



GUIANA

SCALE



AMAZONAS

Natal

Parahiba

RECIFE

Madreus

São de Ra Branca

MACEIO

Propria

São Felix

BAHIA

Colombia

Minas Orais

Epita
1849-2000

Caratinga
Rio
Pernambuco
Victoria

CASPOS

RIO DE JANEIRO

SÃO PAULO

OCEANO

ATLANTICO

PUBLIC AND PRIVATE OPERATION OF RAILWAYS IN BRAZIL

BY

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To
MY MOTHER

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APPENDIX

STATISTICAL TABLES

EXCHANGE VALUE OF THE MILREIS IN U. S. DOLLARS 1821-1930

<i>Year</i>	<i>Dollar</i>	<i>Year</i>	<i>Dollar</i>	<i>Year</i>	<i>Dollar</i>	<i>Year</i>	<i>Dollar</i>
1821.....	1.04	1848.....	.51	1875.....	.55	1902.....	.24
1822.....	.99	1849.....	.52	1876.....	.51	1903.....	.24
1823.....	1.03	1850.....	.58	1877.....	.50	1904.....	.25
1824.....	.98	1851.....	.59	1878.....	.47	1905.....	.32
1825.....	1.05	1852.....	.56	1879.....	.43	1906.....	.33
1826.....	.98	1853.....	.58	1880.....	.45	1907.....	.31
1827.....	.71	1854.....	.56	1881.....	.44	1908.....	.31
1828.....	.63	1855.....	.56	1882.....	.43	1909.....	.31
1829.....	.50	1856.....	.56	1883.....	.44	1910.....	.33
1830.....	.46	1857.....	.54	1884.....	.42	1911.....	.32
1831.....	.51	1858.....	.52	1885.....	.38	1912.....	.32
1832.....	.71	1859.....	.51	1886.....	.38	1913.....	.32
1833.....	.76	1860.....	.52	1887.....	.46	1914.....	.29
1834.....	.79	1861.....	.52	1888.....	.51	1915.....	.25
1835.....	.80	1862.....	.53	1889.....	.54	1916.....	.23
1836.....	.78	1863.....	.55	1890.....	.46	1917.....	.25
1837.....	.60	1864.....	.54	1891.....	.30	1918.....	.65
1838.....	.57	1865.....	.51	1892.....	.24	1919.....	.26
1839.....	.64	1866.....	.49	1893.....	.24	1920.....	.21
1840.....	.63	1867.....	.46	1894.....	.20	1921.....	.13
1841.....	.61	1868.....	.34	1895.....	.20	1922.....	.13
1842.....	.54	1869.....	.38	1896.....	.18	1923.....	.10
1843.....	.52	1870.....	.45	1897.....	.16	1924.....	.11
1844.....	.51	1871.....	.49	1898.....	.15	1925.....	.12
1845.....	.52	1872.....	.51	1899.....	.15	1926.....	.14
1846.....	.55	1873.....	.53	1900.....	.19	1927.....	.12
1847.....	.57	1874.....	.52	1901.....	.23	1928.....	.12
		1929.....	.12	1930.....	.11		

The exchange figures for 1821-1900 were furnished by Dr. James R. Mood, U. S. Department of Commerce. Those for 1900-1912 from: *Handbook of Foreign Currency and Exchange*, U. S. Department of Commerce, Bureau

of Foreign and Domestic Commerce, Trade Promotion Series, No. 102, by James R. Mood; those for 1913-1929 from *Commercio Exterior do Brasil*, Ministerio da Fazenda, Directoria de Estatistica Commercial, 1928-29, Rio de Janeiro, 1930, page IV; the 1930 average from *Federal Reserve Bulletin*, January, 1931, Washington, D. C., p. 32.

"Brazil adopted the gold standard in 1849; the milreis represented 821.778 milligrams of fine gold, and its par value was 26.934 d., or \$0.5463 United States currency. The gold milreis up to the present time has been exclusively a unit of account employed only in certain official transactions, such as the payment of a portion of the import duties. Payments nominally in gold milreis are made actually in paper milreis, at a premium depending upon the exchange value of the paper milreis.

"Decree no. 18257 of May 23, 1928 (published in the *Diario Oficial* of July 6, 1928) fixed the value of the gold milreis in relation to the paper milreis for the payment of public dues. In accordance with the terms of this decree calculations for the conversion of gold milreis in connection with the collection and repayment of duties, taxes, or any other collections or payments in gold by Brazilian public administrative branches will be made on the basis of 4.567 paper milreis to one gold milreis."—(*Handbook of Foreign Currency and Exchange*, p. 22.) This makes the present par value of the milreis 11.96 cents.

CLASS I RAILWAYS PAIRED FOR POSSIBLE SIMILARITIES

PRIVATELY OPERATED	GOVERNMENT OPERATED (Federal Government)
<p>1. <i>Companhia Paulista de Estradas de F.</i></p> <p>a. Operated by Brazilians</p> <p>b. Both broad and narrow gauge</p> <p>c. Large percentage of coffee</p> <p>d. All its territory well developed</p> <p>e. High freight traffic density</p> <p>f. High passenger traffic density</p> <p>g. Few curves and very moderate grades</p> <p>No privately operated road in its territory.</p> <p>2. Great Western of Brazil (North Brazil)</p> <p>a. Operated by British capital</p>	<p>1. <i>Estrada de Ferro Central do Brasil</i></p> <p>a. Operated by Brazilians</p> <p>b. Both broad and narrow gauge</p> <p>c. Small percentage of coffee</p> <p>d. Part of its territory very thinly settled</p> <p>e. Higher freight traffic density</p> <p>f. High passenger traffic density only in cheap suburban traffic</p> <p>g. Many curves and steep grades</p> <p>2. <i>E. F. Noroeste do Brasil</i></p> <p style="text-align: center;">(State Governments)</p> <p>There exists no large government-operated road north of the Federal Capital.</p>

- | | |
|---|--|
| 3. <i>Comp. Ferroviaria Este Brasileiro</i>
(North Brazil) | There exists no large government-operated road north of the Federal Capital. |
| 4. Leopoldina Railway
a. Operated by British capital
b. Narrow gauge | a. No comparable road in its territory; furthermore, a comparison of foreign and Brazilian operation would have no value from the point of view of this study. |
| 5. São Paulo Railway
a. Operated by British capital | a. Apart from the fact that it is British operated, it is in a unique position as the only rail outlet from São Paulo City in the main coffee-producing area to the port of Santos. No railroad with traffic conditions even remotely similar. |
| 6. <i>Companhia Mogiana de Estradas de Ferro</i>
a. Operated by Brazilians
b. Narrow gauge
c. Large percentage of coffee
d. Not all territory well developed
e. Moderate freight traffic density
f. Low passenger traffic density
g. Many curves and some steep grades | 3. <i>Estrada de Ferro Sorocabana</i>
a. Operated by Brazilians
b. Narrow gauge
c. Large percentage of coffee
d. Most of territory well developed
e. Higher freight traffic density
f. Higher passenger traffic density
g. Less curves and few steep grades |
| 7. <i>Cia. E. F. São Paulo Rio Grande</i>
a. Operated by Brazilians
b. Narrow gauge
c. Freight traffic not similar
d. Difficult terrain
e. Moderate freight traffic density
f. Moderate passenger traffic density | 4. <i>Viação Ferrea do Rio Grande do Sul</i>
a. Operated by Brazilians
b. Narrow gauge
c. Freight traffic not similar
d. Easier terrain
e. Higher freight traffic density
f. Higher passenger traffic density |

TABLE 1

Rede Sul Mineira UNDER PRIVATE AND PUBLIC OPERATION

Year	Traffic Density in thous. ton kil.	Expend. in thous. of mil.	Receipts in thous. of mil.	1910-1919, 1922-1928		Number Killed	
				Oper- ating Ratio	Percentage of Receipts from Freight Service		Percentage of Receipts from Passen. Service
1910...	23	3,076	3,475		54	21	12
1911...	26	3,555	3,996		53	25	7
1912...	20	3,816	4,881		53	26	4
1913...	16	4,781	5,445		52	26	4
1914...	18	4,775	5,474		51	26	6
1915...	22	4,962	5,963		55	22	16
1916...	19	5,460	6,021		49	24	11
1917...	18	6,146	5,836		48	27	4
1918...	17	4,061	6,294		47	25	5
1919...	18	6,864	8,028		49	23	14
Aver...	20	4,860	5,541	87	51	25	8.5
1922...	22	8,463	8,099		45	28	7
1923...	25	9,000	9,000		41	31	13
1924...	33	12,000	12,000		46	26	12
1925...	35	14,000	14,000		50	25	11
1926...	26	15,000	18,000		53	22	13
1927...	28	17,000	23,000		55	22	13
1928...	27	18,000	22,000		54	23	17
Aver...	28	14,000	16,000	112	47	25	12.2

The above figures were taken, or compiled, from data given in: *Estatística*, 1910, pp. 95-6, 132, 115, 146-7; 1911, pp. 155-7, 194, 176-7, 208-9; 1912, pp. 154-5, 192, 174-5, 206-7; 1913, pp. 110-11, 149, 130-1, 162-3; 1914, pp. 112-3, 154-5, 136-7, 168-9; 1915, pp. 112-3, 154, 136-7, 168-9; 1916, pp. 138-9, 202, 174-5, 224-5; 1917, pp. 100-1, 142, 124-5, 156-7; 1918, pp. 100-1, 142, 124-5, 156-7; 1919, pp. 142-3, 206, 178-9, 228-9; 1922, pp. 112-3, 154, 132, 136-7, 168-9; 1923, pp. 218-9, 267, 233, 314; 1924, pp. 232-3, 289, 249, 343; 1925, pp. 250-1, 309, 269, 363; 1926, pp. 260-1, 319, 281, 371; 1927, pp. 260-1, 315, 277, 367; 1928, pp. 284-5, 339, 303, 391.

The averages of expenditures and receipts for 1922-28 also includes the year 1929. These were taken from *Relatorio do Inspector Federal das Estradas de Ferro*, Anno de 1929, Rio de Janeiro, 1930, p. 156.

TABLE 2

Rede Sul Mineira

PERCENTAGES BY WEIGHT OF COMMODITIES HAULED

	1910	1919	1928		1910	1919	1928
Timber	—	1.7	2.3	Tobacco	3.0	3.3	0.7
Coffee	17.0	11.0	14.0	Cereals	7.0	1.3	3.0
Matte	—	—	—	Alcohol	2.0	—	—
Sugar	10.0	6.7	4.5	Dried Beef	—	—	—
National Textiles	—	0.4	—	Hides	—	—	—
Salt	9.0	7.7	3.4	Miscellaneous Un-			
Rubber	—	—	—	classified	47.0	50.0	58.0
				Cotton	—	—	—

These percentages computed from: *Estatística, 1910*, pp. 94-5; *1919*, pp. 142-3; *1928*, pp. 270-90.

TABLE 3

Rede Sul Mineira

RECEIPTS PER PASSENGER KILOMETER

1910-1928

(In milreis)

Year	Receipts	Year	Receipts	Year	Receipts	Year	Receipts
1910....	.049	1915....	.048	1920....	—	1925....	.063
1911....	.054	1916....	.050	1921....	—	1926....	.069
1912....	.050	1917....	.051	1922....	.068	1927....	.067
1913....	.061	1918....	.056	1923....	.062	1928....	.070
1914....	.055	1919....	.058	1924....	.062	1929....	—
Annual Average 1910-1919 .....						.053	
Annual Average 1922-1928 .....						.066	

Unless otherwise indicated — indicates data not obtainable.

TABLE 4
Rede Sul Mineira
 RECEIPTS PER TON KILOMETER
 1910-1928
 (In milreis)

Year	Receipts	Year	Receipts	Year	Receipts	Year	Receipts
1910....	.086	1915....	.130	1920....	—	1925....	.237
1911....	.082	1916....	.131	1921....	—	1926....	.300
1912....	.122	1917....	.131	1922....	.163	1927....	.296
1913....	.169	1918....	.141	1923....	.197	1928....	.311
1914....	.145	1919....	.173	1924....	.204	1929....	—
Annual Average 1910-1919 .....							.131
Annual Average 1922-1928 .....							.244

These figures were taken from *Estatística, 1910*, pp. 118-9; *1911*, pp. 180-1; *1912*, pp. 178-9; *1913*, pp. 134-5; *1914*, pp. 140-1; *1915*, pp. 140-1; *1916*, pp. 180-1; *1917*, pp. 128-9; *1918*, pp. 128-9; *1919*, pp. 184-5; *1922*, pp. 140-1; *1923*, p. 241; *1924*, p. 259; *1925*, p. 279; *1926*, p. 291; *1927*, p. 287; *1928*, p. 313.

