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CHAPTER 3

Some Needed Composite Measures of Traffic

WHY THEY ARE NEEDED

In the preceding chapters we have concerned ourselves with relations between the cyclical condition of the American economy and the two principal kinds of railway traffic. Now we would like to inquire into the effect of cycles in traffic itself on railway operations, employment, costs, and profits. Some of the matters we would like to study have a bearing on the widely held belief that prosperity can be assured, and contractions avoided, by raising wage rates. Higher wages are supposed to increase 'purchasing power'; larger sales to wage-earners lead to greater production and rising employment. If prices of goods offered to consumers rise correspondingly, these benefits will not be realized. But prices need not rise, for cost per unit of goods produced, according to the more fully elaborated versions of the theory, tends to fall as output grows.[1] At this point the argument raises important factual questions. Does unit cost vary inversely, in general, with output? If so, how much? If production doubles, is expense per unit cut 50 per cent, or only 10 per cent? Does cost diminish indefinitely, or does it begin to rise when volume reaches a critical level?

The possibility of an eventual increase in cost has received considerable attention in systematic discussions of prosperity and depression. According to a now common theory, unit costs tend to rise toward the end of a business expansion, and to fall toward the end of a contraction; unit profits are thought to vary in the opposite way.[2] If changes in cost and profit really follow this

[1] For examples of purchasing power doctrines see *The State Papers and Other Public Writings of Herbert Hoover*, edited by W. S. Myers (Doubleday Doran, 1934). pp. 136–7, 145; *The Public Papers and Addresses of Franklin D. Roosevelt*, edited by Samuel I. Rosenman (Random House, 1938), II, 133, 205, III, 127; William Green and others, *American Federationist*, April 1936, pp. 396–7, Dec. 1937, p. 1292, Feb. 1938, p. 193, April 1938, pp. 367–8, July 1938, p. 693, Aug. 1938, p. 805; Phillip Murray, *New York Times Magazine*, Dec. 15, 1946, pp. 11, 56, 58; Mordecai Ezekiel, *Jobs for All Through Industrial Expansion* (Knopf, 1939), p. 14.

[2] For descriptions, expositions, or acceptances of this theory see Wesley C. Mitchell, *Business Cycles* (University of California Press, 1913), pp. 475–83, 494–503,

pattern they might explain the advent of recession and recovery, at least in part, for they could affect the willingness of business men to invest in plant and equipment, and the change in cost, if reflected in prices, might influence the volume of purchases by consumers.

The cyclical pattern of cost and profit deserves investigation in every sector of business. The relative richness of the data in the railroad sector enables us to study it there in unusual detail. Anything we can learn may be suggestive of conditions in other industries where capacity is flexible and the ratio of investment to revenue is high. Our findings should be pertinent to the specific problems of railway economics also. In an expansion rising prices sometimes move the railroad companies to propose higher rates and fares. If the growth of traffic tends to neutralize the effect on cost of advancing prices, regulatory authorities may feel justified in withholding or restricting their approval. If unit cost tends to rise in contraction they may be reluctant to order the rate reductions business men and farmers are likely to demand.

The cost of running a railroad, however, cannot be investigated realistically for each class of traffic separately. Much railway labor contributes simultaneously to the performance of both freight and passenger service. Many outlays are incurred in the interest of both. If we wish to analyze the effect of variations in traffic on operations, costs, etc., we must somehow add the two kinds together. Ideally, indeed, we should do more. Railroads carry not only people and freight but also baggage, mail, express matter, and milk and cream.[3] They derive some revenue from the operation of dining cars and from other incidental services, not all of which are

