in one. All had their most abrupt decline during the first segment in 4 contractions, during the second in one. In still another phase, 1937–38, two declined most vigorously in the first segment, the others in the second.

Since early rates of growth in expansion and of decline in contraction, when they occurred, were seldom exceeded later in the same phase (they were never exactly equaled), their projection

Table 117
Profits per Traffic Unit
Change per Month during Segments of Cycles in Traffic Units
(Cents per month)

Cycle, and kind of profit	Segment of expansion				Segment of contraction			
	First	Second	Third	Fourth	First	Second	Third	Fourth
1908–11								
4	.0029	.0016	−.0002	−.0017	−.0064	−.0013	−.0006	.0039
5	.0032	.0015	−.0002	−.0017	−.0073	−.0009	−.0009	.0036
1911–14								
1	−.0005	−.0012	.0015	−.0065	−.0018	−.0003	.0015	−.0005
2	−.0006	−.0014	.0017	−.0062	−.0024	−.0007	.0012	−.0004
4	−.0004	−.0013	.0014	−.0064	−.0022	−.0006	.0011	−.0010
5	−.0006	−.0015	.0017	−.0062	−.0028	−.0011	.0008	−.0008
1914–19								
1	.0061	.0010	−.0047	−.0024	.0233	−.0198	−.0061	−.0108
2	.0063	.0010	−.0048	−.0020	.0220	−.0202	−.0117	−.0128
3				−.0021	.0253	−.0217	−.0061	−.0136
4	.0063	.0011	−.0047	−.0022	.0227	−.0203	−.0066	−.0118
5	.0064	.0011	−.0048	−.0018	.0214	−.0207	−.0065	−.0138
6				−.0019	.0246	−.0223	−.0065	−.0146
1919–21								
1	.0036	.0072	.0003	−.0044	−.0458	.0199	.0143	.0151
2	.0048	.0071	−.0022	−.0038	−.0476	.0192	.0122	.0130
3	.0050	.0057	−.0022	−.0022	−.0473	.0184	.0113	.0121
4	.0040	.0074	−.0001	−.0035	−.0465	.0197	.0127	.0145
5	.0052	.0073	−.0026	−.0030	−.0483	.0190	.0106	.0123
6	.0054	.0059	−.0025	−.0013	−.0481	.0182	.0097	.0114
1921–24								
1	.0058	.0022	−.0070	.0107	−.0048	−.0020	.0048	−.0038
2	.0065	.0014	−.0050	.0109	−.0056	−.0030	.0048	−.0058
3	.0069	.0014	−.0049	.0110	−.0059	−.0032	.0049	−.0065
4	.0060	.0022	−.0063	.0113	−.0055	−.0028	.0046	−.0051
5	.0068	.0014	−.0043	.0115	−.0062	−.0038	.0047	−.0071
6	.0072	.0014	−.0042	.0116	−.0065	−.0041	.0047	−.0077
1924–27								
1	.0064	.0005	.0010	.0044	−.0043	−.0030	.0013	−.0094
2	.0068	.0006	.0008	.0042	−.0042	−.0031	.0012	−.0097
3	.0068	.0007	.0008	.0041	−.0040	−.0034	.0012	−.0100
4	.0066	.0005	.0010	.0046	−.0046	−.0034	.0009	−.0098
5	.0070	.0006	.0008	.0044	−.0045	−.0034	.0008	−.0101
6	.0070	.0006	.0008	.0043	−.0043	−.0037	.0007	−.0104
1927–32								
1	.0091	.0041	.0003	.0010	−.0057	−.0011	−.0022	.0003
2	.0091	.0036	.0008	.0008	−.0058	−.0015	−.0033	−.0010
3	.0089	.0038	.0008	.0007	−.0063	−.0022	−.0039	−.0020
4	.0093	.0043	.0004	.0010	−.0065	−.0018	−.0033	−.0010
5	.0093	.0038	.0009	.0008	−.0066	−.0023	−.0044	−.0024
6	.0092	.0040	.0008	.0007	−.0071	−.0029	−.0051	−.0033
1932–38								
1	.0032	−.0021	.0007	.0001	−.0103	−.0078	−.0019	.0023
2	.0050	−.0013	.0005	.0003	−.0066	−.0114	−.0045	.0111
3	.0055	−.0011	.0007	.0009	−.0068	−.0124	−.0057	.0109
4	.0046	−.0018	.0012	.0009	−.0109	−.0093	−.0031	.0113
5	.0063	−.0011	.0009	.0011	−.0072	−.0129	−.0064	.0102
6	.0068	−.0009	.0012	.0018	−.0074	−.0139	−.0075	.0101

Computed from data in Table 115.
For key to numerals, see Table 115, note a.

into the future would almost always have yielded an unduly optimistic forecast of unit profits in stages IV and V, and an unduly pessimistic forecast in VII, VIII, and IX.

Table 118
Unit Profit: Summary of Change from Segment to Segment of Phases in Traffic Units

Number of expansions in which all known variants:	
In second segment, fell, or rose less rapidly than in first	7
In third segment, fell, or rose less rapidly than in second	5
In fourth segment, fell, or rose less rapidly than in third	4[a]
Number of contractions in which all known variants:	
In second segment, rose, or fell less rapidly than in first	6[b]
In third segment, rose, or fell less rapidly than in second	6[c]
In fourth segment, rose, or fell less rapidly than in third	4

Derived from Table 117.

[a] In each of 2 other expansions, three of six variants increased less rapidly in the fourth segment than in the third.

[b] In 1 other contraction, two of six variants fell less rapidly in the second than in the first segment.

[c] In 1 other contraction, one of the two known variants fell less rapidly in the third than in the second segment.

With few exceptions, the course of the variants, as far as it is known, was similar during any two successive segments. Sometimes all rose in one and fell in the other. Sometimes all rose in one and rose faster in the other. At other times all fell in one and fell more rapidly in the other. We can therefore make a common summary, dealing with a few departures in footnotes (Table 118). In the second segment of seven expansions all variants of profit per unit either fell or rose less rapidly than in the first, acting otherwise in only one. A similar statement holds for the third as compared with the second segment in five expansions, but for the last as compared with the third in only four. In two additional last segments, however, it holds for half of the variants. Declines in unit profit and retardations of increase, considered jointly, were therefore highly characteristic of the second stretch of expansion, less common in the middle or toward the end. In 6 contractions, rises or retardations of decline in profit occurred during the second and third segment. (For one or two variants, we find them in a seventh phase.) They appeared in just half of the fourth segments.

In a broad way, the changes in profit were the obverse of those in costs. Rising costs and less rapidly falling costs, taken together, falling and less rapidly rising profits, were not highly typical features toward the end of expansion, but were more or less characteristic of earlier segments, except of course the first. Falling and less rapidly rising costs, rising and less rapidly falling profits, were not especially common toward the end of contractions, but were fairly prevalent in preceding segments, except the first.