TABLE 5
Rede Sul Mineira
 TESTS OF EFFICIENCY
 1910-1928

	1910	1911	1912	1913	1914	
I. Percentage Serviceable Locomotive ...						
II. Net Car Kilometers per Car Day	52	25	30	19	18	
III. Net Ton Kilometers per Car Day	570	340	260	130	130	
IV. Locomotive Kilometers per Locomotive Day	72	71	68	63	63	
V. Fuel Costs per 1000 Locomotive Kilometers. (In milreis)	—	—	—	479	338	
VI. Percentage Available Freight Capacity Utilized	—	—	—	44	42	
VII. Percentage Available Passenger Capacity Utilized	22	29	37	30	25	
	1915	1916	1917	1918	1919	Aver.
I.						
II.	25	18	25	25	22	26
III.	163	160	160	160	180	223
IV.	67	69	78	93	86	73
V.	285	349	425	395	445	391
VI.	34	37	31	31	38	37
VII.	31	27	30	24	27	28

	1923	1924	1925	1926	1927	1928	Aver.
I.	86	84	78	92	81	60	80
II.	28	24	28	19	20	20	23
III.	190	239	242	114	147	181	185
IV.	65	68	65	66	61	75	67
V.	8518	6616	1155	1452	1826	1155	1250
VI.	47	69	58	19	42	42	46
VII.	43	44	47	33	45	40	46

For bibliography see Appendix, Table 11.

TABLE 6
THE SOROCABANA UNDER PRIVATE OPERATION

Year	Traffic Density (In Thou- sands)	Receipts (In Millions of Milreis)	Expendi- tures (In Millions of Milreis)	1910-1919		Number Killed
				Receipts per P. K.	Receipts per T. K.	
				(In Milreis)		
1910.....	28	14	7	.038	.114	2
1911.....	39	15	7	.039	.078	—
1912.....	56	16	9	.039	.076	—
1913.....	57	19	11	.039	.075	5
1914.....	44	16	9	.037	.072	—
1915.....	52	18	8	.038	.074	1
1916.....	78	19	10	.039	.067	2
1917.....	106	21	13	.036	.059	4
1918.....	85	22	16	.039	.060	—
1919.....	102	25	20	.040	.056	2
Annual						
Aver....	65	18	11	.0385	.073	1.6

The figures for receipts and expenditures were taken from: *Relatorio da Estrada de Ferro Sorocabana, Anno de 1929*, São Paulo, 1930, Table III. The rest are the same as for Table 1, *The Rede Sul Mineira under Private and Public Operation*, for the years 1910-1919.

TABLE 7

PERCENTAGES OF TOTAL FREIGHT OF THE MOST IMPORTANT COMMODITIES

1910, 1919, 1928

SOROCABANA

Commodity	1910	1919	1928	Commodity	1910	1919	1928
Rubber	—	—	—	Cereals	8	10	4
Timber	—	—	14	Alcohol	—	—	—
Coffee	18	3	10	Dried Beef	—	—	—
Matte	—	—	—	Hides	—	—	—
Sugar	—	3	2	Salt	4	1.2	1
National Text. . .	—	—	—	Unclassified	54	75	63

These percentages were computed from the total number of ton kilometers hauled and the number of ton kilometers of each commodity. Ton kilometer figures were taken from *Estatística, 1910*, pp. 96-7; *1919*, pp. 144-5; *1928*, pp. 270-85. The — indicates less than one-half of one per cent.

TABLE 8

CRUSHED ROCK BALLAST APPLIED

1910-1919

SOROCABANA

Year	Kilometers	Year	Kilometers	Year	Kilometers	Year	Kilometers
1910....	—	1916....	—	1921....	—	1926....	65
1911....	—	1917....	—	1922....	10	1927....	71
1912....	—	1918....	—	1923....	40	1928....	148
1913....	—	1919....	—	1924....	21	1929....	—
1915....	—	1920....	—	1925....	19	1930....	—

Average per year 1922-1928 59

Estatística 1910, p. 142; *1911*, p. 205; *1912*, p. 205; *1913*, p. 161; *1914*, p. 167; *1915*, p. 166; *1916*, p. 219; *1917*, p. 153; *1918*, p. 153; *1919*, p. 223; *1922*, p. 165; *1923*, p. 310; *1924*, p. 338; *1925*, p. 358; *1926*, p. 367; *1927*, p. 363; *1928*, p. 386. *Relatório da Secretaria da Agricultura do Estado do São Paulo, 1920*, São Paulo, 1921, p. 76.

TABLE 9
CAPITAL EXPENDITURES, 1919-1928, BY STATE OF SAO PAULO

<i>E. F. Sorocabana</i>				
<i>Year</i>	<i>Pag.</i>	<i>Original Amount Dresdener Bk. Loan Pounds Sterling</i>	<i>Amount paid rescission (milreis)</i>	<i>Improvements to Capital account</i>
1920	88	3,800,000	48,694,982	44,010,156
Expenditures made after rescission				
1920	88			6,131,257
1922	205			17,514,571
1923	243			8,045,329
1924	182			5,058,081
(Lei No. 1,976 de 7 de Outubro de 1924 authorizes expenditure of 130,000,000 for re- construction of line.)				
1926	255	Expenditures under this authorization		127,351,576
Grand Total to 1926				171,448,629

(Page references are to Annual Reports of Secretary of Agriculture, State of São Paulo, for the year in which data is given.)

TABLE 10
CAPITAL EXPENDITURES OF STATE OF SAO PAULO IN REBUILDING
Estrada de Ferro Sorocabana

(In Milreis)

1. Expenditures to 1924 (not counting the amount spent by the state in new construction prior to the rescission of the contract in 1919	39,457,596
<i>Relatorio da Estrada de Ferro Sorocabana anno de 1923, São Paulo, 1924, page 28.</i>	
2. Expenditures 1924-27	157,592,850
<i>Relatorio da Estrada de Ferro Sorocabana anno de 1927, São Paulo, 1928, page 8.</i>	
3. Expenditures 1928	5,994,106
<i>Relatorio da Estrada de Ferro Sorocabana anno de 1928, São Paulo, 1929, page 51.</i>	
4. Expenditures 1929	8,885,092
Total	211,929,644

The above funds involved in part credit operations and to

them must be added funds from a special tax beginning in 1927 of 10% on the total receipts of the line. (*Ibid.*, 1929, page 9.)

A. 1927	2,516,977
B. 1928	6,636,093
C. 1929	13,468,611
Grand total	234,551,325

As part of this sum came out of the annual net operating revenue, subtracting from this sum the total net operating revenue for 1920-1929, the sum of

Ibid., Table 3.

152,849,274

81,702,051

The *Estrada de Ferro Sorocabana* does not issue an annual profit and loss statement. It is possible that not all the net operating revenue for these years went into the capital account. However, in the absence of evidence to the contrary, it may be assumed that it did. The ten per cent fund the shippers and passengers have already paid, for it was levied directly on freight and passenger. As its disposition was rather to capital than operating expense, we have for the purposes of this discussion included it in the capital on which a capital charge must be computed.

TABLE 11

Sorocabana

TESTS OF EFFICIENCY

1910-1919

Year	Per Cent Usable Loc.	Car Kil. Per Car Day	Ton Kil. Per Car Day	Loc. Kil. Per Loc. Day	Fuel Costs Per 1000 Loc. Kil.	Per Cent Freight Cap. Used	Per Cent Passenger Cap. Used
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1910		97	376	141	232	26	36
1911		10	525	161	149	39	15
1912		11	766	150	324	61	42
1913		71	458	138	341	37	37
1914		16	880	242	328	26	34
1915		12	818	193	329	29	24
1916		21	172	243	352	33	28
1917		28	247	292	431	37	36
1918		17	151	295	510	38	37
1919		28	219	342	719	31	42
Aver. ...		31	461	219	372	36	33

(2) These averages were obtained by dividing the total number of car

kilometers hauled by the number of freight cars multiplied by 365. The annual data was obtained from: *Estatística*, 1910, pp. 106-8, 62-5; 1911, pp. 168-70, 124-6; 1912, pp. 166-8, 122-4; 1913, pp. 122-4, 76-8; 1914, pp. 124-6, 78-80; 1915, pp. 124-6, 78-80; 1916, pp. 156-60, 90-4; 1917, pp. 112-4, 60-8; 1918, pp. 112-4, 60-8; 1919, pp. 160-4, 94-8.

(3) Net ton kilometers per car day computed by dividing the total number of ton kilometers by the number of cars multiplied by 365. The above data was obtained from: *Estatística*, 1910, pp. 94-7, 62-5; 1911, pp. 156-9, 124-6; 1912, pp. 154-7, 122-4; 1913, pp. 110-3, 76-8; 1914, pp. 112-5, 78-80; 1915, pp. 112-5, 78-80; 1916, pp. 138-43, 90-4; 1917, pp. 100-3, 60-8; 1918, pp. 100-3, 60-8; 1919, pp. 142-7, 94-8.

(4) Figures for 1910-19 do not give average tractive power of locomotives. These locomotive kilometers were computed by dividing the total number of locomotive kilometers by the number of locomotives multiplied by 365. This data derived from: *Estatística*, 1910, pp. 102-5, 57-65; 1911, pp. 164-7, 120-2; 1912, pp. 162-5, 118-20; 1913, pp. 118-21, 71-4; 1914, pp. 120-3, 73-6; 1915, pp. 120-3, 73-6; 1916, pp. 150-5, 83-8; 1917, pp. 108-11, 64-6; 1918, pp. 108-11, 64-6; 1919, pp. 154-9, 88-92.

(5) These percentages computed from figures given in *Estatística*, 1910, pp. 106-9; 1911, pp. 168-71; 1912, pp. 166-9; 1913, pp. 122-5; 1914, pp. 124-7; 1915, pp. 124-7; 1916, pp. 156-61; 1917, pp. 112-5; 1918, pp. 112-5; 1919, pp. 160-5.

(6) These percentages computed from figures given in *Estatística*, 1910, pp. 94-7; 1911, pp. 156-9; 1912, pp. 154-7; 1913, pp. 110-3; 1914, pp. 112-5; 1915, pp. 112-5; 1916, pp. 138-43; 1917, pp. 100-3; 1918, pp. 100-3; 1919, pp. 142-7.

(7) These percentages computed from figures given in *Estatística*, 1910, pp. 82-5; 1911, pp. 144-7; 1912, pp. 142-5; 1913, pp. 98-101; 1914, pp. 100-3; 1915, pp. 100-3; 1916, pp. 120-5; 1917, pp. 88-91; 1918, pp. 88-91; 1919, pp. 124-9.

TABLE 12

Viação Ferrea do Rio Grande do Sul

PERCENTAGE TOTAL RECEIPTS FROM PASSENGER SERVICE

1910-1928

Year	Percentage	Year	Percentage	Year	Percentage	Year	Percentage
1910.....	21	1915.....	27	1920.....	—	1925.....	19
1911.....	24	1916.....	26	1921.....	—	1926.....	20
1912.....	27	1917.....	24	1922.....	21	1927.....	17
1913.....	27	1918.....	25	1923.....	20	1928.....	17
1914.....	31	1919.....	29	1924.....	22	1929.....	—
Annual Average 1910-1919							26
Annual Average 1922-1928							19

These percentages taken from *Estatística*, 1910, p. 115; 1911, p. 177;

1912, p. 175; 1913, p. 131; 1914, p. 137; 1915, p. 136; 1916, p. 175; 1917, p. 125; 1918, p. 125; 1919, p. 181; 1922, p. 137; 1923, p. 232; 1924, p. 248; 1925, p. 268; 1926, p. 280; 1927, p. 276; 1928, p. 302.

