



GUIANA

SCALE



AMAZONAS

Natal

Parahiba

RECIFE

Maragogi

São de Ra Branca

MACEIO

Propriá

São Félix

BAHIA

Colônia

Muros Ouros

Epita
1849-2000

Caratinga
Rio
Paranaíba
Victoria

CASPOS

TERO
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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INTRODUCTION

IN the thirties and the forties of the nineteenth century, England and the European continent were beginning their railway systems. In that period, the chief reliance of Brazil for transportation was its long frontage on the Atlantic and its many rivers, some of which were wide and deep. Inland transportation, where it existed, usually moved over pack trails. The country, therefore, felt its need of the new means of communication. For Brazil is larger than continental United States excepting Alaska; if it were to develop its vast, sparsely settled hinterland, it needed railroads. Settlement was then confined to a limited area along the coast.

Unaided private capital could not build the railways, for private companies would have to wait years before there could be enough traffic to make the railways profitable. The people of Brazil, however, were accustomed to look to the government to assist them in such enterprises. The method of assistance which the Imperial government of Brazil adopted was to subsidize private capital. This subsidy was chiefly in the form of a guarantee of interest on capital invested. Railway construction was started in the eighteen fifties.

In building these roads the Brazilians were confronted with a variety of difficulties. The topography offered special problems. Brazil may be described as chiefly coastal plain and inland plateau, and the ascent from the former to the latter is usually abrupt. On three lines the grade is so steep that ordinary means of traction are not adequate. On one the trains have to be pulled up by cables. Such lines are expensive to build and to operate.

Heavy downpours during the rainy season make construction and maintenance costly. It was not easy to cut away the luxuriant tropical vegetation which covered a large part of the country. Yellow fever and other tropical diseases took, and are taking, their toll in life and energy.

Nor was there any important single commodity to form the backbone of railway prosperity. Coffee, the present most important item of Brazilian railway traffic, was then grown on a small scale. It grew best on the high inland plateau and the railways ascending from the port cities to the coffee territory cost more to construct and operate than lines running on more level terrain. Traffic in the beginning was so small that many of the roads did not even pay out-of-pocket costs.

Capital had to be obtained from abroad with guarantees of interest, usually payable in gold. During the period of the empire, the exchange value of the milreis, the national monetary unit, was relatively stable. The payment-in-gold feature of the guarantee of interest did not, therefore, occasion great hardships in that period. But in 1889 the form of government was changed to that of a federal republic. With the new government there began a rapid depreciation of the international exchange value of the milreis. In 1889 a milreis was worth fifty-three cents; a decade later it was worth only fifteen cents. This greatly increased the number of milreis which had to be set aside in the budget to take care of the payments in gold of the guarantee of interest.

The heavy drain on the treasury caused by these added payments moved the government in the first decade of the twentieth century to buy some of these roads on which a guarantee of interest was payable in gold. They were paid for in government bonds bearing a lower rate of interest than the rate of the guarantee. The government decided to rent

the roads thus purchased to private companies. It consolidated a number of small lines into five larger systems. At that time government operation was considered more expensive than private operation. Contracts were made with these operating companies for the building of additions and connecting lines for the existing systems. It was the plan of the government to use for this new construction the money which it received as rent.

The government became the owner of railways in still another way. Some of the companies failed because they could not command sufficient capital to carry out the construction and operation for which they had obtained concessions. Popular feeling in the regions concerned would not allow construction, once begun, to stop. No private companies could be found to take over the bankrupt firms, and the government was forced to take them over. Sometimes the roads thus taken over were leased to private companies for operation, but others, including the largest and most important system, have continued to be operated by the government. In this way the central government became both owner and operator of railways. In much the same manner, but on a more modest scale, the several states, called provinces during the days of the empire also became the owners and operators of railway systems.

Meantime coffee had come to be more and more important. Brazil became the world's largest coffee producer. The value of the coffee exported has now come to be more than half of the total exports of the country. Brazil is an agricultural nation living by the raw materials and farm products which it exports. These pay for the imported machinery and manufactured goods. This lack of heavy industries and limited industrial development result chiefly from the lack of coal with which to utilize its abundant supplies of iron ore. Coffee has naturally become the chief reliance of the rail-

roads. As a general rule those roads which haul large amounts of coffee are prosperous; and those roads handling little coffee have either small net operating revenue, or deficits. Private capital has retained these profitable lines. The rest sooner or later came into the hands of the central and the state governments. A few of the roads thus taken over afterwards became prosperous, as heavy coffee traffic developed. But they are exceptions.

Because of the economic instability resulting from national prosperity dependent on one crop, and the financial policy adopted by successive administrations of the federal government, which came into existence following the downfall of the Empire in 1889, the gold value of the milreis has followed a declining course. Freight rates, however, have not gone up as rapidly as the milreis has gone down. This has made the financial existence of both government roads and private roads precarious. There are a few exceptions, some of the private companies having retained in their concession contracts clauses which permitted them to raise rates promptly and at a fixed ratio as the value of the milreis went down. The roads retaining this clause were those having large percentages of coffee traffic. This was natural, because a depreciating milreis usually meant a higher milreis price for coffee. Under such circumstances the planters do not greatly object to paying higher freight and passenger rates.

Ordinary times in Brazil, therefore, were trying enough to railway operators, government and private. Emergency conditions like those caused by the World War greatly intensified their difficulties. There were casualties among the railway companies because of war conditions. Locomotives and rails had to come from abroad. Prices were very high. At times needed equipment could not be secured at any price. Two companies renting important lines from the federal government let their road bed and

equipment run down and had to give up their contracts at the end of the war period. At this stage the federal government began a new policy. Instead of operating the lines itself, or leasing them to other private companies, it rented the systems to the states within whose borders they ran. Another company leasing a large railway system owned by a state government had to give up its contract. The state decided to operate the line. The most significant postwar development in Brazil was this beginning of the operation of big railway systems by the state governments. Before this time the states had only operated unimportant lines.

This in brief is the railway situation in Brazil. There are three types of operators: the federal government, state governments and private companies. This study will seek to discover which type gives the best results from the standpoint of national economic well-being. Some attention will necessarily be given to technical operating efficiency. But the emphasis will be on the discovery and evaluation of the relative advantages and disadvantages to the general public of the three types.

Four methods of approach will be used: (1) The history of imperial and federal government railway policy will be studied, especial attention being given to the last two decades. The foregoing pages are largely a summary of that inquiry. (2) Roads which have changed their type of operation from private to public, or vice versa, will be examined to see what differences, if any, such changes have made. (3a) A privately-owned and operated railway will be compared with a similar railway owned and operated by a state government. (3b) A privately-owned and operated railway will be compared with a similar railway owned and operated by the federal government. (4) Comparisons will be made of certain phases of operation of all federal government and state-government lines with that of lines operated by private companies.

Attention will be centered on the Class I railways, as these not only include all the more important systems, but also constitute two-thirds of the railway mileage of the nation. In a few cases, however, Class II and Class III lines will also be considered.

Obvious limitations affect the conclusions drawn from the comparison of the operating efficiency of roads. For no two railroads are really alike. The pairs which have been chosen were selected, not because they are in all respects similar, but as the ones having the largest number of points in common.¹ This same limitation applies to comparisons of operating efficiency of the same road which has changed its type of operation. The conditions under which any given road operates do not remain the same, and historical comparisons may, therefore, be misleading.²

The outstanding new development of this century has been, as already stated, the entry of the states as operators of large systems. But this happened only in 1920, and a decade is a relatively short time in which to judge the results. There is a special reason for emphasizing this factor with regard to Brazil. There are grounds for believing that the

¹ "It is impossible to establish any one standard by which to gauge the efficiency of railway operation or of the railways as financial concerns. The circumstances under which they operate are so diverse; the extent, character and use of the equipment vary very widely with different roads; the financial methods of different roads handicap one and help another; in fact, to really know the railways involves a continuous and intensive study of all phases of the business itself and the environment, domestic and international, which affects the business." Jackman, William T., *The Economics of Transportation*, A. W. Shaw Company, New York, 1926, p. 92.

² On this point Professor John Maurice Clark says: "Comparisons of actual results are difficult, owing to differences in the nature of the service rendered, and to various local conditions; therefore it is still possible for advocates and opponents each to claim superiority for their favorite system." Clark, John Maurice, *The Social Control of Business*, University of Chicago Press, Chicago, 1926, p. 422.

effects of political abuses in government railway administration are cumulative with the passage of time. The financial history of the government-operated *Central do Brazil* shows that during the last three decades of the nineteenth century receipts were greater than expenditures. But in the twentieth century every year has shown a deficit.³ In the decade 1872-1881, the average operating ratio was less than 50 per cent, while in the decade 1912-1919 it had jumped to 132 per cent.

Doubtless there are many factors which explain this change, but one may be singled out as important. It will be later shown that the outstanding defect of federal-government administration is too many employees. When a man is given a position on the *Central* as a reward for political service or as a result of political influence, the road may not only be obligated to keep him permanently, but also must retire him on a pension. With each change of political administration there are new groups of friends who must be satisfied. Furthermore the president can serve only one term of four years. Politics in Brazil centers more around personalities than it does around parties; hence each new president has to cater to his own group. Assuming that a relatively large number of the appointees, are young men, it would not be necessary for any one administration to create many new sinecures in order to keep this snowball of increasing expenditures for personnel rolling down hill and growing in size.

This hypothesis may be applied also to other branches of the government administration in Brazil. There was a successful revolution in 1930. This revolution represented the mounting resentment of the general public against the cumulative character of the abuses of previous administrations. The whole structure became unsupportable. It was

³ Appendix, p. 199, Table 21. Hereafter "Table" will be written "T".

the first successful revolution in the history of the republic. The writer will freely admit that this hypothesis of the cumulative effect of the evils of preceding administrations has not been proved. The reason for bringing it up here is that the states are new brooms in administering important railways. So far they have swept clean. But they may be administered as the *Central* has been after they have been in the hands of the states as long as the *Central* has been controlled by the federal government. All of which is a caution sign in drawing conclusions from the comparative showing of state operation of important systems.

The character of the quantitative evidence is another limiting factor. Brazil is a relatively young and undeveloped country. The gathering and publication of statistical information has not reached the stage of development that it has in older countries. Operating statistics, as developed by the *Inspectoria Federal das Estradas de Ferro*, are more comprehensive and candid than government financial statements.

These, in brief, are the reasons for the qualified and tentative character of the conclusions reached in this book. It will be further noted that the book is silent on the general question of public versus private ownership and operation of railways. The advisability or nonadvisability of government ownership and operation depends on the specific conditions in each country, and probably no general rule can be given. This study seeks to show how the special situation of Brazil has conditioned the development of railways and controlled the relation of the government to them.⁴

⁴ Professor Edwin R. A. Seligman takes the position that the advisability or nonadvisability of government ownership depends on the political and economic development of the country and on its fiscal position. A good summary of Professor Seligman's view may be found in "Government Ownership or Government Control of Railroads," *Journal of the National Institute of Social Sciences*, New York, June 1, 1919.

Professor John Maurice Clark says: "When the question is asked

The accompanying map gives the Class I railways as set forth in the latest statistical year book of Brazilian railways. The best maps are the detailed maps of the *Club de Engenharia* of Rio de Janeiro, published in fifty sheets, and the state maps issued by the statistical department of the ministry of communications.⁵

which is more efficient, private or public operation, the answer must be that neither system is always superior to the other, both showing conspicuous successes and conspicuous failures." Clark, John Maurice, *The Social Control of Business*, p. 422.

Professors Emory R. Johnson and Thurman Van Metre believe that: "It must be borne in mind too in the discussion of this problem that the experience of one country is not necessarily a safe guide of action for the people of another country. . . . Each nation has its own peculiar social economic and political conditions and the problems of each nation must be worked out on the basis of experience and with reference to its particular conditions of national life." Johnson, Emory R. and Thurman Van Metre, *Principles of Railroad Transportation*, D. Appleton and Co., New York, 1921, p. 566.

⁵ The former are dated 1922, the latter 1928.