In the last segment of expansion profits, like costs, bore little resemblance to those in the immediately following segment of contraction (Table 117). In the four cycles beginning with 1921–24, every variety of profit rose in the former and fell in the latter. In the 1908–11 cycle, the two kinds of profit about which we have any information declined from IV to V, but the decline quickened from V to VI. In three-fourths of the cycles, then, the onset of contraction meant either that rising were converted into falling profits or that any decline already in progress was speeded up.

The transition from contraction to expansion was almost as marked. We can observe it in only 7 instances. In 5 of the 7, the advent of traffic expansion was promptly signalized by conversion of falling into rising profits. In the other two instances, however, there was a rise at the end of contraction, and it was not followed by a more vigorous rise.

Comparisons between segments of reference cycles, which may be equally appropriate to the questions considered in the preceding three sections, lead to similar conclusions. The variant of unit profit for which we have the longest record was higher in the final than in the initial stage in 7 of 8 reference expansions, lower at the trough than at the peak in 7 of 8 reference contractions. Rises occurred rather consistently toward the beginning of expansions, falls toward the beginning of contractions; we do not find either very consistently near the end (Table 119). The most rapid rise, or fall, came early, although the majority of early maximum rises in expansion is not impressive. The characteristic early change tapered off or was reversed in a fair majority of second and third segments, but the tendency did not persist very regularly into the fourth.

Table 119
Net Operating Revenue after Depreciation, per Traffic Unit
Changes during Segments of Reference Cycles

	Segment of expansion				Segment of contraction			
	First	Second	Third	Fourth	First	Second	Third	Fourth
Number of cycles for which data are available	8	8	8	8	8	9	9	9
Number in which unit profit:								
Fell	1	2	3	4	8	6	4	5
Did not change	0	0	2	0	0	1	1	0
Rose	7	6	3	4	0	2	4	4
Rose more rapidly than in any other segment of same expansion	4	1	0	3	...	...	...	...
Fell more rapidly than in any other segment of same contraction†	...	...	...	...	6	1	0	1
Fell, or rose less rapidly than in preceding segment of same expansion	...	7	6	4	...	...	...	...
Rose, or fell less rapidly than in preceding segment of same contraction	...	...	...	...	...	7†	8	5

†Since there are no data on the first segment of the 1907–08 contraction, only eight, not nine, comparisons are possible.

Greatest change in proportion to traffic came early

Instead of dividing the change in unit profit from stage to stage by the number of months elapsed, as we did in the preceding section, we can divide it by the increase in traffic. For example, we can divide the rise in net revenue per traffic unit after depreciation during the first segment of the 1908–11 cycle, .0116 cents, by the increase in traffic, 1.39 billion traffic units; we thus find that profit rose .0083 cents for each billion-unit increment of traffic. The results of such calculations, for a series of segments, tell us whether the improvement in profit during a cyclical upswing in traffic became smaller, in proportion to the growth of traffic, as the expansion got older; and whether the deterioration in profit during a downswing became smaller, in proportion to the loss of traffic, as the contraction developed.

As before, we find that the most striking change usually occurred in the earlier segments (Table 120). The growth of unit profit per billion-unit gain in traffic was greatest during the first segment in 4 expansions, during the second in 2, during the first

Table 120

Change in Unit Profit during Each Segment of Cycles in Traffic Units Divided by Change in Traffic Units

(Cents)

Cycle, & kind of profit[a]	Segment of expansion				Segment of contraction			
	First	Second	Third	Fourth	First	Second	Third	Fourth
1908–11								
4	.0083	.0090	−.0006	−.0057	−.0326	−.0077	−.0525	.0236
5	.0093	.0086	−.0006	−.0058	−.0374	−.0055	−.0750	.0218
1911–14								
1	−.0070	−.0089	.0045	−.0115	−.0051	−.0019	.0066	−.0017
2	−.0093	−.0103	.0053	−.0110	−.0068	−.0050	.0053	−.0012
4	−.0063	−.0092	.0043	−.0114	−.0064	−.0044	.0050	−.0031
5	−.0085	−.0106	.0051	−.0109	−.0082	−.0076	.0037	−.0026
1914–19								
1	.0130	.0026	−.0150	−.0037	.0196	−.0307	−.0104	−.0091
2	.0134	.0027	−.0153	−.0030	.0185	−.0314	−.0104	−.0107
3		No data		−.0032	.0213	−.0338	−.0104	−.0114
4	.0134	.0028	−.0149	−.0033	.0191	−.0316	−.0113	−.0099
5	.0137	.0029	−.0151	−.0027	.0180	−.0322	−.0112	−.0115
6		No data		−.0028	.0207	−.0347	−.0112	−.0122
1919–21								
1	.0043	.0102	[b]	−.0023	−.0723	1.3675	.0084	.0317
2	.0057	.0102	[b]	−.0020	−.0752	1.3212	.0071	.0273
3	.0060	.0080	[b]	−.0011	−.0747	1.2650	.0066	.0253
4	.0048	.0105	[b]	−.0019	−.0735	1.3538	.0074	.0303
5	.0063	.0104	[b]	−.0016	−.0763	1.3075	.0062	.0258
6	.0065	.0083	[b]	−.0007	−.0759	1.2512	.0056	.0238
1921–24								
1	.0176	.0278	−.0069	.0097	−.0086	−.0027	[c]	−.0036
2	.0198	.0173	−.0050	.0100	−.0099	−.0042	[c]	−.0055
3	.0211	.0176	−.0048	.0101	−.0105	−.0044	[c]	−.0061
4	.0185	.0286	−.0062	.0103	−.0097	−.0038	[c]	−.0048
5	.0208	.0178	−.0042	.0105	−.0111	−.0053	[c]	−.0067
6	.0221	.0184	−.0041	.0106	−.0116	−.0056	[c]	−.0073
1924–27								
1	.0142	.0028	.0045	.0109	−.0361	−.0146	.0041	−.0256
2	.0151	.0034	.0036	.0106	−.0350	−.0148	.0038	−.0265
3	.0151	.0036	.0035	.0103	−.0333	−.0163	.0036	−.0272
4	.0146	.0027	.0048	.0114	−.0386	−.0164	.0028	−.0267
5	.0155	.0032	.0039	.0111	−.0372	−.0166	.0025	−.0276
6	.0155	.0034	.0039	.0108	−.0358	−.0181	.0023	−.0284
1927–32								
1	.0357	.0155	.0034	.0300	−.0089	−.0018	−.0031	.0008
2	.0357	.0134	.0085	.0242	−.0091	−.0026	−.0046	−.0017
3	.0351	.0142	.0080	.0217	−.0099	−.0037	−.0056	.0032
4	.0367	.0162	.0038	.0292	−.0101	−.0031	−.0046	−.0016
5	.0367	.0142	.0089	.0233	−.0103	−.0038	−.0062	−.0038
6	.0361	.0150	.0083	.0208	−.0111	−.0050	−.0072	−.0053
1932–38								
1	.0099	.0161	.0024	.0091	−.0234	−.0097	−.0013	.0056
2	.0163	−.0103	.0015	.0035	−.0143	−.0128	−.0015	.0203
3	.0168	−.0087	.0023	.0015	−.0148	−.0128	−.0057	.0287
4	.0140	−.0141	.0039	.0015	−.0237	−.0104	−.0032	.0298
5	.0193	−.0082	.0030	.0019	−.0156	−.0145	−.0064	.0269
6	.0208	−.0067	.0038	.0029	−.0161	−.0155	−.0076	.0265

[a] For key to numerals, see Table 115, note a.