TABLE 13

Viação Ferrea do Rio Grande do Sul

PERCENTAGES BY WEIGHT OF FREIGHT COMMODITIES HAULED

1910-1919

Commodity (In thous. tons)	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	Percentage 1910-1919
Rubber	—	—	—	—	—	—	—	—	—	—	—
Timber	—	—	—	—	—	—	—	—	—	—	—
Coffee	23	28	124	23	24	29	33	37	49	28	.4
Matte	125	123	121	128	106	135	198	236	273	250	2.4
Sugar	148	145	171	158	183	211	216	205	207	215	2.7
National Tex.	169	106	4	1	2	3	1	17	20	18	.4
Cotton	—	—	—	3	—	—	—	—	—	—	—
Tobacco	36	46	54	55	36	63	56	52	55	41	.7
Cereals	339	375	366	653	383	422	639	820	559	605	7.4
Alcohol	27	28	34	51	35	35	49	52	60	63	.6
Dried Beef	226	207	214	290	229	269	296	357	249	278	3.7
Hides	132	123	130	139	128	233	276	212	230	246	2.6
Salt	264	298	285	315	287	377	324	360	368	436	4.5
Unclassified	2882	3259	4887	4286	4036	3838	4433	7675	8328	7366	73.0
Total	4372	4737	5690	6704	5449	5616	6530	10024	10397	9545	100.0

These figures computed from data given in: *Estatística, 1910*, p. 95; *1911*, p. 157; *1912*, p. 155; *1913*, p. 111; *1914*, p. 113; *1915*, p. 113; *1916*, p. 139; *1917*, p. 101; *1918*, p. 101; *1919*, p. 145.

TABLE 14

Viação Ferrea do Rio Grande do Sul

PERCENTAGES OF TOTAL RECEIPTS FROM FREIGHT SERVICE

1910-1928

Year	Percentage	Year	Percentage	Year	Percentage	Year	Percentage
1910	62	1915	58	1920	—	1925	58
1911	61	1916	59	1921	—	1926	63
1912	59	1917	59	1922	65	1927	65
1913	59	1918	60	1923	63	1928	63
1914	54	1919	52	1924	56	1929	—
Annual Average 1910-1919							58
Annual Average 1922-1928							62

Bibliography same as for Percentage Total Receipts from Passenger Service.

TABLE 15
Viação Ferrea do Rio Grande do Sul

TESTS OF EFFICIENCY

1910-1919

Year	Per Cent Usable Loc.	Car Kil. Per Car Day	Ton Kil. Per Car Day	Loc. Kil. Per Loc. Day	Fuel Costs Per 1000 Loc. Kil.	Per Cent Freight Cap. Used	Per Cent. Passenger Cap. Used
1910		53	231	55	387	44	27
1911		64	274	52	451	35	30
1912		65	349	63	392	41	34
1913		51	300	66	566	35	38
1914		35	240	59	503	50	35
1915		36	266	60	631	43	31
1916		44	352	75	668	48	28
1917		47	461	78	703	58	30
1918		41	998	82	791	67	33
1919		31	380	—	902	68	43
Aver. . . .		47	385	66	599	49	33

For bibliography see p. —, Table 11.

TABLE 16
Viação Ferrea do Rio Grande do Sul

UNDER PRIVATE OPERATION

1910-1919

Year	Traffic Density in thous. ton kil.	Expend. in thous. of mil.	Receipts in thous. of mil.	Operating Ratio	Receipts Per Pas. kil.	Receipts Per Ton kil.	Number Killed
1910	44	7,321	10,711	68	.056	.073	2
1911	49	8,541	12,016	71	.053	.070	19
1912	62	8,019	12,932	62	.052	.058	18
1913	71	9,603	14,432	67	.052	.054	14
1914	57	9,246	12,560	74	.053	.054	17
1915	63	10,034	12,742	79	.052	.054	19
1916	83	12,269	14,301	88	.055	.049	8
1917	109	14,708	16,912	87	.054	.048	23
1918	119	18,751	21,424	88	.064	.057	7
1919	96	22,758	22,386	102	.063	.062	23
Aver. . . .	75	12,152	15,042	80	.055	.058	15

These figures from: *Estatística, 1910*, p. 95; *1911*, p. 157; *1912*, p. 154; *1913*, p. 111; *1914*, p. 113; *1915*, p. 113; *1916*, p. 139; *1917*, p. 101; *1918*, p. 101; *1919*, p. 145.

Expenditures and receipts were taken from: *Relatorio do Director da Viação Ferrea do Rio Grande do Sul*, Anno 1929, Porto Alegre, 1930, p. 24.

Receipts per passenger and ton kilometer were taken from: *Estatistica*, 1910, p. 119; 1911, p. 181; 1912, p. 179; 1913, p. 135; 1914, p. 141; 1915, p. 141; 1916, p. 181; 1917, p. 129; 1918, p. 129; 1919, p. 187.

Death figures are from: *Estatistica*, 1910, p. 147; 1911, p. 209; 1912, p. 207; 1913, p. 163; 1914, p. 169; 1915, p. 169; 1916, p. 225; 1917, p. 157; 1918, p. 157; 1919, p. 229.

TABLE 17
COMPARATIVE FREIGHT RATES IN MILREIS PER TON
1930

Classification	100 Kilometers		300 Kilometers		600 Kilometers	
	Mog.	Sor.	Mog.	Sor.	Mog.	Sor.
3 A. Coffee	47.1	33.8	94.1	75.6	122.4	100.9
3. Sugar						
Textiles (national)	48.7	61.6	130.2	127.7	224.3	202.2
4. Cotton	21.9	39.3	53.9	68.4	93.2	92.5
6. Textiles (foreign)	70.6	95.2	203.9	206.6	382.6	299.6
4. Cereals:						
Dried Beef	19.1	19.0	41.5	32.5	53.8	37.5
Rice						
Beans						
Corn						
Potatoes						
Fresh Meat ...						
8. Iron and Steel ..	54.9	72.8	152.1	154.0	283.0	227.0
11. Livestock	16.5	14.6	49.4	28.6	98.8	35.3
12. Timber—cut	11.0	11.8	26.7	24.1	36.1	35.7
14. Timber—rough ..	9.5	9.0	23.6	17.1	33.0	24.5
13. Lime and cement.	12.6	13.4	31.4	27.7	45.5	40.9
Total number						
Classifications ..	16		16		16	
Mogyana higher	9		13		16	

de São Paulo, November, 1930. These items, according to the *Contadoria, de São Paulo, November, 1930.* These items, according to the *Contadoria*, include 80% of all freight, including livestock handled by the roads of São Paulo.

TABLE 18
CAPITAL ACCOUNT
In Milreis

Comparison of *Estatística das Estradas de Ferro* Statements with
Reports of the Company and of the State of São Paulo

Year	<i>Mogyana</i>		<i>Sorocabana</i>		State	Page
	<i>Estatística</i>	<i>Page</i>	<i>Company</i>	<i>Page</i>		
	Mogyana	Sorocabana				
1923	135,578	183,701	293		83,468	28
1924	176,902	204,019	321			
1925	194,095	204,019	341			
1926	219,453	204,019	349			
1927	246,439	204,019	345		243,578	8
1928	242,918	204,019	369		256,208	51
1929					278,562	90
1930				209,652		20
				or		
				254,457		21

All page references are to *Estatística das Estradas de Ferro do Brasil* for the year for which the data is given. The page reference to Company reports is to the *Relatório da Companhia Mogyana de Estradas de Ferro*, anno de 1929, São Paulo 1930. The above statement of the *Mogyana* gives the company's appraisal of their value, on the assets side of the ledger. On the capital liabilities side the total is 254,457,000 including capital in shares 80,000,000 and 174,157,000 milreis in external loans. The difference is probably due to the sum which the company lost by fluctuations in exchange following the flotation of their external loans. The fact that the government accepts the figure of 242,918 is good evidence that the larger sum should be regarded as the capital invested.

OTHER CAPITAL OBLIGATIONS OF THE STATE OF
SAO PAULO FOR THE SOROCABANA

Dresdener Bank Loan initial sum 3,800,000 pounds sterling incurred by the state in the purchase of the road from the Federal Government in 1905. Until 1941 interest and amortisation charges on this loan are 234,430 pounds sterling per year.

Relatório da Secretaria da Fazenda do Estado de São Paulo,
1927, São Paulo, 1928, p. 137.

6% interest on 278,562,000 milreis is 16,713,720 milreis. 234,430 pounds sterling (sterling at 1929 exchange) is 9,549,000 milreis, making a total of 26,262,720 milreis.

TABLE 19
 MAINTENANCE OF PERMANENT WAY, MATERIALS
 REPLACED AND BALLAST LAID

Year	Central		Paulista				<i>Estadística</i> Page
	Number Kil. Rails replaced per year		Number Ties replaced per year (000 omitted)		Number Kil. Crushed Rock Ballast laid per year		
	Cent.	Paul.	Cent.	Paul.	Cent.	Paul.	
1918	126	6	325	130	—	—	154-5
1919	—	—	333	—	—	—	223-5
1920	—	—	—	—	—	—	
1921	—	—	—	—	—	—	
1922	—	77	—	—	—	—	165-7
1923	—	152	—	169	—	1,170	310
1924	—	84	—	183	—	12	338
1925	—	—	—	215	—	55	358
1926	—	—	—	232	—	—	367
1927	—	—	—	227	—	—	363
1928	24	—	471	—	—	—	387
Aver.	75	76	376	192	—	—	
Aver. per kil. of line per year ..	.028	.058	140	147	—	—	

TABLE 20
 PERCENTAGES OF TOTAL RECEIPTS FROM PASSENGER, EXPRESS AND
 BAGGAGE FREIGHT AND UNCLASSIFIED ITEMS

Year	Central		Paulista		<i>Estadística</i> Page
	Passenger		Freight		
	Cent.	Paul.	Cent.	Paul.	
1918	28	15	56	71	125-6
1919	30	18	54	65	179-81
1920	—	—	—	—	
1921	—	—	—	—	
1922	34	20	50	65	137-9
1923	—	19	—	64	232
1924	33	20	48	62	248
1925	34	18	50	64	268
1926	32	18	49	66	280
1927	32	16	52	69	276
1928	31	18	47	67	302
1929	—	—	—	—	
Aver.	32	18	50	65	

TABLE 21

TOTAL RECEIPTS AND EXPENDITURES

1872-1919 by Decades

Central Paulista

(ooo omitted)

Year	Receipts		Expenditures		Coefficient	
	Cent.	Paul.	Cent.	Paul.	Cent.	Paul.
1872-81 (av.)	9,085	1,437	4,504	614	49	37
1882-91 (av.)	12,226	3,656	7,515	1,420	61	39
1892-1901 (av.)	29,012	18,382	27,276	8,102	94	44
1902-11 (av.)	30,388	23,381	33,610	10,310	110	44
1912-19 (av.)	49,711	31,580	65,668	16,751	132	53

These figures from: *Gazeta da Bolsa*, Rio de Janeiro, Vol. XII, No. 27, July 7, 1930, p. 2, and *Relatorio da Companhia Paulista de Estradas de Ferro*, 1929, São Paulo, 1930, Appendix, part 1.

TABLE 22

COMPARATIVE FREIGHT RATES

Per Ton in Milreis

Central and Paulista

(Including 10% additional tax for Central)

Classification		100 Kil.		300 Kil.		600 Kil.	
Cent.	Paul.	Cent.	Paul.	Cent.	Paul.	Cent.	Paul.
Coffee							
II	III A.	22.0	36.2	59.4	74.9	99.	102.1
		24.2		65.34		108.9	
Sugar							
V	III	40.0	37.4	108.0	101.0	180.	168.3
		44.0		118.8		198.	
Textiles							
IV	III	44.0	37.4	118.0	101.0	198.	168.3
		48.4		129.8		207.8	
Cotton							
VII	IV-30	30.0	16.6	81.0	44.2	135.	66.3
		33.0		89.1		148.5	
Rice							
Beans							

XI.	IV	12.0	12.9	32.4	28.3	54.	37.4
		13.2		35.64		59.4	
Corn							
XIV	IV	7.0	12.9	13.	28.3	31.5	37.4
		7.7		14.3		34.65	
Meat (fresh)							
XII	IV	10.0	12.9	27.	28.3	45.0	37.4
		11.0		29.7		49.5	
Iron							
Steel							
VI	VIII	36.0	42.5	97.2	117.3	162.	195.5
		39.6		106.92		178.2	
Livestock							
XIII	XI	10.0	10.6	27.0	29.7	45.0	51.0
		11.0		29.7		49.5	
Timber (rough)							
XII	XII	10.0	6.8	27.0	18.3	45.0	30.6
		11.0		29.7		49.5	
Lime							
Cement							
X	XIII	18.0	7.7	48.6	20.8	81.0	35.8
		19.8		53.46		89.1	

Figures for the *Paulista* by courtesy of the *Contadoria Central Ferroviaria of São Paulo, 1930*. Central figures from *Classificacao Geral das Mercadorias, C. C. F. 1, Contadoria Central Ferroviaria, Rio de Janeiro, 1928*, pages xiii, 8, 18, 36, 43, 57, 70, 76, 94, 99, 126, 134, 21, 94, 126, 134, 21, 94, 38, 51, 70. Base-rate figures computed into milreis from *Bases Padrão Contadoria Central Ferroviaria, Rio de Janeiro, 1925*.

