

hand it is augmented by the fact that short haul rates are usually higher than long haul for the same service. Even this consideration, however, will not hold at the present day for suburban steam traffic, because it is being terribly crippled by electric suburban railways. On the whole, it is probably still true for a road of considerable length of general traffic, not largely suburban.

This view is upheld by the following table, of the internal traffic of New York city:

Year.	Population.	Trips per year per inhabitant, (n).	Value by Formula
1860	814,000	45	45
1870	942,000	122	60
1880	1,206,000	175	99
1885	1,393,000	213	132

By which we see that the gross returns exceeded the ratio of $(\text{population})^2$, but as the length of haul also increased it is probable that the net revenue about followed the law given. The following table, also, of a broader and more general character, confirms the view given:—

TABLE I.

SHOWING INCREASE OF POPULATION AND RAILWAY EARNINGS IN UNITED STATES AND CANADA, 1870 TO 1895.

	Year.	Miles of Railway.	Gross Earnings $\div 10,000$	Population $\div 100,000$	(Col. iv.) ^a	Rates of Col. iii. Col. v.
Canada.	1875	4,300	\$1,958	39.	1,521	1.29
	1880	6,800	2,355	43.	1,849	1.27
	1885	10,200	3,223	45.	2,025	1.59
	1890	13,100	4,680	48.	2,304	2.03
	1895	16,091	4,680	51.	2,601	1.79
U.S.A.	1870	54,000	37,000	385.	148,225	.249
	1875	74,000	50,000	440	193,600	.258
	1880	94,000	60,000	501	251,000	.239
	1885	128,000	77,000	565	319,225	.241
	1890	166,000	120,000	626	391,876	.307
	1895	180,000	107,500	690	476,100	.222

This table shows (assuming that the population served per mile of railway increases in the same proportion as the population of the country as a whole does) that the gross earnings, both in Canada and the United States, have increased more rapidly than the $(\text{population})^2$; however, the rapid falling off from 1890 to 1895 in both countries suggests that this may not entirely hold true in the future.

As another indication of the same law, compare Canada and United States for 1895. (See Table II.)

	Gross Earnings per Mile.	(Pop. per mile of Railway)
Canada	\$2,908	(317) ^a = 100,489
U.S.A.	5,945	(382) ^a = 745,924

Which shows that the gross returns per mile of railway are even more than in the proportion of "square of population per mile of railway."

In any given case it will be difficult to estimate the actual tributary population, which may be decreased by competition, increased by feeders or affected by industrial conditions, but if applied on a large scale to eliminate irregularities, we may look on it as quite accurate enough to guide us in comparisons of routes. Thus, supposing a railway by altering its general location can be made to serve 1,200,000 people instead of 1,000,000, we may estimate its gross returns to be increased from 100 to 144, or 44 per cent., while if the road is not materially longer, or poorer physically, the increase in operating expenses will be much less in proportion.

Revenue is often considered to be injured by a long line between terminals, but this is, largely, a mistaken idea; the only case in which it is true is when

there is keen competition between two places, by two or more routes, in which case the rate is fixed by the shorter line, but in non-competitive and local traffic, or even in the case of a road forming one link in a trunk line, rates are fixed by the mile or divided on a mileage basis, so that if a road can be located through more populous districts, built cheaper or with lighter grades, then the advantages of higher traffic charges, greater volume of traffic, less working expenses and fixed charges may any or all be in favor of the longer line. Incidentally, in Canada bonuses are often given on a mileage basis. These remarks apply only to moderate increases in length of line of from 5 to 10 per cent.

The folly of long tangents, creating more first cost, and often missing local traffic points, is a blunder somewhat common; the idea of serving the public by passing through the *very heart* of each populous district should be more fully appreciated, for ultimately, whatever traffic a road may have is from door to door, including cartage and bus fares; most evidently is this so at competing points. But the most important effect is that a good railway service convenient to the public will foster and increase traffic, while a town given the go-by for the sake of saving a little in land damages, or distance, has often had its prospects blighted forever; it is most important that a road should establish large roomy depots and obtain plenty of yard room, while land is inexpensive, in anticipation of future growth on the part of any prosperous town. Wellington estimates the loss of traffic for each mile a depot is distant from the centre of population at from 10 per cent. to 25 per cent., being greatest at competing points and in manufacturing towns.

TRUNK LINES.

Most trunk lines are liable to suffer from competition, and, to protect themselves, buy or build feeders, and this has concentrated railways into large systems, but a general rule is to link together the largest possible population, quite regardless of minor losses in distance. The limit should never be approached when the increase in revenue is no greater than the increase in length of line, or when differences of distance are so great as to discourage traffic or encourage the construction of a competing road, and an exception might also be made in the case of being able to pass midway between two towns and serve them fairly well by branches.

The N.Y.C. & H.R.R. is a striking example of a road much longer than any of its competitors, but with light grades and a heavy tributary population, it is largely independent of its through traffic, and can handle it as "excess traffic" at a very low rate; on the other hand, the Pennsylvania R.R., soon after its completion west, built feeders in every direction, and thus held traffic that would otherwise soon have passed into other hands owing to its heavy grades.

Other general conclusions regarding trunk lines are:

(1) That they should never attempt to make a small sea or lake port a terminal, but have the largest possible terminals even at the expense of considerable extra distance. As instances of this, witness the Intercolonial making arrangements to enter Montreal, the Erie Railway abandoning Dunkirk as a terminal and building into Buffalo, and the Mexican National attempting to establish a port at Corpus Christi, instead of Galveston, which proved a failure.