PART I

CHAPTER I

DEVELOPMENT OF THE RAILWAY POLICY OF THE IMPERIAL GOVERNMENT: 1835-1874

IN the thirties and the forties of the last century, when railways were being developed in England and on the continent of Europe, Brazil was, as yet, sparsely settled. Official figures for the year 1830 record 5,340,000 inhabitants.¹ As the area of Brazil was approximately 3,286,173 square kilometers, the population density was 1.6 per square kilometer.² Furthermore this population was chiefly concentrated in a few towns and cities along the Atlantic coast line.³ This meant that railways had to be built in advance of traffic. Private capital, unaided, will not build in advance of traffic. Therefore, if the roads were to be built the government had to do one of two things: either build the roads, or grant substantial assistance to private enterprise.

The people of Brazil were accustomed to looking to the government for guidance and assistance in economic questions.⁴ This was manifested especially during the rule of Dom Pedro II, from 1840-1889, the period during which

¹ *O Brasil Actual*, Ministerio da Agricultura, Industria, e Commercio, Instituto de Expansão Commercial, Rio de Janeiro, 1929, p. 12.

² *Resumo de Varias Estatisticas Economico-Financeiras*, Ministerio da Agricultura, Industria e Commercio, Directoria Geral de Estatistica, Rio de Janeiro, 1924, p. 7. Brazil was and is larger than continental United States excepting Alaska.

³ Nash, Roy A., *The Conquest of Brazil*, Harcourt Brace and Co., New York, 1926, p. 186.

⁴ Robertson, William Spence, *History of the Latin American Nations*, p. 146; Edmundson, G., "Brazil and Portugal," *Cambridge Modern History*, vol. x, p. 311.

railway enterprise was started in Brazil.⁵ Sugar mills, for example, were subsidized by the government.⁶ The government's method of promoting railway development was to subsidize private capital. This subsidy took the form of a guarantee of interest on capital invested.⁷

The early history of government policy is characterized by unsuccessful attempts by the government to attract capital from abroad. The first railway law, that of 1835, set forth the conditions under which concessions might be secured.⁸ But as this law offered no special inducements to private capital, no railways were constructed under its provisions.

Railway construction and operation in Brazil presented special difficulties: (1) The ascent from the coast cities to the inland plateau made construction and operation expensive. The outstanding topographical characteristic of Brazil is this elevated region in the interior.⁹ One authority estimates

⁵ "The problem of how best to further the civilization and progress of Brazil was the keynote of the policy of Dom Pedro II. He made close and extended study of economic questions calling to his assistance a variety of expert opinions abroad and at home." Akers, C. E., *A History of South America*, J. Murray, London, 1904, p. 233.

⁶ *Relatorio do Ministerio e Secretario de Estado dos Negocios da Agricultura, Commercio, e Obras Publicas*, Imprensa Nacional, 1887, p. 167.

⁷ Some kilometric subsidies were granted, but the amounts were small compared with payments on account of guarantee of interest.

⁸ *Legislação Ferroviaria Federal do Brasil. Leis, decretos, regulamentos, instruções, avisos, portarias, e outras actos desde as primeiras iniciativas ate 31 de Dezembro de 1921*, arranged by Alberto Randolpho Paiva, Ministerio da Viacao e Obras Publicas, Rio de Janeiro, 1922, vol. i, pp. 7, 8. This is one of a series of sixteen volumes of Brazilian railway law and administrative decisions compiled during the administration of Dr. Pires do Rio for the celebration of the centenary of the independence of Brazil in 1922. It is invaluable for the study of the history of the railways of Brazil.

⁹ Brazil is "essentially a highland with a mountain core, surrounded by a sea of lowlands." Nash, Roy A., *op. cit.*, p. 51.

that this interior plateau covers one-half of the total area of Brazil.¹⁰ This is especially evident on the lines leading to the interior from the capital, Rio de Janeiro, and the principal coffee port, Santos. The line from Santos uses a cable system to draw its trains to the interior plateau. One of the lines from Rio de Janeiro uses a rack-and-pinion system, and another uses a third friction rail. In a distance of 12 kilometers the Santos lines climb 776 meters. In a distance of 6 kilometers one of the lines from Rio de Janeiro climbs 811 meters. From one of the southern ports, Paranagua, the ascent is 759 meters in 37 kilometers.¹¹

This ascent is made more difficult by the heavy rainfall characteristic of the coastal mountain range. For example, on the section of the coastal range near Santos the average rainfall is 3,696 millimeters.¹² As the surface of this incline is loose soil, it is particularly liable to slides.

(2) The strongly marked rainy season causes washouts and slides not only on the slopes of the coastal mountain range, but on the plains and plateaus as well.¹³ (3) The tropical climate invites diseases and probably retards working energy.¹⁴ Yellow fever was epidemic over large areas of

¹⁰ James, Herman, G., *Brazil After a Century of Independence*, Macmillan Company, New York, 1925, p. 25.

¹¹ *Estatística das Estradas de Ferro do Brasil, 1928*, Ministério da Viação e Obras Públicas, Rio de Janeiro, 1930, pp. 144-45, 146-47; 143; 142; 116, 92-93, 93-94, 105, 111; 109; 108; 86, 80, 82; 83-84.

These references include all roads which must make the ascent.

See also James, Preston E., "Geographic Factors in the Development of Transportation in South America," *Economic Geography*, vol. i, 1925, p. 252.

¹² Nash, Roy A., *op. cit.*, pp. 55-56.

¹³ *Relatorio Number 77 da Companhia Mogiana, 1929*, Campinas, 1930, p. 7. *Relatorio da Estrada de Ferro Sorocabana, 1929*, São Paulo, 1930, p. 6.

¹⁴ See Nash, Roy A., *op. cit.*, for an excellent account of tropical diseases.

Brazil until 1908.¹⁵ (4) Brazil lacks coal. The small amount the country has is of low grade.¹⁶ Wood can be burned in locomotives, but it is not as satisfactory as coal. Furthermore the lack of coal has prevented the development of a native steel industry. This meant that locomotives, rails and the metal parts for cars have to be imported.

(5) The monetary unit of the country was unstable. From 1808 to 1850 the milreis, the national monetary unit depreciated in gold value from \$1.46 to \$0.58.¹⁷ This becomes especially significant when it is remembered that coal, locomotives, rails and other equipment had to be purchased abroad.

It is not surprising, therefore, that railways came relatively late to Brazil. The first railway in Brazil began operation in 1854. It ran from Estrella, a point on the bay of Rio de Janeiro, to the foot of the mountains leading to the summer capital of the empire. It was constructed under a special concession without any guarantee of interest. It was only fourteen kilometers long.¹⁸

The legislation which marks the determination of the government to offer inducements sufficiently attractive to draw foreign capital was passed June 26, 1852.¹⁹ It offered three

¹⁵ *Annual Report*, Rockefeller Foundation, New York, 1929, p. 46, shows that this enemy is not yet fully conquered.

¹⁶ Oliveira, E. P., "Mineral Resources of Brazil," *Pan American Geologist*, vol. lli, 1929, p. 186.

Miller, Benjamin L., and Joseph T. Singewald, *The Mineral Deposits of South America*, McGraw Hill Book, Co., New York 1919, p. 200.

¹⁷ Figures for 1808 are taken from Calogeras, Joao Pandia, *La Politique Monetaire du Bresil*, Imprimerie Nationale, Rio de Janeiro, 1910, p. 26. The figure for 1850 was furnished by Dr. James R. Mood, of the United States Department of Commerce. Dollar equivalents of the milreis will be found on page 183 of the Appendix.

¹⁸ *Legislação Ferroviaria*, vol. i, pp. 15, 16, *op. cit.*
Estatística, 1928, *op. cit.*, p. 19. This, with the date, will be the abbreviation used hereafter for this report.

¹⁹ *Legislação Ferroviaria*, vol. i, pp. 17-19, Decreto Legislativo N. 641.

kinds of inducement: (1) No import duties were to be charged on materials used in construction. (2) A privileged zone of five leagues on either side of the right of way was offered. Within that zone no other company could construct a railroad without previous permission from the original company. (3) The most important provision was the guarantee of five per cent on capital invested.

An American writer, it may be noted in passing, has recently stated:

So far as one can gather from the data available in this country, the policy in Brazil has from the first been for the government to build and operate the railways.²⁰

The original documents are available in the Library of Congress, including legislation and reports of the ministers of communications. It seems probable, therefore, that the above-mentioned author did not carry his research on this question to the primary sources.²¹

Under the stimulus of this guarantee concessions were signed for five lines. These lines were later to become parts of five of the most important systems in Brazil: (1) The line from Recife to Palmares became a part of the Great Western of Brazil Railway. (2) The one from Bahia to Alagoinhas in the state of Bahia was afterwards incorporated in the *Companhia Ferroviaria E'ste Brasileiro*. (3) The line from Rio de Janeiro to the Barra de Pirahy finally became a part of the *Central do Brasil*. (4) The line from Santos to

²⁰ Splawn, Walter M. W., *Government Ownership and Operation of Railroads*, Macmillan Company, New York, 1928, p. 148.

²¹ The excellent monograph of Doctor Palmanho de Jesus, is also available in the United States. It was catalogued in the Library of Congress in 1924, four years before Dean Splawn's book was published. "Rapida Noticia sobre As Estradas De Ferro" *Diccionario Historico, Geographico, Ethnographico do Brasil*, Imprensa Nacional Rio de Janeiro, 1922, vol. ii. All subsequent references are to the translation of this article now on file at the Department of Commerce, Washington, D. C.

Jundiahy is now a part of the São Paulo Railway Company. (5) The line from Porto de Caixas to Carangola later became a part of the Leopoldina Railway. All the modern systems above named are now Class I railways. The Class I Railways comprise two-thirds of the railway mileage of the country.²²

But the government found that the guarantee of 5 per cent was not high enough to attract capital, of which London was the principal source. Russia at that time was offering tempting inducements to foreign capital. The provincial government of Pernambuco was persuaded to add a 2 per cent guarantee to the 5 per cent already offered by the central government. This applied on the line from Recife to Palmares. This example was followed by the provinces of Bahia, Rio de Janeiro and São Paulo. Thus all the lines above mentioned had total guarantees of interest of 7 per cent.²³

The Crimean War, 1854-1856, created stringent conditions in the London money market. As has already been stated, London was the chief source of supply for the new capital for building railways in Brazil. Hence the Crimean War slowed up the building of railways in Brazil.²⁴ From

²² Jesus, J. Palmanho de, "Rapida Noticia Sobre As Estradas de Ferro," *Diccionario Historico, Geographico, Ethnographico do Brasil*, *op. cit.*, p. 8.

For the place of these early lines in the modern systems, see *Estatistica*, 1928, pp. 86, 91-93, 117.

The railways of Brazil are divided into three classes. The basis of the classification is the amount of annual receipts. Class I Railways are those which have receipts above 20,000,000 milreis per year (at 1929 exchange, \$2,260,000). Class II Railways are those having receipts under 20,000,000 milreis but above 5,000,000 (\$590,000). Class III Railways are those having receipts under 5,000,000 milreis per year.

Ibid., p. 10. Exchange rates taken from *Commercio Exterior do Brasil*, Ministerio da Fazenda, Rio de Janeiro, 1930.

²³ Jesus, J. Palmanho de, *op. cit.*, p. 8.

1865 to 1870, Brazil was engaged in a war with Paraguay. In 1874 a new railway law was passed. This new law set forth new conditions for the building of railways. The year 1874 also marks the recovery from the effects of the war with Paraguay. This year has been chosen, therefore, as the end of the first period of railway building in the time of the empire. This division is used primarily for convenience in discussion. It does not imply sharp differentiation.