[b] Traffic declined.

[c] Traffic increased.

or second (depending on the variant considered) in 2. The fall in profit per billion units of traffic lost was most severe during the first segment of 6 contractions, the second of 1.

Falls and diminishing rises were a trifle, but perhaps not appreciably, more common in the second than in later segments of expansion (Table 121). Rises and diminishing falls were somewhat more frequent in the second segment of contraction than in the third, and in the third than in the fourth.

Table 121
Unit Profit: Change per Billion-unit Change in Traffic
Summary of Comparisons between Segments of Cycles in Traffic Units

Number of expansions in which change in all known variants of unit profit, per billion-unit increase of traffic:	
In second segment, was a fall, or a smaller rise than in the first	5 (of 8)[a]
In third segment, was a fall, or a smaller rise than in the second	4 (of 7)[b]
In fourth segment, was a fall, or a smaller rise than in the third	4 (of 7)
Number of contractions in which change in all known variants of unit profit, per billion-unit decrease of traffic:	
In second segment, was a rise, or a smaller fall than in first	7 (of 8)
In third segment, was a rise, or a smaller fall than in second	5 (of 7)
In fourth segment, was a rise, or a smaller fall than in third	4 (of 7)[c]

Derived from Table 120.

[a] In another expansion, 1 of 2 variants, and in still another 4 of 6 rose less in the second segment than in the first.

[b] In one other expansion, 1 of 6 variants rose less in the third segment than in the second.

[c] In one other contraction, 2 of 6 variants declined less in the fourth segment than in the third.

Inflexible deductions intensified the typical fluctuations of unit profit

Although the direction of change over a whole phase or the relative rates of change in different segments are rather similar no matter what variant of unit profits we consider, as the foregoing sections indicate, the deduction of depreciation, taxes, and rents did have marked and consistent effects on the amplitude of fluctuations in profit.

In all the traffic expansions after 1908 in which profits increased, each kind of unit deduction, as far as we can tell from the available data, usually either declined or increased by a smaller percentage than the variant of profit from which it is deductible (Table 122). Depreciation always fell; taxes never rose as much as net operating revenue; rents never as much as operating income, except in 1919–

Deductions and Profits, per Traffic Unit; and Traffic Units

Percentage Net Change during Phases of Cycles in Traffic Units, 1908–1938

	Depreciation	Taxes	Equipment and joint facility rents	Net operating revenue		Operating income		Net operating income		Traffic units
				Before depreciation	After depreciation	Before depreciation	After depreciation	Before depreciation	After depreciation	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Expansions in which unit profit:										
Increased										
1908–10	†	−1.9	†	†	5.7	†	6.8	†	†	26.1
1919–20	−6.7	12.6	15.0	14.1	17.9	14.6	20.1	14.4	20.3	21.2
1921–23	−22.4	−15.1	−15.7	11.6	16.7	20.6	29.9	24.4	35.8	40.3
1924–26	−5.3	−0.4	−1.4	18.9	22.3	24.8	30.4	27.0	33.7	18.7
1927–29	−5.4	1.2	−1.3	19.3	23.1	24.8	-31.0	27.3	34.9	8.3
1932–37	−44.3	−25.9	−39.4	2.3	16.8	15.8	48.1	31.1	92.0	80.2
Decreased										
1911–13	3.1	−3.1	†	−9.2	−9.9	−10.1	−10.9	†	†	22.2
1914–18	−18.2	−8.8	†	−9.7	−8.8	−9.9	−8.8	†	†	61.6
Contractions in which unit profit:										
Decreased										
1910–11	†	6.6	†	†	−4.2	†	−5.6	†	†	−4.8
1913–14	52.4	22.2	†	−0.2	−3.9	−3.4	−7.9	†	†	−15.6
1918–19	30.0	21.7	0.0	−23.0	−28.3	−31.2	−38.5	−32.5	−40.4	−18.7
1923–24	29.8	17.9	18.1	−2.7	−6.0	−7.6	−12.5	−9.5	−14.9	−15.1
1926–27	17.3	1.7	10.4	−13.2	−16.5	−16.9	−21.6	−18.9	−24.3	−9.7
1929–32	85.1	35.7	105.6	−18.2	−30.2	−31.2	−48.5	−41.9	−62.6	−52.3
1937–38	43.8	31.1	37.2	−10.9	−19.1	−23.7	−37.4	−31.4	−49.1	−27.9
Increased										
1920–21	56.6	55.9	128.3	47.9	46.7	45.3	43.0	40.2	36.6	−28.7

† Not available.

20, when they rose a trifle more than operating income before depreciation. In all contractions, every kind of deduction increased, except rents in 1918–19, which did not change, unlike operating income, which fell. In consequence, whenever one variant changed in the typical direction (up in contractions, down in expansions of traffic), any variant computed by subtracting a deduction from it changed in the same direction by a larger percentage. Profit after depreciation was more variable than profit before it; compare column 5 with 4, 7 with 6, 9 with 8. Profit after taxes was more variable than profit before taxes; compare column 6 with 4, 7 with 5. Profit after rents was more variable than profit before rents;[16] compare column 8 with 6, 9 with 7.

Table 123
Taxes and Profits, per Traffic Unit; and Traffic Units
Percentage Net Change during Phases of Cycles in Traffic Units, 1893–1908

	Taxes	Net operating revenue	Net operating income	Traffic units
Expansions				
1895–96	−10.21	−2.49	−1.58	10.62
1897–1907	−26.36	−6.55	−4.06	143.35
Contractions				
1893–95	21.53	−0.68	−2.82	−10.38
1896–97	10.37	−0.37	−1.53	−1.65
1907–08	12.35	−8.63	−12.94	−4.92

In the contractions before 1908, the same rules hold for the one deduction and two variants on which we have data (Table 123). Unit profit before taxes declined, as it typically did after 1908, taxes increased, and operating income therefore fell by a larger percentage than net operating revenue. In the expansions profit before taxes declined—not the typical change in later experience; there was no rise for the fall in unit taxes to accentuate.