Paulista Higher	4	3	3		
Number Classifications	10	10	10		
Average per 100 kil.	23.9	21.3	21.3	17.8	17.7 12.1

According to the Brazilian method of classification the livestock item is not included in the number of classifications. The rate of livestock is inserted here for convenience.

The ten per cent additional tax on Federal Government Railways for the purpose of buying new equipment authorized by decree # 16,842 de 24 de Marco de 1925. *Relatorio do Ministro da Viação e Obras Publicas 1296, Rio de Janeiro 1928, p. 17.*

TABLE 23
RECEIPTS PER PASSENGER KILOMETER IN MILREIS

	1923	1924	1925	1926	1927	1928*	1923-28 Average
A. LINES OPERATED BY FEDERAL GOVT.							
Int.	—	.067	.069	—	.055	—	.070
<i>Central do Brasil</i> —							
Sub.	—	.010	.009	—	.010	—	.010
<i>Noroeste do Brasil.</i>	.054	.057	.059	.056	.058	.072	.059
LINES OPERATED BY STATE GOVTS.							
<i>E. F. Sorocabana</i> ..	.043	.042	.048	.049	.048	.046	.046
<i>V. F. R. G. S.</i> .....	.061	.058	.057	.062	.071	.070	.063
<i>Aver. Govt. Operated Lines</i> .....							.059
B. LINES OPERATED BY PRIVATE COMPANIES							
<i>Great Western</i> ....	.063	—	.078	.073	.072	.073	.073
<i>Este Brasileiro</i> ....	.065	—	—	.061	.065	.069	.065
<i>Leopoldina</i> .....	.045	.045	.047	.046	.051	.050	.047
<i>Paulista</i> .....	.045	.048	.053	.053	.054	—	.051
<i>Mogyana</i> .....	.056	.062	.070	.070	.068	.069	.066
<i>São Paulo R. G.</i> ..	.052	—	.047	.055	.054	.057	.053
<i>Average Private Operated Lines</i> ..							.059
<i>Average all—1923-28</i> .....							.059

These figures from: *Estatística, 1923*, pp. 240-1; *1924*, pp. 258-9; *1925*, pp. 278-9; *1926*, pp. 290-1; *1927*, pp. 286-7; *1928*, p. 312.

NOTE.—In these averages for 1923-28, figures for suburban traffic are not included.

TABLE 24
COMPARATIVE PASSENGER RATES
Roads Affiliated with the Contadoria Central Ferroviaria

Classification	* <i>E. F. Central</i> * <i>E. F. Oeste de Minas</i> * <i>E. F. Rio do Ouro</i> * <i>E. F. Paracatu</i>	Leopoldina E. F. Victoria a Minas * <i>E. F. Thereseopolis</i> E. F. Marica	* <i>Rede Sul Mineira</i>
FIRST CLASS—			
One Way			
50 Kil.	6.5	5.5	5.5
100 "	13.0	11.0	11.0
300 "	35.1	29.7	29.7
600 "	58.5	49.5	49.5
SECOND CLASS—			
One Way			
50 Kil.	4.5	3.5	3.5
100 "	9.0	7.0	7.0
300 "	24.3	18.9	18.9
600 "	40.5	31.5	31.5
FIRST CLASS—			
Round Trip			
50 Kil.	10.0	8.5	8.5
100 "	20.0	17.0	17.0
300 "	54.0	45.9	45.9
600 "	90.0	76.5	76.5
SECOND CLASS—			
Round Trip			
50 Kil.	7.0	5.5	no rate given
100 "	14.0	11.0	
300 "	37.8	29.7	
600 "	63.0	49.5	
Relative	122	100	100

Base rate figures taken from page v, *Classificacao Geral das Mercadorias*, C. C. F. I, *Contadoria Central Ferroviaria* 1928, Rio de Janeiro. Cost in milreis worked out from base rate figures of *Bases Padrão Contadoria Central Ferroviaria*, Rio de Janeiro 1925.

Roads starred are government operated. *Estatistica*, 1928, pp. 20, 26, 32, 36 and 38.

As all the roads in this group collect the 10 per cent additional tax, it would not affect the index. *Classificacao Geral* . . . , p. xxviii.

TABLE 25
COMPARATIVE PASSENGER RATES
1928
(In Milreis)

Northern Area

Classification	* <i>Cent. Piauiy</i> * <i>Cent. R. G. do Norte</i> * <i>São Luis e Theresina</i> * <i>Petrolina a Theresina</i>	* <i>Rede Vição Cearense</i>	* <i>Goyas</i>	<i>Rede Bahiana (C. F. Este Brasileiro)</i>	<i>Bahia e Minas</i>	Great Western
FIRST CLASS—						
One Way						
100 kil.	11.0	8.0	13.0	13.0	13.0	11.0
300 kil.	29.7	21.0	35.1	35.1	35.1	29.7
600 kil.	49.5	36.0	58.5	58.5	58.5	49.5
SECOND CLASS—						
One Way						
100 kil.	7.0	4.5	9.0	7.5	7.5	7.0
300 kil.	18.9	12.15	24.3	20.25	20.25	18.9
600 kil.	31.5	20.25	40.5	33.75	33.75	31.5
FIRST CLASS—						
Round Trip						
100 kil.	18.0	13.0	20.0	21.0	21.0	no rate
200 kil.	48.6	35.1	34.0	56.7	56.7	given
600 kil.	81.0	58.5	90.5	94.5	94.5	
SECOND CLASS—						
Round Trip						
100 kil.	11.0	8.0	14.0	10.0	10.0	no rate
300 kil.	29.7	21.0	37.8	27.0	27.0	given
600 kil.	49.5	36.0	63.0	45.0	45.0	
Averages per 100 kilometers after adding 10% tax on government-operated roads				Govt.	Private	
				7.9	8.1	

Figures from *Classificação Geral das Mercadorias, C. C. F. 1, Contadoria Central Ferroviaria, 1928*, Rio de Janeiro, p. 5. Base rate figures translated into milreis from *Base Padrão Contadoria Central Ferroviaria, Rio de Janeiro, 1925*.

Roads starred are government operated, *Estatísticas 1928*, pp. 22, 34.

The ten per cent tax payable on roads operated by the Federal Government by decree of March 24, 1925, # 16,842. *Relatório do Ministério da Viação e Obras Públicas, anno de 1926*, Rio de Janeiro, 1928, pp. 17-19.

TABLE 26
COMPARATIVE PASSENGER RATES SAO PAULO AREA

In Milreis
1930

CLASSIFICATION AND DISTANCE	GOVERNMENT- OPERATED ROADS			PRIVATELY OPERATED ROADS		
	E. S.	N. B.	E. F. A. Aver.	C. P.	C. M.	Aver.
I Class—One way						
100 Kil.	12.3	11.2	10.5	10.6	13.5	
300 "	26.9	30.3	27.7	23.4	29.2	
600 "	35.8	50.4	52.0	31.8	49.3	
II Class—One way						
100 Kil.	6.0	6.8	6.1	6.4	7.9	
300 "	14.2	18.2	12.6	12.8	15.7	
600 "	20.4	30.3	20.7	17.0	22.4	
I Class—Round trip						
100 Kil.	19.7	22.4	16.8	17.0	21.6	
300 "	43.0	60.6	44.3	37.4	46.6	
600 "	57.3	100.8	83.3	50.9	78.9	
II Class—Round trip						
100 Kil.	9.6	13.6	9.8	10.2	12.6	
300 "	22.7	36.4	20.1	20.4	25.1	
600 "	32.6	60.6	33.3	27.3	35.9	
Cost per 100 Kilometers Govt. 10 Prvt. 9.3						

When the 10 per cent tax is added to the fares on the one Federal Government line in this area the privately operated lines have a still lower charge than the government group. *Relatorio do Ministerio da Viação e Obras Publicas Anno de 1926*, Rio de Janeiro, 1928, p. 19. The above figures were furnished by courtesy of the *Contadoria Central Ferroviaria de São Paulo*.

TABLE 27
PASSENGER TRAFFIC DENSITY
CLASS I RAILWAYS
(000 omitted)

PASSENGER KILOMETERS PER KILOMETER OF LINE								
	1922	1923	1924	1925	1926	1927	1928	1923-28 Aver.
A. LINES OPERATED BY FEDERAL GOVT.								
<i>Central do Brasil</i> ..	—	—	—	—	—	—	—	—
Sub. ..	—	52,687	58,532	56,676	66,860	80,815	63,114.0	
Int. ..	—	154	—	—	—	202	212	189.3
<i>Noroeste do Brasil</i> ..	49	41	44	44	47	54	46.5	
LINES OPERATED BY STATE GOVT.								
<i>E. F. Sorocabana</i> ..	110	121	143	139	135	163	133.5	
<i>V. F. R. G. S.</i>	50	65	69	64	60	66	62.3	
<i>Average Govt. Operated Lines</i>								80.7
B. LINES OPERATED BY PRIVATE COMPANIES								
<i>Great Western</i>	57	—	63	67	61	60	61.6	
<i>Este Brasileiro</i> ...	27	—	—	40	35	39	36.2	
<i>Leopoldina</i>	117	—	—	—	—	—	117.0	
Sub. ..	6,651	7,471	8,370	8,939	9,512	10,368	8,551.8	
Int. ..	76	79	89	83	77	79	80.5	
<i>Paulista</i>	197	221	224	216	208	—	213.2	
<i>Mogyana</i>	85	89	97	92	86	85	89.0	
<i>São Paulo R. G.</i> ..	34	—	43	41	44	44	41.2	
<i>Average Privately Operated Lines</i>								93.0
<i>Average of all roads 1923-28</i> ..								88.8

Estatística, 1923, pp. 186-7; 1924, pp. 192-5; 1925, pp. 206-9; 1926, pp. 216-9; 1927, pp. 216-9; 1928, pp. 240-1. The length of the suburban zone of the Central is approximately 70 kilometers and that of the Leopoldina 18 kilometers.

NOTE.—In these averages figures for suburban traffic are not included.

TABLE 28

FREIGHT RECEIPTS PER TON KILOMETER IN MILREIS

	CLASS I RAILWAYS							
	1922	1923	1924	1925	1926	1927	1928	1923-28 Average
A. LINES OPERATED BY FEDERAL GOVT.								
<i>Central do Brasil..</i>	—		.079	.082	—	.089	.087	.082
<i>Noroeste do Brasil.</i>	.114		.111	.123	.129	.144	.152	.129
B. LINES OPERATED BY STATE GOVTS.								
<i>E. F. Sorocabana..</i>		.088	.100	.124	.110	.113	.107	.107
<i>V. F. R. G. S.</i>		.102	.101	.111	.118	.131	.130	.116
Average Govt. Operated Lines..								.109
C. LINES OPERATED BY PRIVATE COMPANIES								
<i>Great Western</i>	.190	—		.251	.243	.239	.263	.237
<i>Este Brasileiro</i>	.141	—			.166	.166	.203	.169
<i>Leopoldina</i>	.177		.178	.178	.183	.257	.267	.207
<i>Paulista</i>	.135		.146	.149	.150	.164	—	.149
<i>Mogyana</i>	.153	—		.195	.208	.202	.193	.190
<i>São Paulo R. G. ..</i>	.095	—		.109	.146	.137	.128	.123
Average Privately Operated Lines..								.179
Average of all roads 1923-28 ...								.151

Estatística, 1923, pp. 240-1; 1924, pp. 258-9; 1925, pp. 278-9; 1926, pp. 290-1; 1927, pp. 286-7; 1928, p. 312.