The total mileage in operation at the end of 1874 was 1,283 kilometers, or 769.8 miles. The greatest increase of any one year in this period was in 1873, during which 196 kilometers were put into traffic. There were two years, 1855 and 1859, for which no new mileage is reported. In 1856 the amount laid was less than 2 kilometers. The average addition per year for the twenty-one years from 1854 to 1874 was 63. The year 1854 was the date of the inauguration of the first line.²⁴

The report of the minister of communications in 1869 estimated the total investment in railways, on which the imperial government had guaranteed interest, at 83,820,202 milreis. (\$31,851,676). The imperial treasury had in reality supplied nearly half this sum. The advances were made either in cash or in the form of loans negotiated with the guarantee of the imperial government.²⁵ This report also stresses the heavy obligations which the empire had already assumed in guarantees of interest; also the greatness of the task to which the government had set itself in building a railway system

²⁴ *Ibid.*, p. 8.

²⁵ *Resumo de Varias Estatisticas Economico-Financeiras, op. cit.*, p. 80.

²⁶ "Para esta somma tem o Thesouro contribuido com a quantia de 35, 489, 297 milreis e as companhias inglezas com a de 48, 330, 975 milreis." *Relatorio do Ministerio e Secretario de Estado dos Negocios da Agricultura, Commercio e Obras Publicas, Rio de Janeiro, 1869, p. 36.*

for a country as large as Brazil. Comparatively little, the document points out, had been achieved.²⁷

In this period disputes were first beginning between the imperial government and the companies which were being aided in the construction of railways. The controversy hinged around the amounts to be charged by the companies as capital investments. For example, in the report of the minister of communications for 1861, the system of auditing of accounts is condemned as defective, irregular, and as causing endless disputes between agents of the government and of the company. The company referred to was the *Estrada de Ferro do Recife*. This condition of affairs led the government engineer then assigned to that company to devise a new system of accounting. This plan, when completed, was provisionally adopted with a view to its serving as a model for the whole country.²⁸ The report of the government engineer charged with the responsibility of supervising the accounts of the *Estrada de Ferro da Bahia* and the São Paulo Railway likewise called for a better method of accounting.

The need of a carefully worked out, coördinated plan of railway construction for the country as a whole was recognized during this period. In the absence of such a plan it was natural that the conflicting wishes of various localities for railway facilities did not lead to construction calculated to develop the country as a whole. *Furthermore the guarantee of interest was based upon a fixed amount of capital investment per kilometer of line. It was, therefore, to the companies' advantage to make the line as long as possible if,*

²⁷ *Ibid.*, p. 3. A previous report, issued in 1866, had been more optimistic. It reminded its readers of the natural obstacles to railway building in Brazil. When these difficulties are remembered, the report declared, the country has no reason to be ashamed of its record. *Ibid.*, 1866, p. 72.

²⁸ *Ibid.*, 1861, p. 52.

by so doing, grades, even the slightest, could be avoided. The method of handling the guarantee of interest fostered badly laid out systems, some of them more winding than a snake. Not a few of these still survive.²⁹

The need of a general plan for railway construction was first discussed by Minister Jesuino Marcondes de Oliveira in his report for 1865. The plan, in his opinion, should be the work of experts. A careful study, he contended, should be made of the economic resources, topography and population of the country.³⁰ The result of the discussion was that the idea of a general plan formed one of the bases of the new law of February 8, 1874, which law gave new orientation and coördination to the railway program of the empire.

Having briefly discussed some of the problems of construction, a few of the questions arising from the operation of the railways will now be considered. The only general verdict on operation given in the reports of the minister of communications is an unfavorable one. This adverse criticism of the management of the railways was given in the report of 1866. The minister attributed the high cost of operation of the railways to the indifference with which they were managed.³¹

The financial results, however, do not appear discreditable. For example, in 1861 the operating ratios were as follows: *Estrada de Ferro Maua* 51.5; *Estrada de Ferro Dom Pedro II* 67.7; *Estrada de Ferro Cantagallo* 72; *Estrada de Ferro Pernambuco* 79.9; *Estrada de Ferro Bahia*, the only one whose operating expenses exceeded the receipts, 182.0. The

²⁹ Denis, Pierre, *Brasil*, Chas. Scribners' Sons, New York, 1911, pp. 108, 113.

³⁰ *Relatorio do Ministerio . . . Obras Publicas*, Rio de Janeiro, 1865, p. 30.

³¹ "Concorrendo tambem para essa situação (high cost of operation) o pouco zelo com que em geral são administradas," *Relatorio do Ministerio . . . e Obras Publicas*, Rio de Janeiro, 1866, p. 66.

average for all roads in 1867 was 51 per cent, 1868, 68 per cent, 1869, 49 per cent.³² It is beyond the scope of this book to go into detail on the question of efficiency of management of this early period. At the present state of the discussion it is impossible, of course, to give any conclusion about it.

Exchange fluctuations during this period were relatively moderate compared with those of the republican régime. The average value of the milreis in 1854 was \$0.5602; in 1873, \$0.5292. The major disturbing factor was the war with Paraguay, 1865-1870. In 1868 the average value of the milreis was only \$0.3448. This was the lowest point of the whole period. The arithmetical average for the two decades was \$0.5039.³³ Railway expenditures apparently played little part in exchange fluctuations. The only other disturbing factor was a world-wide business depression in 1857.³⁴

From the standpoint of the future development of Brazilian government policy, the most significant event of this period was the taking over by the imperial government of the *Estrada de Ferro Dom Pedro II*. This later became the *Estrada de Ferro Central do Brazil*, and is now the largest system in the country. It is still owned and operated by the federal government. The government took it over July 10, 1865, because the company, which the government had aided by guarantees of interest and loans of money, was at the end of its financial resources.³⁵ The government decided to substitute, for its guarantee of interest on the shares of

³² The average unweighted operating ratio for all Class I and Class II Railways for the period 1923-1928 was 95.7 per cent. See Appendix, p. 212, T. 34.

³³ For complete figures, see Appendix, p. 183.

³⁴ Calogeras, Joao Pandia, *op. cit.*, p. 111.

³⁵ *Legislação Ferroviária, op. cit.*, p. 383.

stock of this company, its own bonds. The intermediary company in which the government was the heaviest stockholder, was abolished and the government began to operate the road directly. One of the principal services the government expected of the company was its aid in securing funds, and as the company was unable to do this, the government decided to take it over.

This company was organized in 1855.⁸⁶ It is difficult to ascertain the relative proportions of capital supplied by the government and the company.⁸⁷ Whatever these relative amounts, the financial situation soon became critical. In 1863 only 232,000 milreis remained in the treasury.⁸⁸ In this year the board of directors proposed to the government that there should be a new emission of shares. The amount issued was to be 13,333,200 milreis and the government was to be the only subscriber.⁸⁹ The government gave careful

⁸⁶ The authoritative history of the road is the big volume, *Memoria Historica da Estrada de Ferro Central do Brasil*, Imprensa Nacional, Rio de Janeiro, 1908.

The best single source for histories of individual roads is the volume published by the Imprensa Nacional and written by Cyro Diocleciano Ribeiro Pessoa, Junior, *Estudo Descritivo das Estradas de Ferro do Brasil*, Imprensa Nacional, Rio de Janeiro, 1886. His account of the E. F. Dom Pedro II is found on pp. 199-224.

⁸⁷ The imperial decree establishing the company is found in *Legislação Ferroviaria*, vol. i, pp. 65-86, and is known as Decree No. 1599, May 9, 1855.

This law stipulated that the government should supply, through loans arranged or guaranteed by it, *one-third* of the capital. The writer of the *Memoria . . . da Central* estimates that the sale of stock netted the same as the amount realized from the government loan of 1,425,000 pounds (nominal). *Memoria Historica da Estrada de Ferro Central do Brasil*, p. 35.

The text of the law authorizing the loan is found in *Legislação Ferroviaria*, *op. cit.*, pp. 141-42.

⁸⁸ *Memoria Historica da Estrada de Ferro Central do Brasil*, *op. cit.*, p. 43.

⁸⁹ *Ibid.*, p. 43.

consideration to this proposal. The vote in the council of state was divided; two ministers were for granting the request of the company, two for postponement of the question, and two for the dissolution of the company and exchange of shares of the company for government bonds.⁴⁰ The house of deputies approved the dissolution of the company in 1864, and its resolution to this effect was sent to the senate for action in 1865.⁴¹ By that time the balance remaining in the treasury of the company was gone and there was a deficit of 577,114 milreis. The question had thus decided itself and the imperial decree referred to was a post-mortem. No responsible person asserted that the management of the company had been inefficient. Dom Pedro II himself went on record as being highly satisfied, after an inspection of it in 1862. A critical view was expressed in 1861 by Manoel B. Macedo, government inspector of the *Estrada de Ferro Pernambuco*. The regular inspector, Viriato de Medeiros, however, defended the company. A distinguished commission was appointed by the government to investigate the question.⁴² Their report was favorable to the company.

The beginning of the policy of guarantees of interest and the taking over of the *Estrada de Ferro Dom Pedro II* constitute the two most important events of the period 1835-1873.

⁴⁰ *Ibid.*, p. 44.

⁴¹ *Ibid.*, p. 45.

⁴² *Ibid.*, p. 41. Emperor's statement, *ibid.*, p. 43.

CHAPTER II

THE SECOND PERIOD OF THE EMPIRE 1874-1889

By 1874, the effects of the costly war with Paraguay having partially worn off, the exchange value of the milreís was almost at par, being 52.28 cents.¹ There were constructed during this period 9,583 kilometers, or an average per year of 553 as contrasted with a yearly average during the period 1854-1874 of 63 kilometers. The largest amount built in any one year was in 1884, when 948 kilometers were constructed; the next biggest year was the last but one of the empire, 1888, when 921 kilometers were put into operation. The poorest showing is made in the opening year, 1874, which saw only 154 kilometers of new line.²

Reports of the ministers during this period indicate that there were questions in the minds of some as to whether the method of guarantee of interest was the best method for fostering railroad construction. A decline in construction from 517 kilometers in 1875 to 321 kilometers in 1876 caused the minister to consider using a direct subsidy.³ He became so interested that he ordered the Brazilian Ambassador in London to make an exhaustive inquiry there in order to ascertain the point of view of the English bankers

¹ Par value is 54.63 cents; the following year, 1875, it was back above par, being 55.20.

² *Resumo de Varias Estatisticas Economico-Financceiras*, *op. cit.*, p. 80.

³ *Relatorio do Ministro e Secretario de Estado das Negoccios da Agricultura, Commercio e Obras Publicas, anno 1876*, Rio de Janeiro, 1877, p. 165.

and to get every type of information which might be useful to the government.⁴ This the Ambassador did, and a summary of his findings is given in the annual report of 1878. The Ambassador did not suggest a fundamental change, but he urged that the companies have a clearer understanding as to just what their rights and responsibilities were. This was especially important in the matter of exchange.⁵ The investigation caused exchange to be fixed in the law of 1878 at 27 d.⁶ The length of time before which the government could recapture the road was extended to thirty years.

While ministers were giving their opinions and laws were being passed offering guarantees of interest, conditions were bringing important roads into the hands of the state, either through recapture or through the state's itself initiating and carrying through construction. In order that these opinions may be better understood, the factors bringing the roads out of private ownership will now be taken up.

In 1876 the imperial government began construction on three roads in the states of Pernambuco, Bahia, and Rio Grande do Sul. The line in Pernambuco was that from Palmares (junction point with the *Estrada de Ferro Recife a São Francisco*) to Garanhuns. In its contract with the federal government signed October 13, 1853, the Recife and São Francisco Railway Company was given six years in which to present plans for the construction of an extension of its line from Palmares to the Rio Pirangy (Garanhuns).⁷ If it failed to do so, the government was to have the right to

⁴ *Ibid.*, p. 165.

⁵ *Ibid.*, anno, 1878, Rio de Janeiro, 1879, p. 249 and Appendix.

⁶ Decreto No. 6995, Aug. 10, 1878, *Legislação Ferroviária*, vol. iii, p. 137. d. is the abbreviation of the English pence which was the standard for Brazilian foreign exchange transactions.