Physical relations usually more important than price relations

Unit net operating revenue depends on price relations on the one hand and productivity relations on the other. If we let r stand for

[16] Except that in 1919–20 net operating income before depreciation did not rise as much as operating income before depreciation.

unit revenue and use other symbols in the same way as we did in discussing cost, then unit net revenue equals

$$r - p_1 \frac{q_1}{t} - p_2 \frac{q_2}{t} - \cdots$$

If the p's usually rise substantially while r does not rise very much or even falls, then the price relations change in a way that tends to increase the size of the subtracted items and hence to reduce profit. If the quantities of labor and materials do not rise in proportion to traffic, the q/t ratios tend to fall, the size of the item subtracted tends to fall, and profits tend to rise. Conversely, a fall in the p's relatively to r tends to improve profits and a larger fall in traffic than in quantities of labor and materials tends to reduce them. Prices paid usually rose relatively to r in expansion, although it is not clear that they fell relatively in contraction (Ch. 9). As noted in the discussion of costs, productivity probably improved in expansion, lowering the q/t's, and fell in contraction, raising them. Apparently the changes in physical relations were usually more important than those in price relations when traffic was growing, since unit profit rose in most expansions. Since it fell in all contractions except one, either price relations, like physical relations, altered in a manner adverse to profits, or did not change enough to offset the change in the latter.

In two of the three exceptional phases, the disturbances in prices, which apparently prevailed over changes in unit consumption of materials and services, were extremely severe. In 1914–18, when sellers of commodities increased their prices so rapidly and no corresponding changes were made in fares or freight rates, unit profit declined, although the productivity of labor, at least, increased (Table 53). In 1920–21, when commodity prices were so abruptly deflated (although railway wage rates were readjusted upward) and rates and fares increased, unit profit rose in spite of higher unit fuel consumption (Charts 93 and 94) and at least a slight decline in the productivity of labor. In the 1911–13 expansion, however, the dislocation of prices cannot have been very marked.

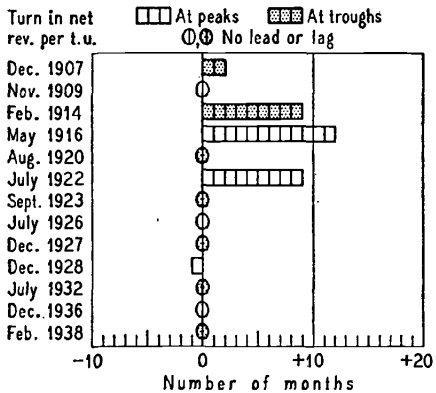
Aggregate sometimes continued to rise or decline after turn in unit profit

Since total profits are the product of unit profits and volume, a decline in the former does not necessarily mean that the growth of

aggregate net earnings has ended. In an expansion, the growth of traffic tends to re-enforce the effect of rising but to counteract that of falling unit profit. Even though unit earnings begin to fall before the end of the phase, continued rise in traffic, if large enough relatively to that fall, will cause aggregate profits to increase. In a contraction, continued decline of traffic may cause total profit to go on declining even after unit profit has turned upward. This has often happened. Net revenue after depreciation will illustrate the point (Chart 119).[17] In 4 of 13 cases, aggregate profits did not reach their peak until several months after the high point in unit profits. In 8, however, the turns coincided. The turn in aggregate only once preceded that in unit earnings.

CHART 119

Number of Months by which Turn in Aggregate Net Operating Revenue Preceded (−) or Followed (+) Turn in Net Operating Revenue Per Traffic Unit



A comparison of averages for successive stages indicates somewhat more divergence. In 7 of 16 instances, the highest stage in aggregate came later than the highest in unit net revenue, or the lowest in the former came later than the lowest in the latter (Table 125). In the other 9 instances the stages coincided.

Even when the highest or the lowest stages failed to coincide, unit and aggregate net did not always move in opposite directions

[17] The 2 extra turns in 1933 and 1934 are not shown. In both, the aggregate lagged by one month.

in the interval. They moved in the same direction in every segment of the 1919–20 expansion, but the rise in unit net revenue during the fourth segment was insufficient to offset the decline during the third, while the rise in aggregate net was more than sufficient. Consequently, the former had its peak in stage III, the latter in V.

Table 124
Aggregate Net Operating Revenue after Depreciation
Averages for Stages of Cycles in Traffic Units
(Millions of dollars)

Cycle	I	II	III	IV	V	VI	VII	VIII	IX
1908–11	58.8	65.2	71.4	77.0	H78.4	73.8	70.9	L70.2	71.5
1911–14	71.5	71.8	71.8	H81.2	78.8	72.6	68.9	67.8	L63.8
1914–19	63.8	85.4	103.9	91.2	94.1†	H108.1†	78.9	67.5	L55.1
1919–21	55.1	60.4	74.8	76.1	H77.9	L15.3	60.7†	71.0	81.9
1921–24	81.9	93.4	99.8	103.7	H134.1	124.1	109.4	119.9	L107.0
1924–27	107.0	124.7	131.2	140.2	H155.3	147.8	135.9	132.6	L117.1
1927–32	117.1	133.2	151.0	154.1	H156.1	124.9	96.8	63.9	L52.3
1932–38	52.3	70.3	68.4	89.8	H109.4	96.0	71.9	L57.9	63.7

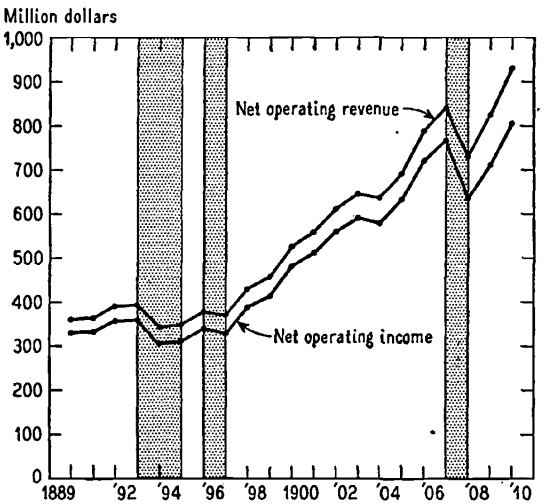
H indicates a high, L a low stage. Level of any stage not marked (except I, which is ignored because it is identical with IX of preceding cycle) is intermediate.
† Profits for June 1918 and August 1920 recomputed on basis of hypothetical cost figures; see Table 97, note b.

Table 125
Unit and Aggregate Net Operating Revenue after Depreciation
High and Low Stages, 1908-1938

Level of profit	Stage in which level was reached				No. of stages by which (2) followed (1)
	(1) Unit net revenue		(2) Aggregate net revenue		
High	1908–11	III	1908–11	V	2
Low	1908–11	VIII	1908–11	VIII	0
High	1911–14	I	1911–14	IV	3
Low	1911–14	VII	1911–14	IX	2
High	1914–19	III	1914–19	VI	3
Low	1914–19	IX	1914–19	IX	0
High	1919–21	III	1919–21	V	2
Low	1919–21	VI	1919–21	VI	0
[illegible]	[illegible]	V	[illegible]	V	0
Low	1921–24	VII	1921–24	IX	2
High	1924–27	V	1924–27	V	0
Low	1924–27	IX	1924–27	IX	0
High	1927–32	V	1927–32	V	0
Low	1927–32	IX	1927–32	IX	0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Low	1932–38	VIII	1932–38	VIII	0

Derived from Tables 115 and 124.