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562–9, and *Business Cycles and Unemployment* (NBER, 1923), pp. 10–1; Thorstein Veblen, *The Theory of Business Enterprise* (Scribner, 1915), pp. 198–201; J. M. Clark, *The Economics of Overhead Costs* (University of Chicago Press, 1923), p. 397; D. H. Robertson, *Banking Policy and the Price Level* (King, London, 1926), pp. 9–10; A. B. Adams, *Profits, Progress, and Prosperity* (McGraw-Hill, 1927), p. 159; J. Lescure, *Des Crises Generales et Periodiques de Surproduction* (Loviton, Paris, 1932), p. 453; J. M. Keynes, *The General Theory of Employment, Interest, and Money* (Harcourt Brace, 1935), pp. 98, 317; J. W. Angell, *Investment and Business Cycles* (McGraw-Hill, 1941), pp. 92–3; J. A. Estey, *Business Cycles* (Prentice-Hall, 1941), p. 111; Gottfried Haberler, *Prosperity and Depression* (League of Nations, 3d ed., 1941), pp. 108–10.

[3] These dairy products are carried mostly in passenger or specially assigned trains; such movement is not usually included in ton-miles.

rendered on trains. If we could, we would add in all these activities to measure the total service to the public. In fact, however, continuous physical statistics on the volume of mail, express, or milk transported, the number, size and quality of meals, etc., do not exist, and we must omit them from consideration. We console ourselves with the thought that ton-miles and passenger-miles account for about 90 per cent of total revenue.

TRAFFIC UNITS BY MONTHS

How are we to combine even these two items? It would not seem right to count a passenger-mile as the equivalent of only one ton-mile. Among other reasons, it usually brings in between two and three times as much revenue. We could discuss the problem of proper combination at great length, and perhaps work out different methods for different purposes. Instead we have cut the knot, perhaps arbitrarily, by equating one to the other in accordance with the average earnings derived from each.

Since the revenue from one has changed relatively to that from the other over the years, it seemed preferable, at first, to strike a fresh average ratio of revenue per ton-mile to revenue per passenger-mile for every cycle. Then we would have an equating factor more or less contemporary with the activities being equated. But when we followed this procedure we encountered trouble in comparing phases belonging to different cycles. Finally we decided to regard a passenger-mile as the equivalent at any time of 2.4 ton-miles; this figure is the approximate average revenue ratio during the sixty-one years 1882–1942. We multiplied passenger-miles in every month by this factor and added the product to ton-miles.[4] The computations for January 1910 illustrate the process:

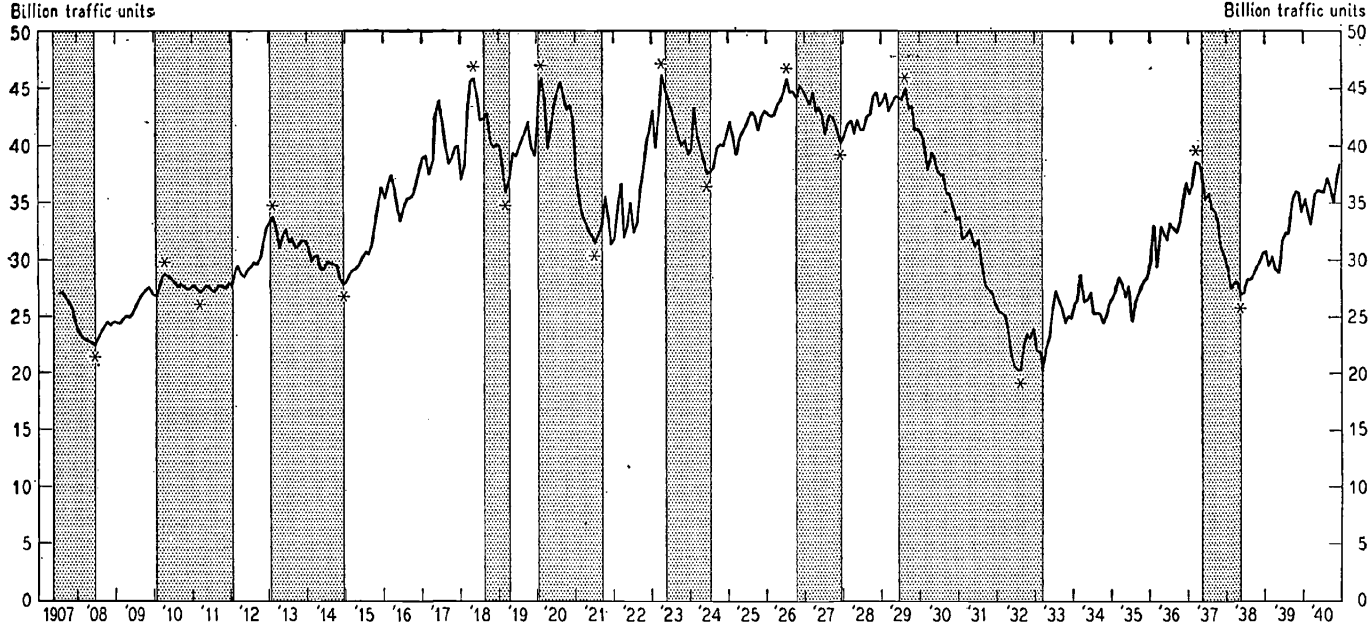
(1) Passenger-miles	2.589 billions
(2) 2.4 × (1)	6.21 billions
(3) Revenue ton-miles	20.58 billions
(4) Sum of (2) and (3)	26.79 billions