⁷ Art. VI, Decreto No. 1245, October 13, 1853, *Legislação Ferroviária*, vol. i, p. 33.

contract with another company for its construction. At the expiration of more than six years this was not done, so the government was authorized by law number 1953 of June 17, 1871, to construct it.⁸ Studies were made and by the act of May 9, 1876, the government gave the necessary orders for beginning construction and the first section was opened to traffic in 1882.⁹ Pessoa in his account does not state why the Recife and São Francisco Railway did not submit plans, but it may be surmised that it was either that the company considered the territory unprofitable or that it could not borrow the money. It may be pointed out in passing that the inability or unwillingness of these companies to construct the extensions which the government deemed necessary was probably one of the causes for the now increasing sentiment for the government to construct for its own account.

In the similar case of the *Estrada de Ferro de Alagoinhas a Joazeiro*, which was an extension of the *Estrada de Ferro Bahia ao São Francisco*, C. D. R. Pessoa, Jr., does not state that the government sought bidders and was unable to find them. The conditions, however, are so similar that we may surmise that it did. Construction of this extension was authorized in the law of July 17, 1871.¹⁰ Contract for the preliminary studies was let September 28, 1872, to Dr. Antonio Maria de Oliveira Bulhões.¹¹ Bids were opened and construction contracted for March 9, 1876.¹² In 1881

⁸ Pessoa, C. D. R., Jr., *op. cit.*, p. 156, Lei N. 1953 de 17 de Julho 1871, Art. 2, paragraph 2, *Legislação Ferroviária*, vol. i, p. 903.

⁹ Pessoa, C. D. R., Jr., *op. cit.*, p. 157.

¹⁰ Lei N. 1953—de 17th Julho de 1871, Art. II, Section 1. *Legislação Ferroviária*, vol. i, p. 903.

¹¹ Decreto N. 5097 de 28 de Setembro de 1872, *Legislação Ferroviária*, vol. ii, p. 78. Pessoa, C. D. R., Jr., *op. cit.*, p. 181.

¹² *Contracto para o Prolongamento da Estrada de Ferro da Bahia*, March 9, 1876, *Legislação Ferroviária*, vol. ii, pp. 600-42.

the first section of 110 kilometers was opened to traffic and in 1885, 180 kilometers were in operation.¹³

The third road on which the government initiated construction in 1876 was in the province of Rio Grande do Sul, running from close to the seaport of Porto Allegre westward across the central part of the state to Santa Maria. The purpose of this road was clearly and frankly strategic, being for the purpose of defending the Uruguayan border.¹⁴

In the original decree authorizing the construction of this line and in the opening of the credits for the financing of the same, it was left open whether the government should construct on its own account or whether it should give a guarantee of interest of 7 per cent per annum to a private company.¹⁵ But the decree approving the contract for the preliminary studies and surveys is silent about a company to take over the work of construction and operation with a guarantee of interest.¹⁶ The decree goes on to give conditions under which a construction contract will be let by the government, and states that the government may construct on its own account. When the government asked for bids for construction, none were forthcoming.¹⁷ Thereupon the

¹³ Pessoa, C. D. R., Jr., *op. cit.*, pp. 182, 490.

¹⁴ The name of this road was the *Estrada de Ferro Taquary a Cacequy*. On this point C. D. R. Pessoa says (*op. cit.*, p. 473): "Entenderam os contratantes dos estudos que a parte estrategica era melhor servida com a linha de Santa Maria, porque para of im militar da estrada o transporte de tropas e material de guerra para a frontier do Uruguay se faria no menor tempo possivel e com a maior seguranco, visto que a distancia da linha preferida era menor e mais se avizinhava do lado de S. Borja e outros pontos da fronteira... Determinado o logar denominado Cacequy [southwestern part of province] para o entroncamento das linhas ferreas estrategicas, foi aberta em 14 de Fevereiro de 1876 concurrencia para o recebimento de proposta afim de realizar-se a construccao."

¹⁵ Decreto Legislativo, No. 2397, September 10, 1873, Art. I, Section 2, *Legislação Ferroviaria*, vol. ii, p. 201.

¹⁶ *Ibid.*, p. 218, Decreto No. 5500, December 10, 1873.

¹⁷ *Ibid.*, p. 215.

imperial government formed a commission of engineers charged with the responsibility of arranging construction in small contracts of 30 kilometers to each contractor.¹⁸ By December 31, 1885, 180 kilometers were in operation.¹⁹

In the following year the province of Rio de Janeiro took over a road, the *Estrada de Ferro Cantagallo*, running from Nichteroy, the capital of the state, to a point called Macuco, on the interior plateau in a northeasterly direction from Rio de Janeiro, the total length of the road in 1884 being 209 kilometers.²⁰ Pessoa, however, does not make clear the reasons why the state took over the road. It had been in financial difficulties before. The ownership had changed hands and in 1865 the province was compelled to take over a portion of the line.²¹ The province had guaranteed the company a return of 7 per cent on its capital investment. In the absence of evidence to the contrary, it may be assumed that the reason the province took it over was the financial situation of the Brazilian company. Pessoa states that "in order to stimulate the organization of the company" in 1857, the province had subscribed to 3,680 shares at 200 milreis per share.²²

During the following year, 1878, the province of Bahia initiated construction on the *Estrada de Ferro Santo Amaro*; the imperial government began construction on the *Estrada de Ferro Sobral* in the state of Ceara, on the *Estrada de Ferro Recife a Caruaru* in the province of Pernambuco, and on the *Estrada de Ferro Paulo Affonso* in the province of Alogas.

¹⁸ Pessoa, C. D. R., Jr., *op. cit.*, p. 473.

¹⁹ *Ibid.*, p. 490.

²⁰ Pessoa, C. D. R., Jr., *op. cit.*, pp. 265, 267.

²¹ *Ibid.*, p. 264.

²² *Ibid.*, p. 263. The road later came back into private ownership and operation, passing to the Leopoldina system in 1890. Silva, Clodimiro Pereira da, *Política e Legislação de Estradas de Ferro*, Typ. Laemmert and Co., São Paulo, 1904, vol. i, p. 488.

In the same year the central government "recaptured" the *Estrada de Ferro Baturite* in Ceara and the *Estrada de Ferro Rio de Ouro* in the federal district and the state of Rio de Janeiro.

(1) In discussing the first, the *Santo Amaro*, which was a short line of only 36 kilometers, C. D. R. Pessoa, Jr. gives no reasons why the province decided to construct this road directly. It was done by the department of public works of the state.²³

(2) The construction of the *Estrada de Ferro Sobral* was taken up by the government as a means of relief to that drought-stricken area, the state of Ceara. The imperial law of 1874 had a provision making it possible for roads, although situated wholly within the bounds of a province, to be constructed by the imperial government, provided it could be shown that the proposed line affected the welfare of the nation as a whole.²⁴ The decree authorizing construction and operation by the central government was signed June 19, 1878.²⁵ In 1885, 110 kilometers were in operation.²⁶

(3) In the case of the *Estrada de Ferro do Recife a Curuaru*, the government was convinced by the settlers in the area affected that a road was needed to take care of the growing agricultural production. It was then declared a "general road for the service of the state" and in October, 1878, authorization was given for preliminary studies for its construction by the central government.²⁷ Construction

²³ Pessoa, C. D. R., Jr., *op. cit.*, p. 190.

²⁴ Art. I, Section 2, Decreto No. 5561 de 28 de Fevereiro de 1874, *Legislação Ferroviária*, vol. ii, p. 261.

²⁵ Portaria de 19 de Junho de 1878, *Legislação Ferroviária*, vol. iii, pp. 96-109.

²⁶ Pessoa, C. D. R., Jr., *op. cit.*, p. 490.

²⁷ Decreto No. 7055, October 26, 1878, *Legislação Ferroviária*, vol. iii, p. 166. Pessoa, C. D. R., Jr., *op. cit.*, p. 163.

was begun in 1881 and the first section put into operation in 1885. Its total length in that year was 28 kilometers.

(4) The building of a railroad for the trans-shipment of goods around the falls of the São Francisco was a task which presented obvious difficulties for private capital. It offered little prospect of ever becoming a revenue producer. It has never produced a profit.²⁸ In the law of July 17, 1871, provision was made for the preliminary studies. The line was to be named *Estrada de Ferro Paulo Affonso*.²⁹ In June, 1878, the government was authorized to open a credit of 9,000,000 milreis (\$4,230,000) for its construction and for other purposes.³⁰ It was opened to traffic in 1883, and was 116 kilometers in length.³¹

(5) The *Estrada de Ferro Baturite*, located in the province of Ceara, was "recaptured" in order that it might be more readily used for the help of the drought-stricken areas and that the construction of the extension to Canoa might be rushed.³² Payment was to be made to the shareholders by exchanging for their shares, at par, the internal bonds of the imperial government bearing interest at 6 per cent.³³

²⁸ See *Estatística*, 1928, p. 346, for the deficits for 1927 and 1928.

²⁹ Lei No. 1953 de 17 de Julho de 1871, Art. II, Section 3, *Legislação Ferroviária*, vol. ii, p. 904.

³⁰ Decreto No. 6918 de 1 de Junho de 1878, *Legislação Ferroviária*, vol. iii, p. 82.

³¹ Pessoa, C. D. R., Jr., *op. cit.*, p. 169.

³² Pessoa says, on this point (*op. cit.*, pp. 84-5): "Achava-se a estrada em trafego até Pacatuba e o seu ramal para Maranguape, na extensão total de 40 kil, quando o Governo Imperial resolveu, em consequencia da secca que então assolava a provincia, resgatal-a para continuar por conta do Estado a sua construcção, afim de suavisar do melhor modo os effeitos daquella calamidade, offerecendo á população famita os recursos precisos, para mantel-a nos habitos do trabalho, e por isso em data de 1 de Junho de 1878, expedio o Decreto n. 6919 no qual não só determinou o resgate como mandou proseguir na execução das obras para o seu prolongamento até Canoa e construcção do ramal de Baturite."

³³ Decreto No. 6919 de 1 de Junho de 1878, Art. I, *Legislação Ferroviária*, vol. iii, p. 83.

(6) The *Estrada de Ferro Rio de Ouro* was built in order to carry materials and men for the construction and operation of the water-supply system of the capital, Rio de Janeiro.⁸⁴ When, in 1878, the government decided to take over the work of supplying water, it naturally took this short railroad of 68 kilometers with it.⁸⁵ In this case we find the government acquiring a railroad in performing a service which practically everywhere in the western world is carried on by government agencies.⁸⁶

Another very interesting development is marked by the authorization in 1887 of a credit of 15,000,000 milreis (\$6,825,000) for the construction by the imperial government of a railroad from Bage in the province of Rio Grande do Sul to Uruguayana on the Argentinian border.⁸⁷ The government had sought to come to an agreement with private companies for the construction and operation of this line by them under a guarantee of interest. It had been negotiating since 1881 with two companies for parts of the line: the first from Bage to Caceguy, 207 kilometers, with the *Compagnie*

⁸⁴ Pessoa, C. D. R., Jr., *op. cit.*, p. 225.

⁸⁵ *Ibid.*, p. 225.

⁸⁶ There was only one other important road which changed ownership and operation during the period prior to the establishment of the republic: a short line in the province of Para running from Belem to Bragança, and known as the *Companhia Estrada de Ferro Bragança*. Contract for its construction was let in 1879 and it had a provincial guarantee of interest of 7 per cent. Senor Clodimiro da Silva reports that he was unable to discover why this railroad passed to the hands of the province in 1887. The reason was possibly financial, as Doctor Lassance Cunha writes that it was purchased by the province and paid for in provincial bonds bearing 6 per cent. Its length in 1889 was 59 kilometers. Silva, Clodimiro Pereira da, *Política e Legislação de Estradas de Ferro*, Typ. Laemmert and Co., São Paulo, 1904 (2 vols.), vol. i, p. 430.

Cunha, Ernesto A. Lassance, *Estudo Descritivo da Viação Ferrea do Brasil*, Imprensa Nacional, 1909, Rio de Janeiro, p. 470.

⁸⁷ Lei No. 3351 de 20 de Outubro de 1887, Art. I, *Legislação Ferroviária*, vol. v, p. 741.