CHART 120
Operating Profits, 1890–1910



Shaded periods are contractions in traffic units.

Effect of inflexible items on aggregate profits

The inflexibility of depreciation charges, taxes, and rents necessarily accentuated the typical cyclical fluctuations in aggregate profits as well as those in unit profits. The typical change in the aggregate figures, as in the case of earnings per traffic unit, was a rise in expansion and a fall in contraction. Indeed, this was more consistently true of aggregate profits, as total earnings of every kind for which we have data grew in all expansions of traffic, including those before 1908, although unit earnings fell in four. Except in 1911–13, aggregate profit of every kind after depreciation increased more than profit of the same kind before it. Compare column 2 of Table 126 with 1, 4 with 3, or 6 with 5. The contrast between income before and income after taxes is almost as clear, if we examine profits after depreciation, for which we have a longer record. In 8 of 10 expansions, including those before 1908, earnings after both depreciation and taxes increased by a larger percentage than earnings after depreciation only. Compare column 4 with 2 and the second column of Table 127 with the first. In 1919–20, one of these eight, there was no appreciable difference between net operating income and net operating revenue, both

taken before depreciation. Compare column 3 with 1. In that phase the changes in profits before and after rents were likewise about equal. But in the few other phases for which we have data, net operating income, because of inflexible rents, rose more than operating income. Compare column 5 with 3 or 6 with 4. In all contractions except 1920–21 (in which the changes were not typical in direction), the percentage decline in each derived variant was larger than that in any variant prior to it.

Table 126
Aggregate Profits: Percentage Net Change during Phases of Cycles in Traffic Units, 1908–1938

	Net operating revenue		Operating income		Net operating income	
	Before depreciation (1)	After depreciation (2)	Before depreciation (3)	After depreciation (4)	Before depreciation (5)	After depreciation (6)
Expansions						
1908–10	†	33.3	†	34.6	†	†
1911–13	11.1	10.2	10.0	8.9	†	†
1914–18	46.0	47.5	45.8	47.5	†	†
1919–20	37.1	41.4	37.1	43.8	37.1	43.7
1921–23	56.5	63.7	69.2	82.2	74.6	90.6
1924–26	41.1	45.1	48.1	54.9	50.7	58.8
1927–29	29.3	33.3	35.1	41.9	37.9	46.2
1932–37	83.6	109.2	107.1	163.5	134.0	239.2
Contractions						
1910–11	†	−8.8	†	−10.0	†	†
1913–14	−15.9	−19.0	−18.6	−22.4	†	†
1918–19	−37.2	−41.4	−43.7	−49.7	−44.9	−51.2
1920–21	5.9	5.1	4.3	2.7	0.5	−1.9
1923–24	−17.4	−20.2	−21.6	−25.7	−23.2	−27.8
1926–27	−21.6	−24.6	−24.9	−29.2	−26.7	−31.7
1929–32	−60.8	−66.5	−66.9	−75.1	−72.0	−81.8
1937–38	−35.9	−41.8	−45.1	−55.1	−50.7	−63.4

† Not available.

Table 127
Aggregate Profits: Percentage Net Change during Phases of Cycles in Traffic Units, 1893–1908

	Net operating revenue	Net operating income		Net operating revenue	Net operating income
Expansions			Contractions		
1895–96	7.9	8.9	1893–95	−11.0	−12.9
1897–1907	127.4	133.5	1896–97	−2.0	−3.2
			1907–08	−13.1	−17.2

CORPORATE PROFITS

Earnings from operations not the only factor in companies' profits

In addition to their profits from carrying goods and passengers, the railroad companies derive income from other sources, such as operation of nontransport enterprises or ownership of stocks and bonds. From their gross receipts they must make deductions, not only for the expenses, taxes, and rents which have been discussed, but on other accounts, such as interest on indebtedness. The amounts available for distribution to stockholders or improvement of their equity are not determined solely by the net earnings from the conduct of a railway business. Receipts from other quarters must be added, and from the resulting total various items must be subtracted, to arrive at what accountants call the net income of the corporations.

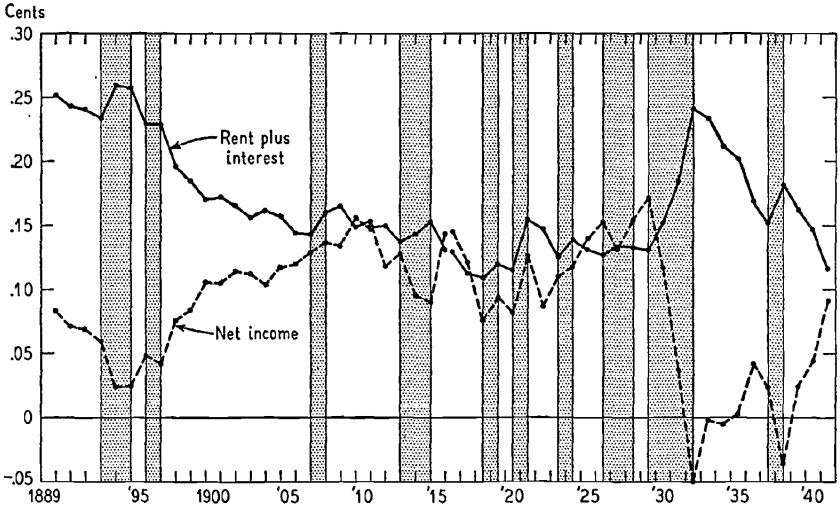
Fixed charges left a highly variable residual

The largest items in the accounting transition from net railway operating income to net income are two deductions—rent for leased roads and interest. Their size is fixed, for the most part, by contracts with lessors and bondholders, running for many years; it is not affected much by changes from one year to the next in traffic or operating profits. Consequently, the average burden of fixed charges imposed on the revenue from a unit of service performed usually became heavier in contractions, lighter in expansions (Chart 121).[18] Since unit net operating income ordinarily varied directly, and unit deductions inversely with traffic, one might expect that net income per traffic unit would also rise and fall with traffic.

[18] Data pertain to all operating roads 1890–1911, Class I line-haul 1911–41. To compute net income for operating roads only we had to tabulate their receipts from other sources from data for individual companies, 1890–1907. Table III-B in *Statistics of Railways* for those years shows income from lease of road, stocks, bonds, and miscellaneous for every road, including strictly lessor companies, in column 23, and the proportion of such income to all earnings and income, in column 24. We assumed that any road for which the proportion was under 100 percent was an operating road. The totals obtained for all such roads were added to 'earnings from operation'; total operating expenses and fixed charges of operating roads were then deducted to get net income.