TABLE 29

COMPARATIVE FREIGHT RATES

Costs per 100 Kilometers

Roads Affiliated with the Contadoria Central Ferroviaria

Starred Roads are Government Operated

Classification	* <i>E. F. Central</i>	Leopoldina	* <i>Rede Sul Mineira</i>
	* <i>E. F. Oeste de Minas</i>	Victoria	
	* <i>E. F. Rio do Ouro</i>	a	
	* <i>E. F. Paracatu</i>	Minas	
		* <i>E. F. Therexopolis</i>	
		<i>E. F. Marica</i>	
2. Machinery (not otherwise classified)	56.	100.	100.
4. Hides	44.	72.	72.
Tobacco			
Textiles (cotton)			
5. Sugar	40.	54.	54.
7. Cotton (compressed)	30.	32.	32.
9. Agricultural Machinery	20.	27.	27.
10. Rough Lumber	18.	23.	23.
Lime, Cement			
11. Beans, Rice	12.	16.	16.
12. Salt, Fresh Meat . . .	10.	12.	12.
14. Corn	7.	9.	9.
15. Coffee	22.	Cent. & R. d. O.	32. Leo. to Rio
	28.	Others	50. All other
	(a) 48 milreis for coffee to Central up to 100 kil.		48
	21 " " " " " " 200 "		21 (a)
	12 " " " " " " 200 " and above		
	70 all other		
Relative	67	100	100

These rates move up for distance above and below 100 kilometers, unless otherwise specified, at fixed ratios which are the same for all roads.

Classifications are from *Classificacao Geral das Mercadorias*, C. C. F. 1, *Contadoria Central Ferroviaria*, Rio de Janeiro, 1928, pages xiii, 8, 18, 36, 43, 57, 70, 76, 94, 99, 126, 134, 21, 94, 38, 51, 70. Base rate figures computed into milreis from *Bases Padrão*, *Contadoria Central Ferroviaria*, Rio de Janeiro, 1925.

TABLE 30
COMPARATIVE FREIGHT RATES

Northern Area

Costs per 100 Kilometers in Milreis per Ton

Northern Roads Not Affiliated with the Contadoria Central Ferroviaria

Roads Starred are Government Operated

Classification	* <i>Cent. do Piauy</i>	* <i>Rede</i>	Great	<i>Rede</i>	<i>Bahia</i>
	* <i>Cent. do Rio Grande do Norte</i>					Western	Bahiana	Minas
	* <i>São Luis e Theresina</i>	* <i>Viação Cearense</i>		(<i>C. F. Este Bras</i>)	
	* <i>Petrolina a Theresina</i>				
2. Machinery (not otherwise classified)	80	42	110	110	100
4. Hides, Tobacco, Textiles (cotton)	44	30	76	56	72
5. Sugar	40	26	70	48	54
7. Cotton	34	23	40	42	32
9. Agricultural Machinery	20	12	28	25	27
10. Rough Lumber, Lime, Cement	18	9.5	25	20	23
11. Beans, Rice	15	9	20	19	16
12. Salt, Fresh Meat	13	8.5	17	15	15
14. Corn	10	5	12	10	9
15. Coffee	34 (a)	22	58 (b)	56 (c)	56 (c)
	50		52	17	17
Averages per 100 kil.	32.5	18.7	46.1	38.0	38.2
Government oper. aver.	28.2	Privately oper. aver.	40.7		

(a) 34 milreis on *São Luis a Theresina*.
50 milreis on others of this group.

(b) 58 milreis less than car lots.
52 milreis car lots.

(c) 56 for less than 200 kilometers.
17 for shipments in excess of 200 kilometers.

Unless otherwise specified these rates move up for distance above and below 100 kilometers at fixed ratios which are the same for all roads.

Classifications are from *Classificacao Geral das Mercadorias, C. C. F. 1, Contadoria Central Ferroviaria, Rio de Janeiro, 1928, pp. xiii, 8, 18, 36, 43, 57, 70, 76, 94, 99, 126, 134, 21, 94, 38, 51, 70*. Base rate figures computed into milreis from *Bases Padrao Contadoria Central Ferroviaria, Rio de Janeiro, 1925*.

TABLE 31

COMPARATIVE FREIGHT RATES, SAO PAULO AREA, 1930, IN MILREIS

CLASSIFICATION AND DISTANCE	GOVERNMENT- OPERATED ROADS			PRIVATELY OPERATED ROADS			
	<i>E. S.</i>	<i>N. B.</i>	<i>E. F. A.</i>	<i>Aver.</i>	<i>C. P.</i>	<i>C. M.</i>	<i>Aver.</i>
IIIa							
Coffee	100 Kil.	33.8	33.6	32.3		36.2	47.1
	300 "	75.6	81.8	68.7		74.9	94.1
	600 "	100.9	122.1	109.2		102.1	122.4
III							
Sugar	100 "	61.6	40.4	40.4		37.4	48.7
Textiles	300 "	127.7	108.9	117.1		101.0	130.2
(Nat.)	600 "	202.2	181.5	230.2		168.3	224.3
IV-30							
Cotton	100 "	39.3	24.2	31.5		16.6	21.9
	300 "	68.4	65.2	84.0		44.2	53.9
	600 "	92.5	108.7	157.5		66.3	93.2
IV							
Rice	100 "	19.0	13.5	13.5		12.9	19.1
Beans	300 "	32.5	36.3	29.8		28.3	41.5
Corn	600 "	37.5	60.5	50.2		37.4	53.8
Meat (Fresh)							
Meat (Dried)							
Potatoes							
Cereals							
VI							
Textiles	100 "	95.2	62.8	67.2		59.5	70.6
(Foreign)	300 "	206.6	169.4	197.7		159.8	203.9
	600 "	299.6	282.3	391.5		265.2	382.6
VIII							
Machinery	100 "	72.8	49.3	51.1		42.5	54.9
	300 "	154.0	133.1	145.2		117.3	152.1
	600 "	227.9	221.8	282.3		195.5	283.9
XI							
Livestock	100 "	14.6	11.2	12.8		10.6	16.5
	300 "	28.6	30.3	34.4		29.7	49.4
	600 "	35.3	50.4	64.7		51.0	98.8
XII							
Timber	100 "	11.8	7.9	8.1		6.8	11.0
(Sawed)	300 "	24.1	21.2	20.3		18.3	26.7
	600 "	35.7	35.3	36.5		30.6	36.1
XIII							
Lime	100 "	13.4	9.0	8.8		7.7	12.6
Cement	300 "	27.7	24.2	22.3		20.8	31.4
	600 "	40.9	40.4	40.6		35.8	45.5

XIV

Timber	100 "	9.0	7.3	6.8	5.4	9.5
(Rough)	300 "	17.1	19.7	18.3	14.5	26.7
	600 "	24.5	32.8	34.5	24.7	33.0

Average per 100 kilometers, all classifications .. 25.7 28.3

The ten per cent tax has been added to the charges of the Noroeste in the final average. These figures were furnished by courtesy of the *Contadoria Central Ferroviaria de São Paulo*.

TABLE 32
FREIGHT TRAFFIC DENSITY
CLASS I RAILWAYS
TON KILOMETERS PER KILOMETER OF LINE
(000's omitted)

	1922	1923	1924	1925	1926	1927	1928	1923-28 Average
A. LINES OPERATED BY FEDERAL GOVT.								
<i>Central do Brasil..</i>	—	—	315	—	—	350	386	350.0
<i>Noroeste do Brasil.</i>	—	41	35	50	46	56	69	49.5
LINES OPERATED BY STATE GOVTS.								
<i>E. F. Sorocabana..</i>	—	153	133	197	220	254	284	206.8
<i>V. F. R. G. S.</i>	—	107	114	128	123	140	149	126.8
<i>Aver. Government-Operated Lines..</i>								183.2
B. LINES OPERATED BY PRIVATE COMPANIES								
<i>Great Western</i>	—	57	—	61	60	57	59	58.8
<i>Este Brasileiro ...</i>	—	34	—	—	42	48	39	40.7
<i>Leopoldina</i>	—	76	89	94	104	107	102	95.3
<i>Paulista</i>	—	226	226	280	284	286	365	277.8
<i>Mogyana</i>	—	86	—	95	97	103	121	100.4
<i>São Paulo R. G. ..</i>	—	98	—	—	108	110	125	110.2
<i>Average Privately Operated Lines..</i>								113.8
<i>Average of all roads, 1923-28 ..</i>								141.6

Estatística, 1923, pp. 217-9; 1924, pp. 231-3; 1925, pp. 249-51; 1926, pp. 259-61; 1927, pp. 259-61; 1928, pp. 283-5.

TABLE 33
COMMODITIES HANDLED, CLASS I RAILROADS
1923-1928

Roads Arranged in the Order of Percentage of Coffee
in Total Tonnage Handled

Government-Owned Roads Starred

Name of Road	Cotton	Rice	Sugar	Coffee	Meat	Hides	Beans	Tobacco	Timber	Corn	Salt	Beef (Dried)	Totals in Millions of Ton Kilometers
<i>Paulista</i> ... (5)	—	—	—	33.1	—	—	—	—	—	—	—	—	1,403
<i>Leopoldina</i> . (6)	—	—	—	24.3	—	—	—	—	—	—	—	—	1,678
<i>Mogyana</i> .. (5)	—	—	—	21.3	—	—	—	—	—	—	—	—	986
<i>Noroeste</i> .. (2)	—	—	2.4	15.5	—	1.2	—	—	25.4	—	—	—	161
<i>Sorocabana</i> (6)	1.3	1.5	2.8	11.1	—	0.1	1.8	—	38.6	7.7	1.1	—	2,286
<i>Este Bras.</i> (6)	1.1	0.7	2.3	5.5	—	0.4	1.5	2.3	3.7	2.4	9.4	0.6	541
<i>S. P. R. G.</i> (6)	—	1.1	1.8	3.5	—	0.2	0.7	—	56.1	2.0	2.0	0.2	1,298
<i>Great West.</i> (3)	10.0	—	33.3	2.1	—	0.3	1.7	0.3	1.0	4.5	3.5	1.4	288
<i>Central</i> (5)	—	—	—	1.8	—	—	—	—	—	—	—	—	4,645
<i>V. F. R. G. S.</i> (5)	—	2.3	2.5	0.4	—	2.0	2.6	0.6	2.7	2.7	5.9	5.6	1,074

The figures in parentheses following each road represent the number of years between 1923-28 for which figures are available.

These percentages compiled from annual commodity ton kilometers as published in *Estadísticas 1923*, pp. 204-21; *1924*, pp. 218-33; *1925*, pp. 236-51; *1926*, pp. 246-61; *1927*, pp. 246-61; *1928*, pp. 270-83.

The S. P. R. G. is partly government-owned, and on divisions owned by the Company there is a government guarantee of interest paid. The three roads with coffee tonnage comprising over twenty per cent of the total are the only ones among the Class I Railroads which have continued under private ownership past the time when guarantees of interest are no longer paid.

This table gives in a nutshell the reason why Brazil has government-owned railways.

TABLE 34
 RECEIPTS, EXPENDITURES AND OPERATING RATIOS
 Class I and Class II Railways
 1923-1928 (Millions of Milreis)

	1923	1924	1925	1926	1927	1928	<i>Average op. rat. 1923-28</i>
A. LINES OPERATED BY FEDERAL GOVT.							
<i>Central do Brasil ...</i>	....	....	....	165	200	183	121
	....	115	128	132	147	175	
<i>Noroeste do Brasil ..</i>	17	12	14	18	29	33	143
	10	9	14	12	16	22	
<i>Rede Cearense</i>	6	7	9	9	10	9	125
	7	6	6	6	7	8	
<i>Oeste do Minas</i>	16	17	21	24	25	24	149
	10	12	13	14	17	19	
<i>Average Federal operated lines ..</i>							127
LINES OPERATED BY STATE GOVT.							
<i>E. F. Sorocabana ...</i>	31	35	47	57	57	55	75
	41	44	68	67	74	81	
<i>V. F. R. G. S.</i>	39	47	57	55	62	66	104
	36	43	53	52	64	69	
<i>Rede Sul Mineira ..</i>	9	12	14	18	23	22	115
	9	12	14	15	17	18	
<i>E. F. Araraquara ..</i>	5	7	8	9	13	10	72
	9	9	11	12	15	16	
<i>Average State operated lines ..</i>							93

B. LINES OPERATED BY
PRIVATE COMPANIES

Great Western	23	21	25	25	25	24	78
	25	25	35	33	32	33	
<i>E'ste Brasileiro</i>	12	14	17	17	21	23	104
	11	14	18	17	18	22	
Leopoldina	42	48	50	54	64	64	68
	60	67	71	77	97	96	
Paulista	42	51	56	56	60	68	68
	58	67	83	83	96	102	
<i>Mogyana</i>	26	31	37	40	41	40	67
	40	49	56	58	59	58	
São Paulo R. G. ...	24	27	32	39	40	36	69
	23	27	31	38	37	40	
<i>Victoria e Minas</i> ...	3	5	7	8	9	9	105
	3	5	6	7	9	9	
<i>Average Private operated lines ..</i>							75
<i>Average all roads 1923-28 ...</i>							91

The averages for each group are weighted according to the relative amounts of annual receipts and expenditures of the lines composing the group.