Imperiale du Chemin de Fer de Rio Grande do Sul; and with the Rio Grande do Sul Railway Company, Limited, for the 259 kilometers from Cacequy to Uruguayana, the interest guarantee being 6 per cent in both cases.⁸⁸ In neither case were the companies and the government able to agree as to the amount of capital to be recognized, the estimates of the companies being greater than the estimates of the government engineer, even though the second company presented four separate estimates and negotiations continued until 1886. In that year the contracts were formally declared extinct. In the beginning of 1889, 466 kilometers of this line were in operation.⁸⁹

Summarizing the data for the period 1874-1889, the following table shows the roads which changed from private ownership to public ownership (central or provincial government), up to the close of the empire.

RECAPTURED ROADS

1874-1889

Name of road	Date	Length in kilometers (1889)	Reasons for recapture
<i>Cantagallo</i>	1877	209	Doubtful; possibly financial
<i>Baturité</i>	1878	110	Drought relief
<i>Rio de Ouro</i>	1878	65	Government takes over water-supply work
<i>Bragança</i>	1887	59	Doubtful; possibly financial
Total		443	

⁸⁸ Decreto No. 8343 de 17 de Dezembro de 1881, *Legislação Ferroviária*, vol. iii, p. 901; No. 8346 de 24 Dezembro de 1881, *ibid.*, vol. iii, pp. 916-17.

⁸⁹ *Legislação Ferroviária*, vol. vii, p. 25.

ROADS CONSTRUCTED BY CENTRAL OR PROVINCIAL GOVERNMENTS

1874-1889

Name of road	Date begun	Length in kilometers (1889)	Reason government undertook
<i>Palmares a Garanhuns</i>	1876	146	No available private capital
<i>Alagoinhas a Joazeiro</i>	"	322	Probably the same reason
<i>Taquary a Cacequy</i> ..	"	306	Strategic
<i>Bahia Santo Amoro</i> ..	1878	36	Unknown
<i>Sobral</i>	"	129	Drought relief
<i>Recife a Caruaru</i>	"	72	Connections with existing lines
<i>Paulo Afonso</i>	"	116	Shipment around falls
<i>Bage a Uruguayana</i> ..	1887	466	Unable to get agreement with private companies as to amount of capital to be invested
Total		1,593	
Total owned and operated		2,206	
Total from period 1854-1874		828	(<i>E. F. Dom. Pedro II</i>)
Total to end of empire		3,044	

Thus in the beginning of 1889, 34 per cent of the total mileage of the country was owned and operated by the central and provincial governments, as compared with 33 per cent owned and operated by the government in 1874, only one railroad then, the *Estrada de Ferro Dom Pedro II*, constituting this percentage.⁴⁰ In 1874 the explanation of the government owning one railroad was a simple one, the company concerned being unable to finance the project; but in the second period the reasons have become more varied, no one reason being dominant.

The important change during this period is the growing

⁴⁰ Figures for the *E. F. Dom Pedro II* taken from Pessoa, C. D. R., Jr., *op. cit.*, p. 205.

Total figures for 1889 from *Legislação Ferroviária*, vol. vi, p. 25.

sentiment for recapture. An illustration of this is found in the debate in the senate which preceded the passage of the railway building law of 1871. The speeches of the senators show preoccupation with the question of getting the most mileage for their individual provinces. But the minister is more interested in the recapture of the roads in the states of Pernambuco and Bahia.⁴¹ His argument may be summed up under two categories: (1) The government's experience with the companies on whose capital they had guaranteed interest had been "painful" (*dolorosa*). He does not, however, go into details as to why the experience was painful. (2) It will be easier to recapture the roads now, for their value is being increased by *our* building of extensions to them.⁴² His argument evidently prevailed, for provision was put in the law for the recapture of these roads, if an agreement could be reached with the companies.⁴³ In 1884 the contract of the *Estrada de Ferro Recife a São Francisco* permitted recapture. In that year the government engineer assigned to supervise the road argued for recapture.⁴⁴ His main reason was that he believed cost of operation by the government would be less.

The strongest ministerial statement in favor of government operation is perhaps that given by Minister Rodriga

⁴¹ *Estradas de Ferro Recife a São Francisco, and Bahia a São Francisco.*

⁴² An account of the building of extensions to these roads by the imperial government is found *supra*, pp. 32-34.

⁴³ "Resgatadas, livre o Estado de todos os onus actuaes e com a dolorosa experiencia adquirida durante os tempos pouco felixes com as Directorias das estradas de ferro, celebraria novos contractos com companhias nacionaes ou estrangeiras, nos quaes do futuro fosse acautelado por aquella experiencia adquirida no passado. Mas cuidar-se de prolongar, quer as Estradas de Pernambuco e Bahia, quer a de São Paulo, sem pelo menos tentar a seu resgate me parece que não é acto de prudencia e sabedoria." *Legislação Ferroviaria*, vol. i, pp. 904-22, 923.

⁴⁴ His report is summarized in Pessoa, C. R. D., Jr., *op. cit.*, pp. 101-8.

Augusta da Silva in 1887.⁴⁵ He is speaking of the whole system of guaranteed interest. He contends that government operation is cheaper. This is because of the heavy expenses of supervision of the affairs of the companies, of verifying their accounts, and of maintaining a commission abroad for coördinating purchases of material.⁴⁶ In grouping the railroads into government-operated and privately-operated, he subtracts from the former the *Estrada de Ferro Dom Pedro II* and the *Estrada de Ferro Bahia a Alagoinhas*; the *Estrada de Ferro Recife a Palmares* and the *Santos a Jundiáhy* from the latter.⁴⁷ His figures then show an operating cost of 1,931 milreis per kilometer for the government-operated group and 2,476 milreis per kilometer for the privately-owned lines.⁴⁸ The government can borrow money on its own bonds for 5½ per cent. As its guarantees of interest are usually for 7 per cent, 1½ per cent can be saved on capital charges.⁴⁹

His advocacy of renting the recaptured lines to private companies does not appear consistent with the contention that government-operation is cheaper.⁵⁰ He wanted the government to buy the roads through flotation of a bond issue, and then rent them for operation to private companies. This is precisely what the government of the federal republic of Brazil later did.⁵¹

⁴⁵ *Relatorio do Ministro do Estado da Agricultura, Commercio, e Obras Publicas*, Imprensa Nacional, Rio de Janeiro, 1888, pp. 157-65.

⁴⁶ *Ibid.*, p. 164.

⁴⁷ These are roads having exceptional traffic density.

⁴⁸ His figures are for 1886. *Ibid.*, p. 164.

⁴⁹ *Ibid.*, p. 164.

⁵⁰ *Ibid.*, p. 165.

⁵¹ "Tanto... em vez de custeal-as directamente, o Governo as fizesse explorar, por arrendamento em condições muito menos onerosas das que actualmente aggravam o thesoureiro." *Ibid.*, p. 165.

Exchange fluctuations during the period now being discussed were not extreme when compared with the decade following the establishment of the federal republic. The high point was in 1889, when a milreis was worth 53.62 cents; and the low point was in 1885, when a milreis was worth 37.71 cents. The average value of the milreis for 1874-1889 was 46.27 cents. In 1900, in the second decade of the republic, a milreis was worth 19.27 cents.⁸³ Exchange was practically at par in 1889.

There were warnings, however, of troubles which were to be much more serious later. Back in 1867 the government declined to allow the *Estrada de Ferro de Pernambuco* to charge losses in remittances due to fluctuations in exchange to the expenditures account.⁸⁴ But in 1869 it reversed itself, specifying, however, that such accounts should be subject to the approval of the government supervisor.⁸⁵

The war with Paraguay cost approximately 600,000,000 milreis (\$327,780,000 United States money).⁸⁶ Following that disaster, exchange was brought back to par. Up to 1887 the amount of capital invested in railroads, on which interest had been guaranteed, was 113,317,115 milreis (\$61,191,242). As this is less than one-fifth of the cost of the war with Paraguay, railway expenditures did not make it impossible, other things being equal, to maintain exchange at par. They were not the most important factor. Some of the money for the war was spent at home, but much of the impedimenta had to be imported.

⁸³ Par value of the milreis at that period was 54.63 cents. The annual fluctuations of the milreis since 1808 are given in the Appendix, p. 183.

⁸⁴ Aviso No. 49 de 13 de Junho de 1867, *Legislação Ferroviária*, vol. I, p. 468.

⁸⁵ Aviso No. 25 de 22 de Julho de 1869, *Legislação Ferroviária*, vol. I, p. 682.

⁸⁶ Calogeras, João Pandiá, *op. cit.*, p. 163.

Dr. Calogeras estimates that the payments on account of guarantee of interest for the eighteen-month period, 1886-1887, were 7,000,000 milreis (\$3,824,100). Practically all of this represented capital invested in railway construction. Brazil's financial position was regarded as sound, for in 1888 a loan of nominal value of 6,297,300 pounds sterling, bearing $4\frac{1}{2}$ per cent interest, was floated at 97. Foreign confidence in Brazil's financial stability is further shown by the flotation in 1889 of a funding loan of nominal value of 19,837,000 pounds sterling, bearing interest at 4 per cent, plus a sinking funding charge of $\frac{1}{2}$ of one per cent. This was sold at 90. This is significant, if it be recalled that this followed the economic disturbances caused by the freeing of the slaves in 1888.⁵⁶

The most important factor in this foreign confidence was the ability of the imperial government to resist the temptation to inflation. The greatest amount of currency in circulation during this period was in 1878-1879. The amount was 216,912,804 milreis. During the second full year of the republic, 1891, the total was 706,000,000 milreis.⁵⁷ In 1889, the last year of the empire, the total circulation was 174,000,000 milreis.⁵⁸

The significant part played by coffee in Brazil's economic life begins with the eighteen-fifties.⁵⁹ By 1889 it had become the leading export commodity. Coffee exports comprised 67 per cent of the value of all exports for that year.⁶⁰

⁵⁶ Calogeras, João Pandiá, *op. cit.*, pp. 209, 194, 195.

⁵⁷ *Ibid.*, pp. 161, 225.

⁵⁸ Denis, Pierre, *op. cit.*, pp. 149-50.

⁵⁹ James, Herman G., *op. cit.*, p. 295.

⁶⁰ In that year 5,585,534 bags, of 60 kilograms each, were sent out. They were valued at 18,794,936 pounds sterling. The merchandize balance that year was 4,183,635 pounds sterling. *Resumo de Varias Estatisticas Economico-Financeiras*, *op. cit.*, pp. 43, 45.

The empire of Brazil came to an end in 1889. A federal republic took its place. Under the rule of Dom Pedro II, 1840-1889, the standard of administration was high.⁶¹ Economic progress was marked. Immigration was increasing.⁶²

⁶¹ "The political life of the empire was, on the whole, pitched on a high plane. Dishonesty among the higher officials was rare; most of them left office poorer than when they entered." James, Herman G., and Martin, Percy A., *Republics of Latin America*, Harper and Brothers, New York, 1923, p. 120.

⁶² For an excellent summary of economic progress under Dom Pedro II, see Calogeras, João Pandiá, *Formação Histórica do Brasil*, Biblioteca Scientífica Brasileira, Pimenta de Mello and Co., Rio de Janeiro, 1930, pp. 403-4.

CHAPTER III

THE FIRST PERIOD OF THE REPUBLIC

1890-1914

THE first important development of national railway policy in the republic was the beginning of the policy of recapture of roads having a guarantee of interest, and of renting them after recapture to private companies for operation. This change had been foreshadowed in the closing days of the empire.¹ In 1890 the provisional government of General Maonel Deodoro da Fonseca issued a decree protecting companies building railways against fluctuations in exchange.² In 1889 the average value of the milreis was 53.62 cents. By 1898 it had fallen to 14.58 cents.^{2a} *In the latter year the sum necessary to take care of the additional milreis payments, made necessary by the depreciation of the milreis, amounted to almost one-third of the budget.*³ The contracts made during the empire, as well as the new con-

¹ See *supra*, p. 42.

² It has been charged that this law also left a gap by which these companies might even make a profit in converting their pounds sterling into milreis. Jesus, J. Palmanho de, *op. cit.*, p. 29. The clause reads as follows: "If the capital is obtained in a foreign country the rate of exchange in all operations shall be 27 d. to 1 milreis." Art. XXXI of Decreto No. 862 de 16 de Outubro de 1890, *Legislação Ferroviaria*, vol. vi, p. 738.