CHART 121

Rent for Leased Roads Plus Interest, and Net Income, per Traffic Unit, 1890–1941



Shaded periods are contractions in traffic units.

In the war period, however, the expectation does not hold, for the customary link between operations and profits was broken. Class I railroads, with a few minor exceptions, were operated for the account of the federal government, and most of such net operating income as there was accrued to it. Whether current operating profits were high or low, the companies received for the use of their properties a 'standard return' equal, with some modifications, to previous average earnings from operation. This arrangement prevailed through the first two months of 1920 also. During the next six, although the companies were again in charge of their lines, the government promised to pay them the amount by which their current profits might fall short of one-half the standard annual return. Actual earnings were far below it, and they collected about $600,000,000 under the guarantee. In these three years, a fairly stable income from the government largely replaced net operating income in the corporate accounts (Table 128). The substitution affected the net change in the ratio of corporate earnings to traffic not only in 1918–19 and 1919–20 but

also in 1915–18 and 1920–21. Net income per unit did not rise and fall with traffic in these phases and would not have done so even if the usual positive relation between traffic and operating profits had existed.

Table 128
Corporate Income Accounts, 1917–1922: Selected Items
(Millons of dollars)

	1917	1918	1919	1920	1921	1922
Net railway operating income[a]	934	−45	−57	68	601	760
Income from lease of road[b]	4	893	912	165	28	6
Miscellaneous income[c]	2	14	16	602	38	1
Dividend income	123	92	90	109	162	134
Net income	593	387	447	431	314	370

Class I line-haul companies. Includes accounts of roads not controlled by Railroad Administration.

[a] Since these are corporate accounts, they do not include net railway operating income accruing to the government in 1918, 1919, and the first two months of 1920. It was negative in 1918 and 1919 because corporations whose properties were taken over continued to have some expenses and taxes of their own, and even, for some mysterious reason, a small balance of equipment and joint facility rents payable.

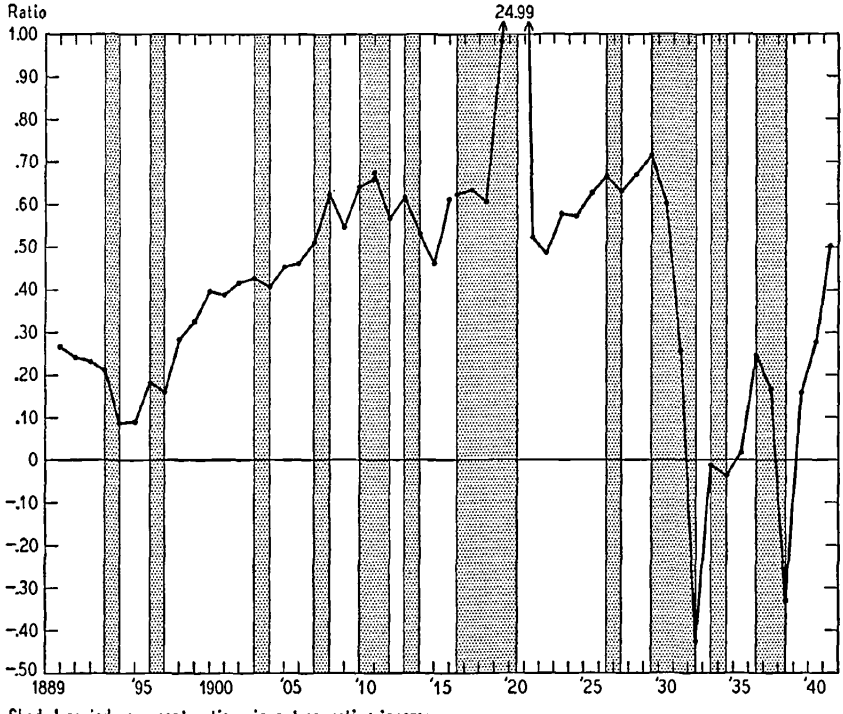
[b] Includes standard return paid by government for period of federal operation.

[c] Includes amounts due or received on account of federal guarantee of earnings under private operation, March–August 1920. "It should be noted that although, under our accounting rules, the income estimated as necessary to make good the guarantee is accruable as miscellaneous income, many of the carriers so accrued only the actual advances received . . . " (*Statistics of Railways*, 1920, p. XL). Further settlements probably account for the somewhat abnormal level of this account in 1921.

In 10 of the 15 other phases, however, there was a net rise when traffic expanded and a net fall when it contracted (Chart 121). The 5 exceptions were 1907–08, 1908–13, 1921–23, 1923–24, and 1926–28. The rise in 1923–24 was less rapid than in the following expansion. The net increase in 1926–28 was less than in 1924–26 or 1928–29. Traffic was only a little larger in 1927 than in 1928; if we had called the earlier year the trough, there would have been no exception, for unit net income fell in 1926–27, rose in 1927–29. It is fair to say that the relation between traffic and unit net income was positive, although it was not as close as the inverse relation between traffic and fixed charges. The difference in regularity arose largely from imperfections in the positive relation of unit operating profit to traffic.

CHART 122

Ratio of Net Income to Net Operating Income, 1890–1941



Shaded periods are contractions in net operating income.

While aggregate net income was more variable, with fair consistency, than traffic, it was more variable than operating profit with greater consistency. Since the principal items affecting corporate earnings are fluctuating operating profits on the one hand and stable fixed charges on the other, the deduction of rents and interest, along with minor additions and subtractions, should cause aggregate net income to rise and fall by larger percentages than aggregate net operating income during phases of the latter. Again this relation cannot be expected to hold good in phases affected by the war arrangements—in this case a contraction from 1916 to 1920 and an expansion from 1920 to 1923.[19] In the latter, the standard return affected only the initial year; the rest

[19] In the combined net operating income of the Railroad Administration and the corporations, not the corporate figure in Table 128.

The 1919–20 expansion drops out of sight in annual data.

of the phase does show an (irregularly) rising ratio of net income to net operating income, as do all the other expansions. Except from 1916 to 1920, the ratio fell—i.e., net declined by a larger percentage than net operating income—in all contractions of the latter except 1907–08 (Chart 122).[20]

Return on net worth rose and fell with traffic

In judging the profitability of a business, managers and stockholders are likely to consider not only the aggregate net income but also its relation to the money invested in the enterprise. If the return at the beginning of an expansion was 3 percent of the net assets and the latter were subsequently doubled, aggregate corporate profits 20 percent higher than at the beginning would amount to only 1.8 percent of the enlarged investment, hardly an attractive rate of return on venture capital. It is therefore of interest to examine the rate of return as well as aggregate or unit corporate earnings.