The above averages were compiled from figures given in: *Estatística*, 1923, pp. 266-77; 1924, pp. 282-9; 1925, pp. 308-9; 1926, pp. 318-9; 1927, pp. 314-5; 1928, pp. 338-9.

TABLE 35

RECEIPTS, EXPENDITURES AND OPERATING RATIOS

Class III Railways

1923-1928 (Thousands of Milreis)

	1923	1924	1925	1926	1927	1928	Average op. rat. 1923-28
A. LINES OPERATED BY FEDERAL GOVT.							
<i>São Luis a Theresina</i>	<u>2,362</u>	<u>2,929</u>	<u>3,073</u>	<u>3,194</u>	<u>3,073</u>	<u>2,954</u>	287
	1,057	845	1,049	730	1,213	1,229	
<i>Central do Piauhy</i>	<u>452</u>	<u>392</u>	<u>663</u>	<u>886</u>	<u>2,310</u>	<u>1,183</u>	444
	58	153	232	207	339	336	
<i>Petrolina a Theresina</i>	<u>....</u>	<u>285</u>	<u>646</u>	<u>623</u>	<u>822</u>	<u>1,048</u>	607
	....	67	110	174	116	97	
<i>Rio Grande do Norte</i>	<u>907</u>	<u>749</u>	<u>1,290</u>	<u>1,387</u>	<u>1,646</u>	<u>1,244</u>	137
	868	846	926	851	841	932	
<i>Rio do Ouro</i>	<u>1,274</u>	<u>1,930</u>	<u>2,055</u>	<u>2,235</u>	<u>2,455</u>	<u>2,540</u>	269
	502	554	643	774	1,047	1,126	
<i>Goyas</i>	<u>1,287</u>	<u>1,684</u>	<u>2,862</u>	<u>....</u>	<u>4,751</u>	<u>3,508</u>	111
	1,580	2,248	3,048	....	2,529	3,205	
<i>Quarahim a São Borja</i> ...	<u>....</u>	<u>....</u>	<u>....</u>	<u>....</u>	<u>....</u>	<u>1,877</u>	207
	....	....	....	....	....	908	
<i>Average Federal operated lines</i>							199
LINES OPERATED BY STATE GOVT.							
<i>Bragança</i>	<u>1,136</u>	<u>1,312</u>	<u>1,403</u>	<u>1,502</u>	<u>1,543</u>	<u>1,549</u>	99
	1,259	1,313	1,436	1,415	1,520	1,555	
<i>Paracatú</i>	<u>728</u>	<u>....</u>	<u>....</u>	<u>1,525</u>	<u>1,499</u>	<u>1,446</u>	314
	....	....	....	268	315	818	
<i>Average State operated lines</i>							130

These averages compiled from figures given in *Estatística, 1923*, pp. 313-6, 216-9, 186-8; *1924*, pp. 342-4, 230-5, 192-7; *1925*, pp. 362-4, 248-53, 206-10; *1926*, pp. 370-2, 259-63, 216-21; *1927*, pp. 366-8, 259-63, 216-21; *1928*, pp. 390-2, 283-7, 240-5.

TABLE 40
FREIGHT CAR KILOMETERS PER CAR DAY
Class I Railways

	1923	1924	1925	1926	1927	1928	1923-28 Average
A. LINES OPERATED BY							
FEDERAL GOVT.							
<i>Central do Brasil</i>	—	—	—	71	—	78	74.5
<i>Noroeste do Brasil</i>	33	23	18	22	27	30	25.5
LINES OPERATED BY							
STATE GOVTS.							
<i>E. F. Sorocabana</i>	52	—	38	34	42	47	42.6
<i>V. F. R. G. S.</i>	28	29	30	34	46	55	37.0
<i>Aver. Govt. Lines</i> ...							44.9
B. LINES OPERATED BY							
PRIVATE COMPANIES							
<i>Great Western</i>	39	33	43	41	25	23	34.0
<i>Este Brasileiro</i>	25	20	23	21	25	33	24.5
<i>Leopoldina</i>	37	—	39	39	38	38	36.2
<i>Paulista</i>	—	—	—	—	—	—	—
<i>Mogyana</i>	26	27	26	27	27	29	27.0
<i>São Paulo R. G.</i>	38	33	29	25	24	28	29.5
<i>Aver. Private Lines</i> ..							30.24
Annual average of all							
roads	33.5	27.5	30.7	34.8	31.7	40.1	34.8

These figures were compiled from: *Estatística, 1923*, pp. 168-70, 156-8; *1924*, pp. 174-6, 162-4; *1925*, pp. 188-91, 172-4; *1926*, pp. 194-7, 178-80; *1927*, pp. 202-5, 186-8; *1928*, pp. 218-9, 202-3. The total number of car kilometers was divided by the number of cars multiplied by 365.

TABLE 41

NET TON KILOMETERS PER CAR DAY

	Class I Railways						
	1923	1924	1925	1926	1927	1928	1923-28 Average
A. LINES OPERATED BY							
FEDERAL GOVT.							
<i>Central do Brasil</i>	—	—	—	376	—	494	435.0
<i>Noroeste do Brasil</i>	240	202	—	172	191	236	208.2
LINES OPERATED BY							
STATE GOVTS.							
<i>E. F. Sorocabana</i>	377	318	405	354	409	465	388.0
<i>V. F. R. G. S.</i>	328	361	363	440	471	550	418.8
<i>Average Government-</i> <i>Operated Lines</i>							362.5
B. LINES OPERATED BY							
PRIVATE COMPANIES							
<i>Great Western</i>	258	248	328	312	179	182	254.5
<i>Este Brasileiro</i>	168	143	194	176	199	256	189.3
<i>Leopoldina</i>	246	298	304	345	343	321	309.5
<i>Paulista</i>	—	—	—	—	—	—	—
<i>Mogyana</i>	201	—	224	228	225	265	228.6
<i>São Paulo R. G.</i>	328	297	255	225	231	265	266.8
	268.0	266.7	296.1	292.0	281.0	337.1	
<i>Average privately</i> <i>operated</i>							241.7
<i>Average of all roads,</i> <i>1923-28</i>							294.9

Estatística, 1923, pp. 207-19; 1924, pp. 231-3; 1925, pp. 249-51; 1926, pp. 259-61; 1927, pp. 259-61; 1928, p. 283.

TABLE 42
LOCOMOTIVE KILOMETERS PER LOCOMOTIVE DAY

	Class I Railways						1923-28 Average
	1923	1924	1925	1926	1927	1928	
A. LINES OPERATED BY							
FEDERAL GOVT.							
<i>Central do Brasil</i>	—	—	—	—	—	—	—
<i>Noroeste do Brasil</i>	—	90	83	81	—	—	84.6
LINES OPERATED BY							
STATE GOVTS.							
<i>E. F. Sorocabana</i>	171	113	121	136	139	148	138.0
<i>V. F. R. G. S.</i>	102	103	91	90	91	97	95.6
<i>Average Government-Operated Lines</i> ...							106.0
B. LINES OPERATED BY							
PRIVATE COMPANIES							
<i>Great Western</i>	59	51	63	69	65	63	61.6
<i>Este Brasileiro</i>	43	41	47	35	46	70	50.3
<i>Leopoldina</i>	94	96	90	—	—	90	91.3
<i>Paulista</i>	153	147	160	147	155	—	150.4
<i>Mogyana</i>	111	110	115	108	111	126	113.5
<i>São Paulo R. G.</i>	142	191	125	130	129	138	142.5
<i>Average Privately Operated Lines</i> ...							101.6
<i>Average of all roads, 1923-28</i>							103.1

Estatística, 1923, pp. 162-5, 144-7; 1924, pp. 168-71, 150-3; 1925, pp. 182-5, 160-3; 1926, pp. 188-91, 166-9; 1927, pp. 196-9, 176-9; 1928, pp. 212-3, 190.

TABLE 43
PERCENTAGE SERVICEABLE LOCOMOTIVES

	Class I Railways						1923-28 Average
	1923	1924	1925	1926	1927	1928	
A. LINES OPERATED BY							
FEDERAL GOVT.							
<i>Central do Brasil</i>	—	—	—	—	—	—	—
<i>Noroeste do Brasil</i>	87	87	—	55	—	—	76.3

LINES OPERATED BY
STATE GOVTS.

<i>E. F. Sorocabana</i>	—	—	76	85	87	91	84.7
<i>V. F. R. G. S.</i>	—	91	84	90	78	—	85.7
<i>Average Government-Operated Lines</i> ...							82.2

B. LINES OPERATED BY
PRIVATE COMPANIES

Great Western	—	—	—	—	—	—	—
<i>Este Brasileiro</i>	49	—	—	59	52	64	56.0
Leopoldina	67	67	47	65	63	60	61.5
<i>Paulista</i>	82	87	—	—	—	—	84.5
<i>Mogyana</i>	68	68	73	75	80	72	72.6
<i>São Paulo R. G.</i>	—	—	—	80	80	80	80.0
<i>Average Privately Operated Lines</i> ...							70.9
<i>Average of all roads, 1923-28</i>							75.1

Estatística, 1923, pp. 162-3, 144-7; 1924, pp. 168-71, 150-3; 1925, pp. 182-5, 160-3; 1926, pp. 188-91, 166-9; 1927, pp. 196-9, 176-9; 1928, pp. 212-3, 190.

TABLE 44

FUEL COSTS IN MILREIS PER 1000 LOCOMOTIVE KILOMETERS

	Class I Railways						
	1923	1924	1925	1926	1927	1928	1923-28 Average
A. LINES OPERATED BY FEDERAL GOVT.							
<i>Central do Brasil</i>	—	—	—	—	—	—	—
<i>Noroeste do Brasil</i>	1,002	—	—	—	—	—	1,002
LINES OPERATED BY STATE GOVTS.							
<i>E. F. Sorocabana</i>	1,095	1,444	1,188	1,164	1,320	1,118	1,222
<i>V. F. R. G. S.</i> ...	1,317	—	—	1,433	1,570	1,470	1,447
<i>Average Government-Operated Lines</i>							1,224
Adjusted for locomotive of same capacity as privately operated group							925

B. LINES OPERATED BY
PRIVATE COMPANIES

Great Western ...	1,605	1,546	1,332	1,280	1,416	1,100	1,379
<i>Este Brasileiro</i> ..	365	—	—	574	713	534	546
Leopoldina	875	—	1,042	1,028	—	936	970
<i>Paulista</i>	1,452	1,350	1,432	1,072	1,033	—	1,267
<i>Mogyana</i>	1,039	1,117	1,236	1,394	1,394	1,066	1,207
<i>São Paulo R. G.</i> ..	926	656	1,043	1,316	1,149	1,035	1,021
<i>Average Privately Operated Lines</i>							1,065
<i>Average of all roads, 1923-28</i>							1,118

Estatística, 1923, pp. 162-5, 180-2; *1924*, pp. 168-71, 186-8; *1925*, pp. 182-5, 200-2, *1926*, pp. 188-91, 207-9; *1927*, pp. 196-9, 211-3; *1928*, pp. 212-3, 231-3.

TABLE 45

AVERAGE TRACTIVE POWER OF STREAM OF LOCOMOTIVES

Class I Railways (Tons)

		1928			1928
A. LINES OPERATED BY FEDERAL GOVERNMENT			B. LINES OPERATED BY PRIVATE COMPANIES		
<i>Central do Brasil</i>	11,118		Great Western	—	
<i>Noroeste do Brasil</i>	7,756		<i>Este Brasileiro</i>	5,990	
LINES OPERATED BY STATE GOVERNMENTS			Leopoldina	6,902	
<i>E. F. Sorocabana</i>	11,280		<i>Paulista</i>	—	
<i>V. F. R. G. S.</i>	8,120		<i>Mogyana</i>	7,922	
			<i>São Paulo R. G.</i>	8,322	
<i>Average Govt. Lines</i> ..	9,568		<i>Average Privately</i>		
			Operated Lines	7,284	

Estatística, 1928, pp. 186-7.