^{2a} See Appendix, p. 183.

³ Roure, Agenor de, "Historia Economica e Financeira," published in *Diccionario Historico, Geographico, e Ethnographico do Brasil*, Rio de Janeiro, 1922, vol. i, p. 110a.

tracts of the republic, called for payment in terms of gold.⁴ Naturally when the milreis suffered such a marked decline, *more* milreis were required to meet these gold obligations. It has been estimated that this *additional* amount, due *solely* to the depreciation of the milreis, amounted, in 1898, to 110,000,000 milreis (\$16,038,000). In that year the total budget was only 343,000,000 milreis.⁵ Bankruptcy threatened.

The situation called for action and the result was a shift in policy, making the government of the federal union the owner of 59.5 per cent of the mileage of the country, as against the 34 per cent owned and operated by it in 1889. The second shift growing out of the altered set-up of ownership was the inauguration of the policy which made the government rent over 50 per cent of the mileage it owned. (In 1889 it operated all the mileage it owned.)

The most important cause of this decline in the value of the milreis was the excessive issue of unsecured paper money. The average amount outstanding during the period 1890-1898 was 629,000,000 milreis, as contrasted with the average amount outstanding in the decade, 1880-1889, of 208,000,000 milreis, an increase of over 200 per cent. (The population increase for the period 1890-1900 is estimated at 19 per cent.⁶ Two factors were influential in causing this inflation. The first was political instability. In 1890, 1891, 1892, 1893, and 1898 there were major disturbances of public order (in Brazilian terminology, "revolutions"), and minor disturbances in 1895 and 1896.⁷ The second was the

⁴ James, Herman G., *op. cit.*, p. 376.

⁵ Roure, Agenor de, *op. cit.*, p. 1102.

⁶ Circulation figures from Calogeras, João Pandiá, *op. cit.*, pp. 161, 285, 311, 331. Population figures from *Resumo de Varias Estatisticas Economico-Financeiras*, *op. cit.*, p. 7.

⁷ Thorp, Willard L., *op. cit.*, pp. 289-90.

habit, inherited from the empire, of annual budgetary deficits. The average annual deficit for the first twenty-two years of the republic has been estimated at 48,846,398 milreis.⁸ This compares with an estimated average annual budgetary deficit during the empire, from 1826-1888, of 13,802,494 milreis. The difference cannot be charged to falling off in the "favorable" foreign trade merchandise balance, for the average for the period 1890-1898, 2,979,000 in pounds sterling, represents a slight increase over the average of 2,576,000. for the period 1883-1889.⁹ The average annual amount of construction during the period 1890-1898 was 564 kilometers, as compared with 553 kilometers per year for the period 1874-1889.¹⁰ The responsibility for the payments of guarantees of interest was, of course, cumulative, the usual period for the payment of the guarantee of interest being thirty years.¹¹ Of the total amount invested in private railways up to the beginning of 1889, 77 per cent had guarantees of interest from the central or provincial governments¹² (the latter called states, after 1889).

The report of the Minister of Communications for 1891 asks for the renting of the lines belonging to the government. He further urged the recapture of the lines having guarantees of interest. Following recapture, these were to be rented. He believed that government operation is more

⁸ *20th Century Impressions of Brasil*, A Symposium, Lloyds Greater Britain Publishing Co., London, 1913, p. 446.

⁹ *Resumo de Varias Estatisticas Economico-Financeiras*, p. 43.

¹⁰ Compiled from *ibid.*, p. 80.

¹¹ Art. I, Section 1, Decreto Legislativo No. 2450 de 24 de Setembro de 1873, *Legislação Ferroviaria*, vol. ii, p. 204.

¹² Figures are taken from *Legislação Ferroviaria*, vol. vi, p. 25. Total capital investment of private companies is 265,109,000 milreis (approximately \$140,000,000), of which 206,442,000 milreis (approximately \$110,000,000) had guarantees. The rate was usually 7 per cent.

costly: first, by reason of the greater number of employees under government administration and, second, by reason of the provision of pensions and other benefits, not furnished by private companies, which must be provided for government employees. He points out that the *Central do Brasil* is the only government-operated road which is yielding a net operating revenue. Even in the case of this road little surplus is available for interest on the capital invested.¹³

No immediate action was taken on the suggestions of the 1891 report. But in 1896 the senate asked the president to make a study of the question of renting the *Central do Brasil*.¹⁴

In 1898 the financial affairs of Brazil reached such a state that bankruptcy was one of the possibilities. Her salvation came through the Funding Loan of 10,000,000 pounds sterling of that year, through which Brazil paid her interest obligations on her foreign debt for the period January 1, 1898—June 30, 1901, in Funding Bonds, secured by a first mortgage on the customs receipts of Rio de Janeiro and other ports.¹⁵ As a result of this loan and its wise provision for the redemption by Brazil of an equal amount of paper money, at 18 d. per milreis, the financial situation of Brazil improved.¹⁶ An index of this improvement is found in the fact that exchange moved upward from the yearly average

¹³ The *Estrada de Ferro Central do Brasil* is the road known during the days of the Empire as the *E. F. Dom Pedro II*.

Relatorio do Ministerio dos Negocios do Estado da Agricultura, Commercio, e Obras Publicas, 1891, Rio de Janeiro, 1892, p. 109. This report estimates the total expenditure of the government in the *Central* as 113,000,000 milreis (approximately \$60,000,000). *Ibid.*, p. 109.

¹⁴ *Relatorio do Ministerio dos Negocios do Estado da Agricultura, Commercio, e Obras Publicas*, 1896, Rio de Janeiro, 1897, p. 224.

¹⁵ The best account of this loan is that given by Calogeras, *La Politique Monetaire du Bresil*, *op. cit.*, pp. 323-342. An excellent brief account is that given by Denis, *Brazil*, *op. cit.*, p. 150.

¹⁶ *Ibid.*, p. 151.

of 14.58 cents in 1898 to 15.08 in 1899, to 19.27 in 1900, and to 23.07 in 1901.¹⁷

A continuation of this policy of the Campo Salles administration was the recapture operation beginning in 1900, as a result of which the national government became, and continued to be, the owner of over half of the railway mileage of the country. In this year Dr. José Carlos Rodrigues was sent to London as a representative of the Brazilian government to negotiate an agreement for the purchase of the roads on which a guarantee of interest was payable.¹⁸ He finished his work in 1902, as a result of which 2,148 kilometers were recaptured.¹⁹ The price paid was 14,605,000 pounds sterling in government bonds, payable in gold and bearing interest at 4 per cent. In substantiation of his argument that the operation lessened the gold obligations of the country, Dr. Rodrigues presented figures showing that his operation left an annual balance for amortization of these bonds of 378,600 pounds sterling.²⁰ It is beyond the province of this work to say whether his figures are correct or not, or whether the operation brought any benefit to the international financial position of Brazil.²¹ It was confined to roads having a guarantee payable in gold.²² The government did not,

¹⁷ See Appendix, p. 183.

¹⁸ Calogeras, João Pandiá, *op. cit.*, p. 360. All of the roads having guarantees of interest payable in gold were owned by British capital.

¹⁹ *Resgate das Estradas de Ferro, Relatório Apresentado ao Ministério Joaquim Murtinho* [Minister of Communications] em 1902 por José Carlos Rodrigues, Rio de Janeiro, Imprensa Nacional, 1903, p. 97.

²⁰ *Ibid.*, p. 97. His summary, in which he explains how he arrives at this figure, is given on pp. 42-44, 94-95.

²¹ Dr. João Pandiá Calogeras thinks that it did, *op. cit.*, p. 365, but he accepts the figures of Dr. Rodrigues without subjecting them to critical analysis. For a contrary view of this operation see Dr. J. Palmanho de Jesus, *op. cit.*, pp. 33-35.

²² *Legislação Ferroviária*, vol. ix, p. 13.

as Dr. Palmanho de Jesus seems to imply, abandon the policy of guaranteeing interest in gold.²³ The last operation was completed under this particular plan in 1905, when the total amount of mileage having a guarantee of interest payable in gold was reduced to 903 kilometers, and the total annual net burden to 235,195 pounds sterling.²⁴ In 1900 the total mileage having guarantees of interest payable in gold was 3,110 kilometers and the total annual net burden was 964,248 pounds sterling.²⁵ In 1914, however, the number of kilometers having a guarantee payable in gold was up to 2,169 and the annual net burden 766,702 pounds sterling.²⁶

The aspect of this recapture operation bearing most directly on the argument of this book, is that it was, from the point of view of the government then in power, an effort to reduce its gold commitment, and had no relation to the question of the efficiency or lack of efficiency of private operation. It was a financial transaction. The report of Dr. Rodrigues, which sums up the government's view of the action, is critical of government operation.²⁷ Furthermore, he advocates in this same report the policy of renting these

²³ The statement of Dr. de Jesus is as follows: "A new partial guarantee system could have been devised, which would compel the concessionaire to bear a small part of the deficit by which the receipts fell short of the dividend rate fixed, and allow him to share to a greater degree in the profits in the excess of such rate." *Op. cit.*, p. 54.

²⁴ *Estatística, 1905*, Tables II and IIA.

²⁵ *Estatística, 1900*, Tables II and IIA.

²⁶ *Estatística, 1914*, Tables II and IIA.

²⁷ Dr. Rodrigues says: "Assim, o systema de garantia de juros desanima a iniciativa particular e torna-se onerissimos para o Estado. Não quizemos seguir o exemplo da Belgica que construiu quasi todas as suas estradas e as explora: tivemos medo da extravagancia na administração pelo Estado mas perfilhamos outro systema de administrallas igualmente oneroso." *Op. cit.*, p. 41.

recaptured roads to private capital.²⁸ This was the policy, as will shortly be pointed out, which the government adopted.

*This recapture operation is more significant than the mere number of kilometers involved, which was relatively small, being only 13 per cent of the total mileage of the country in 1902.*²⁹ For in the renting contract adopted, the government used the renting company for the construction of larger systems. For example, the five largest government-owned and rented systems grew out of the nuclei provided by this operation; namely, the lines rented to the Great Western of Brazil comprising in 1930, 1,635 kilometers; lines rented to the *Companhia Ferroviaria E'ste Brasileiro*, 2,292 kilometers in 1930; *Viação Ferrea do Rio Grande do Sul*, 2,648 kilometers in 1930; *Rede Sul Mineira*, 1,292 kilometers in 1930; and the *São Paulo Rio Grande* whose government-owned and rented portion was 605 kilometers in 1930. (The total mileage of the *Companhia Estrada de Ferro São Paulo Rio Grande* is 1,997 kilometers, but of this amount the company owns 1,391 kilometers on which it has federal-government guarantees of interest.)³⁰ These lines totaled 26 per cent of the total railway mileage of the country in 1930, and 82 per cent of the mileage owned and rented by the federal

²⁸ *Ibid.*, p. 42.

²⁹ The total mileage in operation in 1902 was 15,680 kilometers. *Resumo de Varias Estatisticas Economico Finceiras*, *op. cit.*, p. 80.

³⁰ The following table shows these nuclei and the roads of which they now form a part.