In the railroad industry, however, net investment is not likely to change rapidly. Most of the assets consist of plant and equipment, which take time to build and, once constructed, have long actual or potential usefulness. Most of the liabilities are similarly inflexible. Long-term bonded indebtedness is important. The depreciation reserve, another deduction from assets, changes slowly and is more or less independent of traffic. Consequently, net worth, the difference between assets and liabilities, also changes gradually. Profits grew faster than net investment in traffic expansions, and shrank more rapidly in contractions, for the rate of return on net worth usually increased in the former, diminished in the latter (Chart 123).[21] The movement of the curve

[20] All operating roads 1890–1911, Class I line-haul 1911–42.

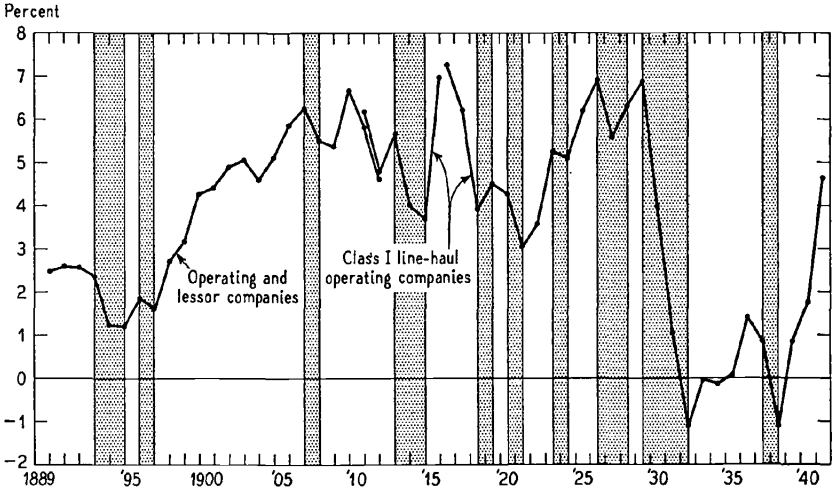
[21] We have computed net worth from balance sheet data. For the 1911–42 segment, long-term debt, current liabilities, deferred liabilities, and unadjusted credits (including reserve for depreciation) were deducted from total assets. For 1890–1912 capital stock and profit and loss were added. It would have required enormous labor to obtain separate figures for operating roads, 1890-1907, but it seems likely that the ratio for them would vary in the same manner as that shown. For consistency the earnings figures used include the net income of nonoperating roads and differ in this respect from the net income used in computing data for Charts 121 and 122.

The net worth figure we use for any year is the average of figures for the beginning and end of the year. We had to estimate the Class I figure for the beginning of

from 1917 through 1921 should be ignored because of the unusual conditions previously described.[22]

CHART 123

Percentage Ratio of Net Income to Net Worth, 1890–1941



Shaded periods are contractions in traffic units.

1910–11; it was assumed to bear the same proportion to the figure for 'operating and lessor' companies as prevailed at the end.

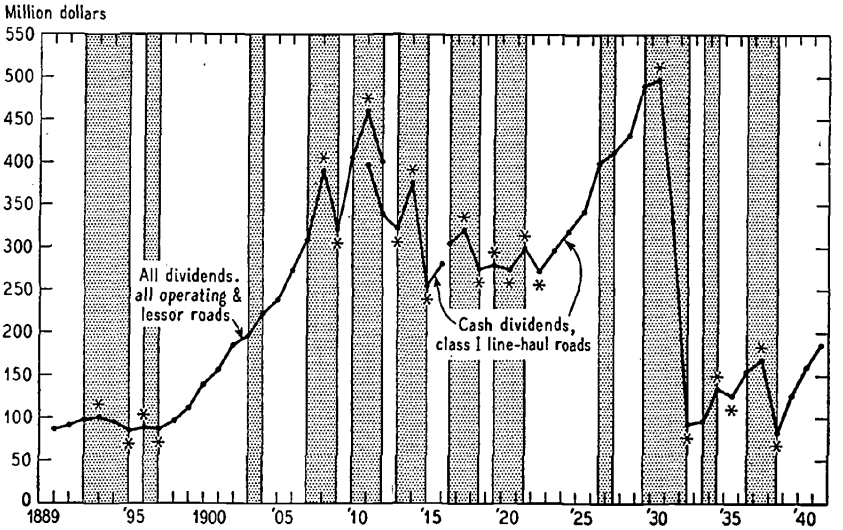
The basic statistics on assets and liabilities are imperfect. Those used for the first segment are incomplete—some roads are omitted. Railway capital accounting was sometimes loose or fraudulent in the early years; the results persisted, to a diminishing degree, in later balance sheets. Depreciation charges were small. The net worth does not accurately represent the dollars actually invested minus the amounts actually advanced by creditors and minus a reasonable depreciation charge. It seems unlikely, however, that truer data would show much greater variability from year to year than those we are obliged to use. Our main point is therefore not affected by the crudity of the accounts.

Perhaps it is unnecessary to add that the 'rate of return' discussed here differs in concept from that which appropriately figures in regulatory proceedings where the fairness or adequacy of the return on investment devoted to transportation only, whether financed by borrowing or otherwise, is in question.

[22] The rate of return was even more closely related to cycles in net income itself. Even outside of the period 1917–21, net income and traffic sometimes changed in opposite directions; for example, from 1903 to 1904 or 1927 to 1928. But net income and its ratio to net worth rose and fell together year by year, except from 1923 to 1924, even in the war period. Whenever corporate profit increased, net assets did not accumulate as fast; whenever it fell, they did not, with the one exception, diminish as fast.

CHART 124

Railway Dividends, 1890–1941



Shaded periods are contractions in net income.

Dividends less variable than corporate earnings

Growing net income enhances the prospect of cash distributions to stockholders; diminishing net curtails it. In good years, however, directors often fail to pay all current earnings out; in lean years, they sometimes draw upon assets previously built up to maintain disbursements to the equity owners. Yet variations in net income are reflected, by and large, in dividends, although this may not be obvious at once from the annual data to which we are confined (Chart 124). Broadly speaking, from 1893 to 1938 each expansion or contraction of profits can be paired with a similar change in payments. To do this we must sometimes match a phase of the former with a phase of the latter beginning and/or ending a year later. For example, we regard the dividend contraction of 1908–09 as corresponding to the income contraction of 1907–09, the dividend expansion of 1935–37 to the income expansion of 1934–36. In some instances the phase of disbursements we assign to an expansion of profits occurred entirely in subsequent years when earnings were contracting. Thus we think of the 1913–14 growth of dividends as a directors' reaction to the 1912–13 ex-

pansion of net income. In one case we meet a similar problem in trying to match contractions; we solve it by pairing the 1934–35 decline in payments with the 1933–34 decline in profits.

The 1903–04 and 1926–27 contractions, it is true, have no analogues in payments. But the trough of net income in 1904 was well above that in 1897, the peak in 1903 below that in 1907. Likewise 1927 was higher than 1921 and 1926 lower than 1929. We can think of 1897–1907 and 1921–29 as continuous if somewhat irregular expansions in profits, and link them with 1897–1908 and 1922–30 in dividends.