TABLE 46

NUMBER OF EMPLOYEES PER 10,000 TON KILOMETERS
OF REVENUE WEIGHT

Class I Railways

	1923	1924	1925	1926	1927	1928	1924-28 Average
A. LINES OPERATED BY FEDERAL GOVT.							
<i>Central do Brasil</i>	—	—	—	—	—	—	—
<i>Noroeste do Brasil</i>	2.17	.57	.45	.54	.47	.33	.47
LINES OPERATED BY STATE GOVTS.							
<i>E. F. Sorocabana</i>	—	—	.21	.20	.18	.16	.19
<i>V. F. R. G. S.</i>	3.00	.37	.36	.36	.28	.28	.31
<i>Average Govt. Operated Lines</i> . . . . .							.32
B. LINES OPERATED BY PRIVATE COMPANIES							
<i>Great Western</i>	1.70	.57	.53	.54	.56	.54	.55
<i>Este Brasileiro</i>	1.39	.76	—	.62	.69	.73	.70
<i>Leopoldina</i>	—	—	.31	.29	.30	.31	.30
<i>Paulista</i>	4.64	.22	.19	.21	.22	—	.21
<i>Mogyana</i>	3.79	—	.26	.30	3.74	—	.28
<i>São Paulo R. G.</i>	3.66	.26	.29	.30	.29	.24	.28
<i>Average Privately Operated Lines</i> . . . . .							.39
<i>Average of all roads, 1924-28</i> . . . . .							.37

Estatística, 1923, pp. 299-301; *1924*, pp. 327-9; *1925*, pp. 347-9; *1926*, pp. 355-7; *1927*, pp. 351-3; *1928*, p. 375.

NOTE.—Owing to the probability of another method of computation being used, these averages do not include 1923, and in the case of the *Mogyana*, 1927.

TABLE 47

RATIO OF LABOR COSTS TO TOTAL EXPENDITURES

Class I and Class II Railways

1923-1928

	1923	1924	1925	1926	1927	1928	1923-28 Average
A. LINES OPERATED BY							
FEDERAL GOVT.							
<i>Central do Brasil</i>	—	—	—	—	54	—	54
<i>Noroeste do Brasil</i>	—	—	—	—	57	44	50
<i>Rede Cearense</i>	68	67	55	—	63	66	64
<i>Oeste de Minas</i>	—	—	58	—	66	—	62
<i>Average Fed. Govt.</i>							
Lines							59
LINES OPERATED BY							
STATE GOVTS.							
<i>E. F. Sorocabana</i>	—	44	42	44	44	47	44
<i>V. F. R. G. S.</i>	47	—	—	63	50	54	53
<i>Rede Sul Mineira</i>	47	45	43	43	39	42	43
<i>E. F. Araraquara</i>	—	—	—	—	—	—	—
<i>Aver. State-operated</i>							
Lines							50
B. LINES OPERATED BY							
PRIVATE COMPANIES							
Great Western	43	46	48	49	49	53	48
<i>Este Brasileiro</i>	62	62	60	63	59	60	61
Leopoldina	51	51	52	54	50	52	52
<i>Paulista</i>	—	43	47	53	52	—	49
<i>Mogyana</i>	47	—	47	45	43	—	45
<i>São Paulo R. G.</i>	44	42	47	48	49	48	46
<i>Victoria a Minas</i>	—	—	53	67	65	62	62
<i>Average Privately</i>							
Operated Lines							53

These percentages compiled from figures given in: *Estatística*, 1923, pp. 299-303, 252-3; 1924, pp. 327-9, 272-4; 1925, pp. 347-9, 292-4; 1926, pp. 355-7, 302-4; 1927, pp. 351-3, 298-300; 1928, pp. 374-6, 322-4.

The averages for federal government, state government, and privately operated lines are weighted for differences in relative amounts of annual expenditures of the roads of each group.

TABLE 48
RATIO OF LABOR COSTS TO TOTAL EXPENDITURES

		Class III Railways						
		1923-1928						
		1923	1924	1925	1926	1927	1928	1923-28 Average
A. LINES OPERATED BY								
FEDERAL GOVT.								
<i>São Luis a Theresina.</i>	66	—	74	74	74	76	73	
<i>Central do Piauhy.</i>	—	—	—	—	43	74	59	
<i>Petrolina a Theresina.</i>	—	—	63	73	77	72	71	
<i>Rio Grande do Norte.</i>	53	67	64	61	61	70	63	
<i>Rio do Ouro</i>	—	—	62	66	62	68	64	
<i>Goyas</i>	60	51	61	—	—	61	58	
<i>Quarahim a São Borja</i>	—	—	—	—	—	42	42	
<i>Average Fed. Govt.</i>								
Lines								61
B. LINES OPERATED BY								
STATE GOVT.								
<i>Bragança</i>	64	59	57	58	60	59	60	
<i>Santa Catharina</i>	70	59	67	68	62	65	65	
<i>Aver. State-operated</i>								
Lines								63
C. LINES OPERATED BY								
PRIVATE COMPANIES								
<i>Madeira Mamore</i>	65	60	63	65	63	66	64	
<i>Nasareth</i>	63	58	54	58	55	54	57	
<i>Marica</i>	—	—	—	—	46	50	48	
<i>Theresa Christina</i>	64	49	54	62	57	62	58	
<i>Mossoró</i>	—	—	—	—	—	—	—	
<i>Average Privately</i>								
Operated Lines								57

These percentages were compiled from figures given in: *Estatística, 1923*, pp. 301-3, 253-4; *1924*, pp. 329-31, 274-6; *1925*, pp. 349-51, 294-5; *1926*, pp. 357-9, 304-6; *1927*, pp. 353-5, 300-2; *1928*, pp. 377-9, 324-6.

TABLE 49
 NUMBER EMPLOYEES PER 10,000 TON KILOMETERS
 USEFUL WEIGHT TRANSPORTED
 Class II and Class III Railways

	1923	1924	1925	1926	1927	1928	1923-28 Aver.	Aver. No. of Employees Per Kil. of Line
A. LINES OPERATED BY FEDERAL GOVERNMENT								
I. <i>Rede Cearense</i>	2.06	0.66	—	—	—	—	1.36	2.12
<i>Oeste do Minas</i>	1.03	0.81	0.82	0.96	—	—	0.90	2.84
III. <i>São Luis-Theresina</i> ...	0.34	—	3.81	5.75	2.38	1.95	2.84	2.84
<i>Central do Piauhy</i>	—	—	—	3.17	3.84	3.86	3.61	2.16
<i>Petrolina-Theresina</i> ...	—	—	6.14	5.77	1.01	2.09	3.75	2.63
<i>Central R. G. do Norte</i>	2.20	0.65	1.23	1.20	1.45	1.23	1.32	2.02
<i>E. F. Rio do Ouro</i>	1.36	—	0.69	—	0.48	0.30	0.70	3.74
<i>Quarahim a São Borja</i>	—	—	—	—	—	—	—	1.44
<i>Average of Federal operated lines</i>							1.71	2.39
LINES OPERATED BY STATE GOVERNMENTS								
II. <i>Rede Sul-Mineira</i>	1.61	0.55	0.55	0.76	0.69	0.64	0.80	2.91
<i>E. F. Araraquara</i>	—	—	0.36	0.34	—	—	0.35	5.06
III. <i>E. F. Bragança</i>	0.78	1.19	1.23	1.28	1.24	1.10	1.13	2.05
<i>E. F. Paracatú</i>	—	—	—	—	—	3.50	3.50	4.06
<i>Santa Catharina</i>	1.08	0.70	0.82	0.78	0.66	0.66	0.78	1.86
<i>Average of State- operated lines</i>							1.31	3.18
B. LINES OPERATED BY PRIVATE COMPANIES								
II. <i>Victoria a Minas</i>	1.23	0.73	1.19	1.00	0.89	1.05	1.01	3.25
III. <i>Madeira-Mamore</i>	0.74	1.08	1.19	1.04	0.86	1.01	0.98	1.40
<i>E. F. Nazaré</i>	0.18	0.97	0.95	1.04	0.87	0.70	0.78	3.62
<i>E. F. Maricá</i>	0.78	1.27	0.47	—	—	—	0.84	3.66
<i>D. Theresa Christina</i> ...	2.05	0.36	0.52	0.64	0.66	0.82	0.84	2.40
<i>Ilheus a Conquista</i>	—	—	—	—	—	—	—	1.44
<i>E. F. Mossoró</i>	—	—	—	—	—	—	—	2.93
<i>Average of Privately operated lines</i>							0.89	2.74

Bibliography: Same as for Table 46.

TABLE 50
AVERAGE ANNUAL WAGES PAID
Class I Railways

	1923	1924	1925	1926	1927	1928	1923-28 Average
A. LINES OPERATED BY FEDERAL GOVT.							
<i>Central do Brasil</i> ..	—	2,701	3,017	3,923	3,863	—	3,373
<i>Noroeste do Brasil</i>	—	—	—	—	4,280	4,029	4,154
LINES OPERATED BY STATE GOVTS.							
<i>E. F. Sorocabana</i> ..	—	1,978	2,345	2,787	2,685	2,691	2,497
<i>V. F. R. G. S.</i> ...	—	—	—	2,778	2,856	3,083	2,905
<i>Average Govt. Operated Lines</i> ..							3,200
B. LINES OPERATED BY PRIVATE COMPANIES							
<i>Great Western</i> ...	1,638	1,703	2,014	2,054	2,048	2,181	1,939
<i>Este Brasileiro</i> ...	1,338	1,334	1,517	1,634	1,666	1,888	1,592
<i>Leopoldina</i>	1,922	2,250	2,643	2,899	2,970	3,043	2,621
<i>Paulista</i>	—	2,874	3,100	3,075	2,971	—	2,980
<i>Mogyana</i>	2,153	—	2,810	2,863	2,886	—	2,678
<i>São Paulo R. G.</i> ...	1,955	2,204	2,480	2,779	2,600	2,683	2,450
<i>Average Prvt. Operated Lines</i> ..							2,400

These average-wage figures computed from data given in: *Estatística*, 1923, pp. 299-301, 305-7; 1924, pp. 327-9, 333-5; 1925, pp. 347-9, 353-5; 1926, pp. 355-7, 361-3; 1927, pp. 351-3, 357-9; 1928, pp. 375, 381.

These data on wages are inconclusive for two reasons: first, it is not known how many of the high officials are included in these figures; second, there are no adequate indexes of the cost of living in the different territories covered by these roads. The Central do Brazil is the only railroad with terminals in the two cities, Rio de Janeiro and São Paulo, in which the cost of living is higher than elsewhere in Brazil. The wage level, therefore, on the Central should be higher than on any of the other roads. It does not seem possible to say which group pays the highest real wages.

TABLE 51
AVERAGE ANNUAL WAGES PAID
Class II and Class III Railways
(In Milreis)

	1923	1924	1925	1926	1927	1928	1923-28 Average
A. LINES OPERATED BY FEDERAL GOVT.							
<i>Rede Cearense</i>	1,579	1,793	1,841	—	2,620	2,251	2,016
<i>Oeste de Minas</i> ..	—	—	2,150	—	2,713	—	2,431
<i>São Luis a Theres.</i>	1,311	—	1,362	1,489	1,427	2,457	1,629
<i>Central do Piauhy</i>	—	—	—	—	2,489	2,478	2,533
<i>Petrolina a Theres.</i>	—	—	1,643	1,887	1,653	1,831	1,753
<i>Central do R. G. N.</i>	1,672	1,931	2,248	2,304	2,089	2,327	2,095
<i>Rio do Ouro</i>	—	—	3,493	4,044	3,649	5,412	4,149
<i>Goyas</i>	1,679	1,738	2,398	—	—	3,642	2,364
<i>Quarahim a São Borja</i>	—	—	—	—	—	1,839	1,839
<i>Average Fed. Govt. Lines</i> ..							2,311
STATE GOVT. OPERATED LINES							
<i>Rede Sul Mineira</i> .	1,557	1,737	1,965	2,436	2,615	2,695	2,501
<i>Araquara</i>	—	—	—	—	—	—	—
<i>Bragança</i>	1,165	1,175	1,354	1,334	1,378	1,349	1,292
<i>Santa Catharina</i> ..	1,950	2,343	2,323	2,753	2,875	2,797	2,507
<i>Average State Govt. Lines</i> ..							2,060
B. LINES OPERATED BY PRIVATE COMPANIES							
<i>Victoria a Minas</i> ..	—	—	2,151	2,888	3,129	2,872	2,760
<i>Madeira Mamore</i> ..	—	3,613	3,220	3,904	4,139	3,384	3,652
<i>Nazereth</i>	1,096	1,457	1,666	2,089	2,103	2,355	1,791
<i>Marica</i>	—	—	—	—	2,009	1,520	1,764
<i>Theresina Christina</i>	1,486	1,486	1,399	1,452	1,626	1,737	1,531
<i>Mosoré</i>	—	—	—	—	—	—	—
<i>Ileosa Conquista</i> ..	—	—	—	—	—	—	—
<i>Average Privately Oper. Lines</i> ..							2,299

These average-wage figures have been computed from figures given in:

Estatística, 1923, pp. 298-308, 304-7; 1924, pp. 327-31, 332-7; 1925, pp. 347-51, 354-7; 1926, pp. 355-59, 362-5; 1927, pp. 351-5, 356-61; 1928, pp. 374-9, 382-5.