Line Recaptured in 1902	Present system in which incorporated
<i>Natal e Nova Crus</i>	Great Western of Brazil
<i>Conde de Eu</i>	" " " "
<i>Recife e San Francisco</i>	" " " "
<i>Alagoas</i>	" " " "
<i>Bahia e São Francisco</i>	<i>Comp. Ferroviaria E'ste Brasileiro</i>
<i>Central da Bahia</i>	" " "
<i>Minas e Rio</i>	<i>Rede Sul Mineira</i>
<i>Parana</i>	<i>Comp. E. F. Sao Paulo Rio Grande</i>
<i>Sudwest Bresliien</i>	<i>Viação Ferrea do Rio Grande do Sul</i>

Sources: Rodrigues, Jose Carlos, *op. cit.*, p. 97; *Estatistica*, 1928, p. 16.

government.²¹ In considering the financial crisis leading to the funding loan of 1898, reference was made to discussions of renting of the roads. These discussions came to a head in 1896. The Minister of Communications in that year asked for the opinion of the *Club de Engenharia*, an influential engineering organization.²² The final decision of the government is contained in Law No. 427 of December 9. The form in which it is put shows clearly the connection between the renting policy and the financial crisis through which the country was passing. Article IV of the law reads as follows:

In order to reduce the amount of paper money in conformity with law of the 11th of September 1846 and also to repay the foreign debt and better the financial situation of the country the government is authorized to rent, following the submission of competitive bids, the railways of the government.²³

It is not contended that ideas of government inefficiency did not enter into the decision to rent the road.²⁴ The implication is clear that it is believed that government operation is more expensive. But the driving force which brought about the renting was the threat of bankruptcy hanging over the country. Details of the policy of renting were set forth in a second decree of December 28, 1896. This decree provided for the payment of a fixed sum on rental, (reflecting their need of cash) and a payment based on an annual percentage of the net operating income, to be worked out as the circumstances warranted in each case, and for tariff schedules

²¹ The lines given above total 8,472 kilometers, and the total number of kilometers in 1930 owned and rented by the federal government was 9,781.

²² *Legislação Ferroviária*, vol. viii, pp. 34, 102.

²³ Lei No. 427 de 9 de Dezembro de 1896, Art. 4, *Legislação Ferroviária*, vol. viii, p. 204.

²⁴ See *Relatório do Ministerio*, 1897, Introduction, pp. 27-38.

which should be movable with the exchange value of the milreis.⁸⁵

A further development in the renting policy is found in the law of 1903, which sets forth the policy of contracting for the construction of new lines and connecting links by the renting companies. One of the reasons for the adoption of the renting policy was the belief that through it the state might be able to construct more mileage; in other words, the money saved through private operation was to be used for new construction.⁸⁶ Out of this policy grew the large systems of government-owned and rented lines already discussed.⁸⁷ A study of the individual rent contracts concluded under the legal régime just outlined is beyond the province of this book. *In addition to the provision for the construction of extensions and connections, the renting policy, however, involved another important feature, namely, that of consolidating a number of smaller lines to make a larger system.* This is particularly illustrated in the number of small lines which were rented to the Great Western of Brazil Railway. In 1914, including additions constructed by the company, its length was 1,476 kilometers, and it embraced, among others, the following lines:⁸⁸

<i>Natal and Itamaty</i>	164 kilometers
<i>Conde de'Eu</i>	194 "
<i>Central de Pernambuco</i>	269 "
<i>Recife a S. Francisco</i>	124 "
<i>Sul de Pernambuco</i>	193 "
<i>Central de Alagoas</i>	194 "
<i>Paulo Affonso</i>	115 "

⁸⁵ Decreto No. 2413 de 28 de Dezembro de 1896, Arts. II and VIII, *Legislação Ferroviária*, vol. viii, p. 237.

⁸⁶ Lei No. 1145 de 31 de Dezembro de 1903, Art. XXIII, *Legislação Ferroviária*, vol. ix, pp. 721, 728.

⁸⁷ *Supra*, p. 52.

⁸⁸ *Estatística, 1914*, pp. x, xi. The order of these and subsequent lines is geographical from north to south.

With Recife (Pernambuco) as a center; the railways of the states of Sergipe, Alagoas, Pernambuco, Parabyba, and Rio Grande do Norte were consolidated into one system, making for both economy of operation and betterment of service. Another group of government-owned lines, recaptured in the operations just described, were made into a system centering around the port of Bahia in the state of Bahia. In 1914 its length was 1,708 kilometers, including lines constructed following the recapture operation. The present name of this system is the *Companhia Ferroviaria E'ste Brasileiro*. Its more important divisions in 1914 were:³⁹

<i>Bahia a Joazeiro</i>	575 kilometers
<i>Alagoinhas a Propria</i>	440 "
<i>São Felix a Bandeira</i>	
<i>de Mello</i>	254 kilometers
<i>Bahia e Minas</i>	376 "

A third system resulting from these operations of recapture, renting and consolidation was known as the Rede Sul Mineiro, located mainly in the state of Minas Geraes, and comprising in 1914, 1,249 kilometers. It was composed among others of the following lines:⁴⁰

<i>Cruseiro a Santa Rita</i>	532 kilometers
(Recaptured 1902 as the	
<i>E. F. Minas e Rio</i>)	
<i>Linha Sapucahy</i>	594 "

The fourth important system formed was the *Viação Ferrea do Rio Grande do Sul*, rented to the *Compagnie Auxiliare des Chemins de Fer au Bresil* which comprised in 1914, 2,172 kilometers, all located in the southernmost state of Rio

³⁹ *Estatistica, 1914, pp. x, xi.*

⁴⁰ *Estatistica, 1914, pp. x, xi.*

Grande do Sul. Its more important divisions in 1914 were the following:⁴¹

<i>Porto Alegre a Uruguayana</i>	766 kilometers
<i>Santa Maria a Marcellino Ramos</i>	535 "
<i>Cacequy a Rio Grande</i>	490 "
<i>Montenegro a Caixas</i>	116 "
<i>Entrocamento a Santa Anno do</i>	
<i>Livramento</i>	158 "

The best evidence that this consolidation work was well done is that the systems have survived and continue today.

In the period from 1890 to 1914, 16,089 kilometers of line were put into operation. This is an average of 670 kilometers per year, which compares with an average of 553 kilometers per year for the second period of the empire, 1774-1889.⁴² In addition to the method of construction through gold guarantees and construction contracts with the renting companies, already mentioned, the government was also encouraging construction by guarantees of interest payable in paper currency. The number of kilometers having paper-currency guarantees, with the annual payments under them for 1900, 1905, 1910, and 1914, is as follows:⁴³

Year	Kilometers	Annual payments in milreis
1900	1,354	1,354,883
1905	1,114	1,286,752
1910	1,014	1,453,171
1914	1,095	1,319,094

Despite the fact that during the period of the republic, 1900 to 1914, exchange increased in strength, this last method of guarantees of interest payable in currency was of de-

⁴¹ *Estatística, 1914*, pp. x, xi.

⁴² *Resumo de Varias Estatísticas, op. cit.*, p. 80.

⁴³ *Estatística, 1900, 1905, 1910, 1914*, Quadro No. 2 in each vol.

creasing importance. The government financed some construction for its own account through the issue of bonds, bearing 5 per cent interest if payable in currency, and 4 per cent interest if payable in gold. The exact amount of construction financed in this manner, the writer has not been able to find.⁴⁴

There were two other changes from private ownership during this period which are worthy of mention. The first was the recapture in 1890, by the federal government, of the *Companhia Estrada de Ferro São Paulo Rio de Janeiro*. This company owned a line from Cachoeira to São Paulo, 231 kilometers in length.⁴⁵ It was *one-meter gauge*. At Cachoeira it joined a *one-meter, sixty-centimeter gauge* line to Rio de Janeiro. The latter was the *Central do Brasil* owned by the federal government. The government took over the *São Paulo Rio de Janeiro* and widened the gauge to one meter, sixty centimeters. The advantages of having a railway of the same gauge between the two most important cities, São Paulo and Rio de Janeiro, are obvious.⁴⁶

The second change is the still more interesting case of the failure, bankruptcy, and purchase by the state government of São Paulo, of the *Companhia União Sorocabana e Ituana* in the first quinquennium of the twentieth century. This road is now known as the *Estrada de Ferro Sorocabana*. It is significant because it is a failure of private ownership and operation in an area where three privately-owned and operated systems were, and are, succeeding. The roads are the São Paulo Railway Company, Limited, the *Companhia Paulista de Estradas de Ferro* and the *Companhia Mogyana*

⁴⁴ The authorization for the beginning of this policy is found in Decreto Legislativo No. 1126 de 15 de Dezembro de 1903, Art. I, Section 3, *Legislação Ferroviária*, vol. ix, p. 623.

⁴⁵ Cunha, Ernesto A. Lassance, *op. cit.*, p. 186.

⁴⁶ *Ibid.*, p. 186.

de Estradas de Ferro. It is the first case of the failure of an important private company in the richest coffee zone.

The *Companhia União Sorocabana e Ituana* was the result of the amalgamation of the *Companhia Sorocabana* and *Companhia Estradas de Ferro Ituana* in 1892.⁴⁷ From its first year of operation in 1875, the *Companhia Sorocabana* showed a net operating revenue, and the *Companhia Estradas de Ferro Ituana* showed consistent and unbroken net operating revenue from the sixth year of operation, 1878.⁴⁸ New building on both was rapid, the Sorocabana increasing from 111 kilometers in 1875 to 397 in 1893, and the Ituana from 70 kilometers in 1873 to 239 kilometers in 1893.⁴⁹ Both of the parent companies had guarantees of interest which, in the contract of fusion, they agreed to repay to the state.⁵⁰

Net operating revenue increased from 1,064,504 milreis in 1893 to 3,446,517 milreis in 1904 (\$250,381 and \$854,166). Total mileage increased from 636 kilometers to 928 kilometers for the same period. The average operating

⁴⁷ At the present time the *Estrada de Ferro Sorocabana*, in its main lines, extends from the city of São Paulo in two directions, west and southwest. The first line goes to the western border of the state to the Parana River; and the other to the border of the state with the state of Parana at Itarare, where it connects with the main line of the *Companhia Estrada de Ferro São Paulo Rio Grande*. The total length of the system in 1930 was 2,025 kilometers.

Leis, Decretos e Contractos Relativos as Concessões Vigentes de Estradas de Ferro, Outorgadas pelo Governo de São Paulo, 1869-1913. Directoria de Viação, Typographia do Diário Oficial, São Paulo, 1914, pp. 309, 349, 301, 308.

Figures for the present mileage of this system are taken from *Estatística*, 1928, p. 17.

⁴⁸ *Relatório da Secretaria da Agricultura do Estado de São Paulo, Anno 1895*, São Paulo, 1896, pp. 97, 98.

⁴⁹ *Ibid.*, pp. 97, 98.

⁵⁰ *Leis, etc., ... de São Paulo, op. cit.*, p. 312, art. xv; p. 352, art. xiv; p. 399, art. v.

ratio was 58.6 per cent.⁵¹ Its tariffs were flexible, moving up and down with the international exchange value of the milreis. This variable tariff was an important factor in explaining the increase in receipts per kilometer of line of 5,547 milreis in 1892 to 9,918 milreis in 1898.⁵² The contract with the state of São Paulo in 1893, providing for this movable tariff, put an exchange value of 20 d. per milreis as the standard from which increases should be granted (the average value of the milreis in 1893 was 11.59 d.). For certain classifications the increase was 3 per cent for every penny of decline in value, with a maximum increase of 24 per cent; in other classifications it was 5 per cent for every penny of decline in the value of the milreis, with a maximum increase set at 40 per cent. Now there was a difference of 13 d. between the actual exchange rate of 1898 or 7 d. and the base rate of 20 d. prescribed in the contract. But the law set maximum limits of 24 and 40 per cent increase in freight rates due to fluctuations in exchange, otherwise the 3 and 5 per cent increases per penny of decline in the value of the milreis would have been 39 and 65 per cent, the difference between the base rate of 20 and the actual exchange of 7 d. multiplied by 3 and 5 per cent respectively. Hence the law did not fully protect the company.⁵³ However, the *Com-*

⁵¹ *Relatorio de Estrada de Ferro Sorocabana, Referente ao Anno de 1929*, São Paulo, 1930, table no. iii.

⁵² *Ibid.*, table no. iii.