The specific cycles in traffic units (Chart 31) correspond in number with those in ton-miles (Chart 7) and there are no large

[4] Data used: July 1907–February 1919: Babson estimates of revenue ton-miles; passenger-miles as estimated in Chapter 2. March 1919–December 1919: Babson estimates; passenger-miles as reported by the ICC. January 1920–December 1938: revenue ton-miles and passenger-miles as reported by the ICC.

CHART 31

Traffic Units, July 1907—December 1940



Shaded periods are reference contractions.

differences in turning dates. In 1908 a trough in traffic units came 4 months after one in freight movement. In 1913 a peak in composite traffic came 3 months before one in the movement of freight. In five cases there was an interval of one month, and in ten there was none. Since in this period the cycles in ton-miles did not differ much from the reference cycles, it is not surprising that the latter can readily be matched by cycles in traffic units.

Table 23
Traffic Units, 1911–1942

	Level of business	Traffic units			Level of business	Traffic units	
		All roads[a]	Class I line-haul roads[b]			All roads[a]	Class I line-haul roads[b]
		(millions)				(millions)	
1911	Trough	333,834	328,505	1926	Peak	P 533,452	P 529,958
1912		343,962	338,510	1927	Trough	513,501	518,507
1913	Peak	P 385,327	P 380,039	1928		T 512,559	T 509,705
1914		373,883	368,923	1929	Peak	P 525,328	P 522,832
1915	Trough	T 355,432	T 351,163	1930		450,613	448,610
1916		426,196	421,630	1931		363,953	362,427
				1932	Trough	T 276,289	T 275,217
1916		451,088	446,488	1933		290,114	288,932
1917		494,944	490,394	1934		313,856	312,531
1918	Peak	P 512,962	P 509,084	1935		328,262	326,934
1919	Trough	T 480,087	T 476,943	1936		395,333	393,729
1920	Peak	P 527,908	P 524,149	1937	Peak	P 422,355	P 420,532
1921	Trough	T 400,442	T 397,511	1938	Trough	T 344,081	T 342,642
1922		428,528	425,477	1939		390,136	388,480
1923	Peak	P 508,583	P 504,963	1940		432,789	430,995
1924	Trough	T 479,628	T 476,116	1941		548,474	546,392
1925		504,617	501,172	1942		770,576	768,375

P or T indicates peak or trough in traffic units themselves.
[a] Sum of revenue ton-miles and 2.411 × passenger-miles.
[b] Sum of revenue ton-miles and 2.430 × passenger-miles.