TABLE 52

MAINTENANCE OF PERMANENT WAY

Mogyana and Sorocabana

MATERIAL REPLACED AND BALLAST LAID

Year	No. Kils. Rails replaced per year		Number Ties replaced per year		No. Kils. Crushed Rock Ballast laid per year		Page
	<i>Mog.</i>	<i>Sor.</i>	<i>Mog.</i>	<i>Sor.</i>	<i>Mog.</i>	<i>Sor.</i>	
	1923	—	24	229,359	324,015	—		40	310
1924	10	154	236,374	186,824	—	21	338
1925	69	22	309,609	524,480	6	19	358
1926	80	45	447,080	493,897	14	65	367
1927	10	90	396,622	415,655	—	70	363
1928	13	36	455,426	437,595	12	148	387
<i>Aver.</i>	36.4	64.6	345,745	363,411	5.3	60.5	
No. replaced per kilometer of line per year	.018	.033	175	197	.0026	.033	

Unless otherwise stated, all page references are to *Estatística* for the years for which the figures are given.

TABLE 53

TONS AND TON KILOMETERS OF COFFEE HANDLED

Year	Tons		Ton kilometer		<i>Estatística</i> Page
	<i>Mog.</i>	<i>Sor.</i>	<i>Mog.</i>	<i>Sor.</i>	
1923	241,424	94,894	38,506,276	28,592,399	205
1924	264,239	82,466	.....	27,306,846	219
1925	231,469	114,057	38,584,123	40,631,704	237
1926	277,083	109,658	45,220,734	39,608,247	247
1927	280,024	187,069	51,012,165	68,748,900	247
1928	231,682	122,887	38,519,566	50,777,275	271
				<i>Mog.</i>	<i>Sor.</i>
Average distance of each ton of coffee			.....	167	363

TABLE 54
ROLLING STOCK
1910, 1919, 1928

Road	Locomotives (Total owned)			Maximum Weight (Thous. of tons)			Minimum Weight (Thous. of tons)		
	1910	1919	1928	1910	1919	1928	1910	1919	1928
<i>Sul Mineira</i>	57	82	108	47	47	83	15	15	20
<i>Central</i>	—	484	641	—	126	—	—	11	—
<i>Paulista</i>	—	—	254	—	—	—	—	—	—
<i>Mogyana</i>	—	—	185	—	—	80	—	—	17
<i>Sorocabana</i>	—	124	256	36	87	93	17	17	17
<i>V. F. R. G. S.</i>	168	208	261	31	71	79	8	11	22

	Freight Cars— Average Capacity (Total owned)			Passenger Cars— Average Number (Total owned)			Places per Car					
	1910	1919	1928	1910	1919	1928	1910	1919	1928			
<i>Sul Mineira</i>	380	617	776	10	13	14	53	67	96	39	39	40
<i>Central</i>	—	6,381	7,505	—	—	—	—	—	882	—	—	—
<i>Paulista</i>	—	—	—	—	—	—	—	—	242	—	—	—
<i>Mogyana</i>	—	—	2,915	—	—	15	—	—	224	—	—	34
<i>Sorocabana</i>	—	2,076	2,688	—	18	22	—	133	235	—	30	45
<i>V. F. R. G. S.</i>	1,834	2,651	2,978	12	12	21	164	205	378	37	37	37

These figures taken or compiled from: *Estatísticas, 1910*, pp. 58-63; *1919*, pp. 90-7; *1928*, pp. 186-210.

In the *1919 Estatísticas* no figures for the Central were available, and *1918* figures were inserted instead (pp. 64-71). In the *1919 Estatísticas* no figures were available for the Sorocabana, so *1918* figures were employed instead (pp. 52-57).

APPENDIX

TABLE 55
CRUSHED ROCK BALLAST APPLIED
Viaçao Ferrea do Rio Grande do Sul

1910-1919		1923-1928	
Year	Kilometers	Year	Kilometers
1910....	—	1915....	2
1911....	—	1916....	3
1912....	—	1917....	2
1913....	—	1918....	1
1914....	—	1919....	4
1920....	—	1924....	41
1921....	—	1925....	—
1922....	—	1926....	28
		1927....	—
		1928....	81
		1929....	—
Annual Average 1910-1919		1.5	
Annual Average 1923-1928		25.0	

The above figures were taken and computed from: *Estatística, 1910*, p. 142; *1911*, p. 205; *1912*, p. 205; *1913*, p. 161; *1914*, p. 167; *1915*, p. 166; *1916*, p. 219; *1917*, p. 153; *1918*, p. 153; *1919*, p. 223; *1923*, p. 310; *1924*, p. 338; *1925*, p. 358; *1926*, p. 367; *1927*, p. 363; *1928*, p. 386.

The data for the years 1910-1919 are given in terms of cubic meters. These figures have been converted into kilometers on the basis of equivalence given in: *Manual of the American Railway Engineering Association, 1929*. The American Railway Engineering Association, Chicago, page 113.

TABLE 56
PERCENTAGE OF UTILIZATION OF FREIGHT CAR CAPACITY

	Class I Railways						1923-28 Average
	1923	1924	1925	1926	1927	1928	
A. LINES OPERATED BY FEDERAL GOVT.							
<i>Central do Brasil</i>	—	—	—	—	—	—	—
<i>Noroeste do Brasil</i>	34	42	42	32	31	31	37.0
B. LINES OPERATED BY STATE GOVTS.							
<i>E. F. Sorocabana</i>	—	—	56	51	—	53	53.3
<i>V. F. R. G. S. . .</i>	49	40	40	41	45	50	44.1
<i>Average Govt. Operated Lines</i>							44.6

C. LINES OPERATED BY
PRIVATE COMPANIES

Great Western ..	49	—	50	47	45	49	48.0
<i>Este Brasileiro</i> ..	38	—	—	45	47	40	42.5
Leopoldina	—	—	52	59	61	56	57.0
São Paulo R. R.	—	—	—	—	—	—	—
<i>Paulista</i>	—	—	—	—	—	—	—
<i>São Paulo R. G.</i>	47	—	—	37	42	39	41.2
<i>Mogyana</i>	55	—	54	53	53	59	54.8
<i>Average Prvt. operated lines, 1923-28</i>							48.7
Page (<i>Estatística</i>)	217	231	249	259	259	288	

TABLE 57

SOROCABANA, 1910-1919

PERCENTAGE TOTAL RECEIPTS FROM FREIGHT AND
PASSENGER SERVICE

Year	Freight	Passenger	Year	Freight	Passenger
1910	58	26	1915	56	22
1911	55	27	1916	62	29
1912	56	28	1917	63	19
1913	58	26	1918	58	20
1914	54	27	1919	57	22
<i>Average 1910-1919</i>				58	25

TABLE 58

MOGYANA AND SOROCABANA 1923-1928

PERCENTAGE TOTAL RECEIPTS FROM FREIGHT AND
PASSENGER SERVICE

Year	Freight		Passenger		Year	Freight		Passenger	
	<i>Mog. Sor.</i>	<i>Sor.</i>	<i>Mog. Sor.</i>	<i>Sor.</i>		<i>Mog. Sor.</i>	<i>Sor.</i>	<i>Mog. Sor.</i>	<i>Sor.</i>
1923	63	56	23	20	1926	66	61	21	18
1924	63	54	22	21	1927	67	66	19	15
1925	63	59	23	18	1928	63	60	16	22
<i>Average 1923-28</i>						64	59	21	19

Source: *Estatística*, 1923, p. 232; 1924, p. 248; 1925, p. 268; 1926, p. 280; 1927, p. 276; 1928, p. 302.

TABLE 59

PERCENTAGE OF AVAILABLE PASSENGER SERVICE UTILIZED

	Class I Railroads							1923-28 Average
	1922	1923	1924	1925	1926	1927	1928	
A. LINES OPERATED BY FEDERAL GOVTS.								
<i>Central do Brasil</i>	—	—	—	—	—	—	—	—
<i>Noroeste do Brasil</i>	48	45	46	40	45	47	45.1	
B. LINES OPERATED BY STATE GOVTS.								
<i>E. F. Sorocabana</i>	—	51	52	46	42	58	49.8	
<i>V. F. R. G. S.</i>	47	67	61	54	41	59	54.8	
<i>Average Govt. Operated Lines</i>								49.9
C. LINES OPERATED BY PRIVATE COMPANIES								
<i>Great Western</i>	38	—	41	38	33	36	35.2	
<i>Este Brasileiro</i>	44	—	—	59	54	56	53.2	
<i>Leopoldina</i>	52	61	61	52	53	54	53.0	
<i>Paulista</i>	39	—	—	—	—	—	—	
<i>Mogyana</i>	—	—	44	42	43	43	43.0	
<i>São Paulo R. G.</i>	39	—	40	34	37	37	35.4	
<i>Average Privately Operated Lines</i>								43.9
<i>Average of all roads, 1923-28</i>	47	47	55.8	46.4	46.4	43.3	48.7	46.1

Estatística, 1923, p. 180; 1924, p. 193; 1925, p. 207; 1926, p. 217; 1927, p. 216; 1928, p. 241.

TABLE 60

AVERAGE DISTANCE OF EACH TON HAULED AND
EACH PASSENGER TRANSPORTED

Year	Mogyana		Sorocabana		<i>Estatística</i> Pages
	Each Passenger		Each Ton of Freight		
	<i>Mog.</i>	<i>Sor.</i>	<i>Mog.</i>	<i>Sor.</i>	
1923	43.9	73.5	117.8	245.2	189 & 217
1924	44.8	80.7	....	236	192 & 231
1925	48.4	86.7	120.6	198.8	207 & 249
1926	52.5	79.6	123.1	212.2	217 & 259
1927	51.5	82.9	125.6	227.8	217 & 259
1928	49.7	91.0	109.3	230.9	241 & 283
Average	45.63	81.9	119.28	225.15	

TABLE 61

COMPARATIVE PASSENGER RATES IN MILREIS

Classification	1930							
	Mogyana		Sorocabana					
	I		100 Kil.		300 Kil.		600 Kil.	
	<i>Mog.</i>	<i>Sor.</i>	<i>Mog.</i>	<i>Sor.</i>	<i>Mog.</i>	<i>Sor.</i>	<i>Mog.</i>	<i>Sor.</i>
I. One way	13.5	12.3	29.2	26.9	49.3	35.8		
II. One way	7.9	6.0	15.7	14.2	22.4	20.4		
I. Round trip	21.6	19.7	46.6	43.0	78.9	57.3		
II. Round trip	12.6	9.6	25.1	22.7	35.9	32.6		
I. Commutation—one way	3.4	3.1	7.3	6.7	12.4	9.0		
II. Commutation—one way	1.6	1.4	4.0	3.5	5.6	5.1		
I. Commutation—round trip ..	5.4	4.9	11.7	10.7	19.8	14.3		
II. Commutation—round trip ..	3.2	2.4	6.3	5.7	9.0	8.1		
Relative all classifications.					114	100		

TABLE 62
COMPARATIVE PASSENGER RATES IN MILREIS

Classification	II					
	Central		Paulista			
	100 Kil.		300 Kil.		600 Kil.	
	Cent.	Paul.	Cent.	Paul.	Cent.	Paul.
I. One way	13.0	10.6	35.1	23.4	58.5	31.8
II. One way	9.0	6.4	24.3	12.8	40.5	17.0
I. Round trip	20.0	17.0	54.0	37.4	90.0	50.9
II. Round trip	14.0	10.2	37.8	20.4	63.0	27.3
Relative all classifications					173	100

Central Figures from *Classificao Geral das Mercadorias*, C. C. F. I, *Contadoria Central Ferroviaria*, Rio de Janeiro, 1928, page V, and *Bases Padrão Contadoria Central Ferroviaria*, Rio de Janeiro, 1925.

Paulista figures furnished by courtesy of the *Contadoria Central Ferroviaria of São Paulo*, November, 1930.

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V I T A

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