In one brief period, on the other hand, we are unable to make out any kind of correspondence. If we regard either the slight 1919–20 or the somewhat larger 1921–22 fall in dividends as a response to the 1919–21 contraction of earnings, we are still left with two phases in payments to stockholders neither of which has any equivalent in net income.

We find 20 instances of corresponding peaks or corresponding troughs. In 11 the turn in dividends appears one year later than that in earnings; in the other 9 they coincide.[23] Frequent lags are to be expected. Directors usually meet at regular intervals to declare (or omit) dividends. Profits may reverse their direction considerably before the customary occasion for recognizing any change. Income for a period cannot be computed until the accounts are closed; action based on full information is not possible until early in the next period. Many directors no doubt follow a policy of withholding payments in good times to preserve their regularity in bad times, but may later abandon that objective if profits fall off severely. The expansion in dividends resulting from a short expansion in income may easily be thrown over into the following contraction of income. Quarterly data, however, would probably reveal a closer correspondence in time.

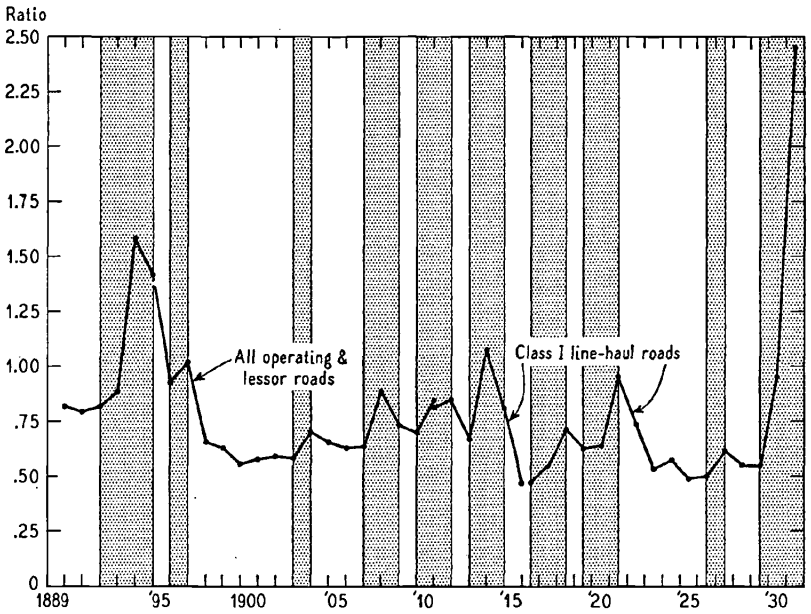
The 1907–08 lag in disbursements helps to explain the failure of net income to decline relatively to net operating income in that contraction. Dividends received (chiefly from other roads) are the largest single addition to operating income in the computation of corporate income. Like dividends paid, they increased from 1907

[23] We pair the 1922 rather than the 1920 low point in dividends with the 1921 low in income; if we choose 1920 instead, we have 10 lags, 1 lead.

to 1908, then fell to 1909. If they had been curtailed promptly, net income might have fallen more than net operating income.

CHART 125

Ratio of Dividends to Net Income, 1890–1931



Shaded periods are contractions in net income.

Partly, at least, because of the lag, dividends have not risen or fallen by as large a percentage as net income during expansions and contractions in the latter. From 1892 to 1929 there was a net decline in the ratio of payments to profits in every expansion, a net increase in every contraction (Chart 125). Although net income finally became a net deficit, for all roads taken together, in 1929–32 and 1936–38, disbursements to stockholders were still made, in reduced quantities (line (7) and (8) of Table 129). A reduction of the deficit from $139 million in 1932 to $6 million in 1933 was accompanied by an increase of only $3 million in dividends, a deepening of the deficit in 1934 by larger dividend payments. From 1934 to 1935 payments to owners were reduced although the deficit became a surplus. As the improvement continued, the ratio fell from the extremely high figure of 16.75 in 1935 to 0.94 in 1936, still an abnormally high figure.

Dividend Appropriations compared with Net Income before Dividends
Class I Line-haul Railroads, 1931–1939
(Dollar figures in thousands)

	1931	1932	1933	1934	1935	1936	1937	1938	1939
Roads Having Negative Net Income but Making Dividend Appropriations									
(1) Net income	−25,628	−23,239	−2,216	−3,347	−2,568	−338	[a]	−2,056	−226
(2) Dividends	26,302	2,991	531	231	1,851	100	[a]	643	462
Roads Having Positive Net Income but Making Appropriations in Excess of Income									
(3) Net income	117,693	17,296	5,578	18,970	18,826	66,679	13,678	6,891	1,800
(4) Dividends	210,670	24,563[b]	9,967	52,126	36,492	72,360	18,970	10,558	2,161
(5) Excess dividends, (4) − (3)	92,977	7,267	4,389	33,156	17,666	5,681	5,292	3,667	361
Both Groups of Roads									
(6) Dividends not currently earned, (2) + (5)	119,279	10,258	4,920	33,387	19,517	5,781	5,292	4,310	823
All Roads									
(7) Net income	134,762	−139,204	−5,863	−16,887	7,539	164,630	98,058	−123,471	93,182
(8) Dividends	330,151	92,354	95,726	133,419	126,282	154,514	167,902	82,733	125,944
Ratios									
(9) Dividends to income, all roads, (8) ÷ (7)	2.45	[c]	[c]	[c]	16.75	.94	1.71	[c]	1.35
(10) Deficit-road dividends to all dividends, (3) ÷ (8)	.080	.032	.006	.002	.015	.001	.000	.008	.004
(11) Unearned to all dividends, (6) ÷ (8)	.361[d]	.111[d]	.051	.250	.155	.037	.032	.052	.007

Dividend figures exclude noncash dividends, include appropriations from income and from surplus. The latter distinction has little meaning. Some roads carry all net income to and make all dividend appropriations from surplus.

[a] No roads with negative income made appropriations.

[b] Includes −$8,148,000 "representing an adjustment of appropriations from income in the previous year" by one road.

[c] Not computed; signs of income and dividends differ.

[d] If the road mentioned in note b had reported $8,148,000 less dividends in 1931 instead of making an adjustment in 1932, data for it would not be included in (3), (4), or (5) for 1931, as they are above. This ratio would be .357 for 1931 and .183 for 1932.

The data for most of the depression years may suggest that railroads paid dividends even when they were losing money. This was true only in part. The deficit is an algebraic total in which the profits of some roads are masked by the losses of others. Companies with deficits contributed a very small percentage of all dividends. Some companies, with positive income, appropriated for dividends larger sums than they earned. Even when appropriations of the first group are combined with excess appropriations of the second, the fraction of all dividends accounted for is minor. Most dividends were earned in every year, although the unearned portion was as high as 36 percent in 1931.