TRAFFIC UNITS BY YEARS

As no monthly data on passenger-miles—not even estimates—are available prior to July 1907, it was impossible to compute traffic units by months before that time. Even afterwards, many of the things with which we would like to compare traffic are represented only by annual figures. There are no monthly records of railway employment before 1921, and none of railway corporate profits after interest and the like until 1935. We therefore need some annual measures of composite traffic, and have prepared two sets, one for all roads from 1882 to 1942, and the other for Class I

roads from 1911 to 1942. For all operating roads, the average ratio of annual revenue per passenger-mile to annual revenue per ton-mile from 1882 to 1942 was 2.411. Accordingly, we multiplied passenger-miles in each year by 2.411 and added the product to ton-miles. Similarly, for Class I roads the average ratio from 1911 to 1942 was 2.430. Traffic units for them were computed by applying this ratio.

Table 24

Traffic Units, All Roads, 1882–1913, and Change per Year between Reference Peaks and Troughs

Year ending June 30	Level of business	Years from prec. peak or trough	Traffic units†	Change from preceding peak or trough		
				Total	Per year	
					To peak from trough	To trough from peak
			(millions)			
1882	Peak		57,838			
1883			64,657			
1884			65,891			
1885	Trough	3	71,174	13,336		4,445
1886			76,092			
1887	Peak	2	87,045	15,871	7,936	
1888	Trough	1	92,405	5,360		5,360
1889			97,525			
1890	Peak	2	109,384	16,979	8,490	
1891	Trough	1	113,317	3,933		3,933
1890	Peak		104,773			
1891	Trough	1	112,041	7,268		7,268
1892			120,459			
1893	Peak	2	P 127,894	15,853	7,926	
1894	Trough	1	114,786	−13,108		−13,108
1895			T 114,613			
1896	Peak	2	P 126,789	12,003	6,002	
1897	Trough	1	T 124,691	−2,098		−2,098
1898			146,337			
1899			158,846			
1900	Peak	3	180,265	55,574	18,525	
1901	Trough	1	188,917	8,652		8,652
1902			204,762			
1903	Peak	2	223,649	34,732	17,366	
1904	Trough	1	227,378	3,729		3,729
1905			243,845			
1906			276,556			
1907	Peak	3	P 303,432	76,054	25,351	
1908	Trough	1	T 288,501	−14,931		−14,931
1909			288,985			
1910	Peak	2	332,984	44,483	22,242	
1911	Trough	1	333,834	850		850
1912			343,962			
1913	Peak	2	P 385,327	51,493	25,746	

P or T indicates peak or trough in traffic units themselves.

† Sum of revenue ton-miles and 2.411 × passenger-miles.

Beginning with 1913–15 every specific phase in annual traffic units (all roads or Class I) corresponded to one in the reference chronology, and vice versa (Table 23). With a slight exception, moreover (traffic was a trifle lower in 1928 than 1927), the peak and trough years are the same as in the reference system. Prior to 1913, however, traffic diminished in only three of the business contractions—1893–94 (there was a further slight decline to 1895), 1896–97, and 1907–08 (Table 24). The growth in railway business continued without interruption in 1882–85, 1887–88, 1890–91, 1900–01, 1903–04, 1910–11. In every one of these six phases, however, it was retarded. In attempting to determine what disturbances in other aspects of the railway industry accompany cycles in traffic, we can begin our inquiries no earlier than 1893–95, and will have to regard 1897–1907, and likewise (when we use annual data) 1908–13, as one long expansion.

The cycles in annual traffic units are identical with respect to number and dates with those in annual ton-miles, with few exceptions. There are two trough-to-trough cycles in freight traffic from 1908 to 1915 but only one in composite traffic. Ton-miles reached bottom in 1894 rather than 1895 and in 1927 rather than in 1928. On both occasions, obviously, passenger traffic continued to decline after freight traffic had ceased to do so.