⁵³ This law is found in *Leis... do Estado de São Paulo, op. cit.*, p. 406. "A taxa adicional de que trata a clausula antecedente sera: de tres por cento (3%) por dinheiro abaixo de 20 dinheiros por milreis (20 d. por 1\$000) despresadas as fraccoes, para a tabella n. 4-A, (sal ordinario) De cinco por cento (5%) por dinheiro abaixo de vinte dinheiros por milreis (20 d. por 1\$000), despresadas as fraccoes, para as demais tabellas das tarifas, salva a exclusao ja mencionada. Em qualquer caso, porem, nao podera essa taxa adicional exceder de vinte e quatro por cento (24%) os precos actualment em vigor para a tabella n. 4-A (sal ordinario) e de quarenta por cento (40%) os demais tabellas sujeitas a mesma taxa."

panhias Paulista de Estradas de Ferro and *Mogyana de Estradas de Ferro* were subject to identical provisions. As these companies both survived and are today among the three most prosperous of the nation, other causes must be sought for the failure of the Sorocabana.⁵⁴

The first distress signal of the company came in 1894. Its statement showed annual liabilities as follows:

Interest on debentures (partly payable in gold) ..	2,926,270	milreis
Interest on floating debt	394,000	"
Amortization of debt to state of São Paulo	120,000	"
Repayment to state of São Paulo on account of its guarantee of interest account	100,000	"
Total	3,540,270	milreis

Subtracting from this the net operating revenue of 2,187,878 milreis gave a deficit of 1,352,392 milreis. The company was carrying very heavy capital charges. In addition to these interest charges, the company had obligated itself to repay to the state of São Paulo sums which the parent companies had received from the state of São Paulo prior to the amalgamation of the two in 1892.⁵⁵ No statement of the amount of gold or currency obligations is available for 1894, but the capital account statement issued by the company for 1899 showed gold debentures totaling 326,500 pounds sterling. Service on the gold obligations, on the basis of 6 per cent interest and the rate of exchange of 1899, would have required 626,880 milreis. But the paper currency debentures, which may have been increasing during the period from 1894 to 1899, totaled 44,274,600 milreis.⁵⁶ It is probable that the floating indebtedness was the obliga-

⁵⁴ *Ibid.*, p. 85.

⁵⁵ *Relatorio da Companhia União Sorocabana e Ituana, anno de 1896*, Rio de Janeiro, 1897, p. 7.

⁵⁶ *Relatorio da Companhia União Sorocabana e Ituana anno de 1899* Rio de Janeiro, 1900, *annexos*.

tion which increased. Interest at 6 per cent on these totals 2,836,440 milreis. Interest on gold and paper debentures in the company's profit and loss statement totals 3,294,888, which is practically the figure given above. Taking the figures of the company, interest on debentures alone absorbed all but 197,087 of the 3,491,975 milreis which represented the net operating revenue of the company in 1899.⁸⁷ The report of the company for the year 1898 showed that the deficit from 1894-1898 was 6,792,225 milreis. The statement of 1899 shows a cash balance of only 238,639 milreis. In view of these facts the wonder is how the company survived until it went into bankruptcy in 1903, especially when it is recalled that it was increasing its mileage during this period.

Rolling stock and equipment deteriorated and little new equipment was bought. Complaints of the state agency regulating the railways are continuous from 1898. The report of the secretary of agriculture, in whose department the *Inspectoria de Estradas de Ferro* functioned for 1898, speaks of "grave defects" in the lines of the company.⁸⁸ The company purchased abroad three locomotives and three passenger cars in 1899. During the same year the company built in its own shops sixty freight cars.⁸⁹ But the figures of the state railway department indicate that the *Companhia Mogyana* had practically twice as much equipment per kilo-

⁸⁷ *Ibid.*, *anexos*.

⁸⁸ *Relatorio da Secretario da Agricultura do Estado de São Paulo anno de 1898*, São Paulo, 1899, p. 108. The report's explanation of the situation of the company is that they are attempting to finance new construction out of current receipts, without further borrowing. The difficulty with this explanation is that the indebtedness of the company was already so heavy that they would have found it difficult, if not impossible, to get further capital. *Ibid.*, p. 108.

⁸⁹ *Relatorio do Companhia União Sorocabana e Ituana do anno de 1899*, Rio de Janeiro, 1900, pp. 9, 10.

meter of line as the *Companhia União Sorocabana e Ituana*.⁶⁰ The company was doing its best in 1899 and there was no criticism of it by the state *Inspectoria*.⁶¹ But in 1900 the report of the *Inspectoria* said, "maintenance continues deficient on the majority of the lines of this network."⁶² By 1901 conditions were evidently much worse. The *Inspectoria das Estradas de Ferro* was unable to get any information from the company.⁶³ They were much behind in payments to their employees.⁶⁴ The report said that conditions were so bad that there had grown up a sentiment in the state that the road should pass into other hands.⁶⁵ For four months the company's traffic was so disorganized that it had to set up embargoes against accepting further consignments of coffee.⁶⁶ In its efforts to economize, the company had been taking on large numbers of inexperienced persons.⁶⁷ There was a strike among the employees of the company's shops in Sorocabana and, with the abrupt transfer of the shops to Mayrink, there was further disorganization of the vital work of keeping the rolling stock in repair.⁶⁸

⁶⁰ The figures are as follows: Locomotives per kilometer of line, *Mogyana*, 0.13, *Sorocabana*, 0.07; passenger cars, *Mogyana*, 0.73, *Sorocabana*, 0.08; freight cars, *Mogyana*, 1.64, *Sorocabana*, 0.69. *Relatório do Secretario da Agricultura do Estado de São Paulo, anno de 1899*, São Paulo, 1900, p. 121. This same report also speaks of the lack of "obras de protecção," *ibid.*, p. 120.

⁶¹ "Foram substituidos 238, 677 dormentes. Com relação a obras d'arte taes como pontes, pontilhões e boeiros pouco nos resta a fazer." *Relatório da Companhia... Sorocabana, op. cit.*, pp. 6, 9.

⁶² *Relatório do Secretario da Agricultura do Estado de São Paulo, anno de 1900*, São Paulo, 1901, p. 172.

⁶³ *Relatório do Secretario da Agricultura do Estado de São Paulo, anno de 1901*, São Paulo, 1902, p. 169.

⁶⁴ *Ibid.*, p. 190.

⁶⁵ *Ibid.*, p. 200.

⁶⁶ *Ibid.*, p. 197. The period was from January to April.

⁶⁷ *Ibid.*, p. 198.

⁶⁸ *Ibid.*, p. 198.

In 1902 one fine of 2,000 milreis was assessed against the company for poor maintenance of the permanent way; and four fines, two of 1,000 milreis, one of 600 milreis, and one of 500 milreis, for irregularity of traffic.⁶⁹ Conditions continued bad in 1903, until the receivers, appointed in January of that year, took energetic measures and brought conditions back to approximate normality in June of the same year.⁷⁰ The system was operated by the receivers until September 20, 1904, when the line was purchased at public auction by the federal government for 64,000,000 milreis (\$15,859,200).⁷¹ It was sold by the federal government in 1905 (January 18) to the government of the state of São Paulo for 3,250,000 pounds sterling.⁷² The records which the writer has examined do not show just why private capital did not bid in the line. Probably one of the reasons was the large amount of money required to put the road in a first-class state of repair. It is also possible that there were no private companies with sufficient capital to buy it.

The reasons for going more into detail with reference to this line are three: first, it is the first important failure in the coffee territory of a road which had a movable tariff; second, subsequent to this purchase by the state of São Paulo, it was operated for two years by the state and then rented to a private operating company in 1907. This company operated it until 1919, since which date it has been operated by the state of São Paulo. It thus offers a chance to study

⁶⁹ *Relatorio do Secretario da Agricultura do Estado de São Paulo, anno de 1902*, São Paulo, 1903, p. 225.

⁷⁰ *Relatorio do Secretario da Agricultura do Estado de São Paulo, anno de 1903*, São Paulo, 1904, p. 117.

⁷¹ *Relatorio da Estrada de Ferro Sorocabana Anno de 1904*, São Paulo, 1905, p. 4. This included 4,000,000 milreis debt of the company to the *Companhia Edificadora* for material which the latter had furnished to the Sorocabana, *ibid.*, p. 3.

⁷² *Leis... de São Paulo, op. cit.*, p. 445.

historically the difference between public and private operation. This comparison will be found in Chapter VI.⁷⁵ In the third place, the *Sorocabana* is one of the very few railways in Brazil with which another road has important points in common. This other road is the *Companhia Mogyana de Estradas de Ferro*. The *Mogyana* is similar to the *Sorocabana* in gauge, kinds of traffic and total length. Both roads are operated by Brazilians. A separate chapter, therefore, will be given to a comparison of the state-operated *Sorocabana* and the privately-operated *Mogyana*.⁷⁶

There is not sufficient evidence on which to decide whether the management of the *Companhia União Sorocabana e Ituana* was inefficient. It will be recalled that its capital charges were heavy. New capital was not secured. The flexible tariff clause in the contract with the state of São Paulo did not fully protect the line against the continuous depreciation of the milreis. This road illustrates the difficulties of railway construction and operation in Brazil. The *Sorocabana* had heavy traffic. Its terrain was not unduly difficult. Perhaps average management is not enough to enable a road to survive in Brazil. The number of failures indicates the possibility of conditions so difficult that only a road having management above the average in ability could survive.

There were two other changes in ownership of important railways in this period. The first was brought about by the failure of the *Estrada de Ferro Oeste de Minas* in 1903. It was purchased by the federal government at public auction in June of that year.⁷⁵ In the absence of accusations against the management, it may be assumed that the reason for the

⁷⁵ *Infra*, p. 100.

⁷⁶ *Infra*, p. 119.

⁷⁵ Decreto No. 4893 de 18 de Julho de 1903, *Legislação Ferroviária*, vol. ix, p. 556.

failure was insufficient receipts to cover capital charges as well as operating expenses. The road passes through a sparsely settled area with scant resources.⁷⁶ The average annual operating deficit for the quinquennium 1924-1928 was 7,943,642 milreis.⁷⁷ This road, the mileage of which in 1914 was 1,358 kilometers, is still owned by the federal government.

The second road was originally a part of a concession given in 1904 to a private company, the *Companhia Estrada de Ferro Noroeste do Brasil*, for a line from Bauru, state of São Paulo, passing through Itapura to Corumbá, state of Matto Grosso. The government, however, decided to build on its own account the *Itapura-Corumbá* section, using the *Noroeste* company only as contractors for construction.⁷⁸ The *Itapura-Corumbá* section, 837 kilometers long, has been operated since 1914 by the federal government.⁷⁹ The report of the minister does not state why the government changed its mind about the construction of the *Itapura-Corumbá* section. In view of the very sparsely settled territory through which it passes, the government may well have figured that the payment of a guarantee of interest would be continuous. The section which it conceded to private capital, Bauru to Itapura, in the state of São Paulo, is in the coffee-producing section; the one the government built, *Itapura-Corumbá*, is in the sparsely settled state of Matto Grosso. Even now, with the two joined together to form the *Estrada de Ferro Noroeste*, owned and operated by the federal government, the profits of the coffee area are not enough to offset the losses of the Matto Grosso division.

⁷⁶ The writer went over the principal lines of this road in 1930.

⁷⁷ Computed from *Estatística*, 1928, p. 366.

⁷⁸ *Relatório do Ministério da Agricultura, Commercio e Obras Publicas de anno 1904*, Rio de Janeiro, 1905, p. 5.

⁷⁹ *Estatística*, 1913, p. ii.

The average annual deficit for the quinquennium 1924-1928 was 2,912,381 milreis.⁸⁰

The following table gives the percentages of the railway mileage owned and operated by the government and by private companies in 1889 and 1914:

	Ownership in per cent		Operation in per cent	
	1889	1914	1889	1914
Federal government	} 34 {	53	} 34 {	18
State governments		8		2
Private	66	39	66	80
	<hr/>	<hr/>	<hr/>	<hr/>
	100	100	100	100

It will be noted that there was an increase of 14 per cent in the privately-operated roads, and an increase of 27 per cent in the roads owned by the federal and state governments. This conforms with the picture already drawn, that the outstanding developments of the first period of the republic were increases in government-owned mileage through recapture and new construction, accompanied by the policy of renting the government-owned lines to private companies for operation. The total number of kilometers in operation in 1914 was 26,062.⁸²

⁸⁰ Figures from *Estatistica*, 1928, p. 366. There was one year, 1925, in which there was a small net operating income.

⁸¹ *Estatistica*, 1913, p. xx; 1889 figures, *supra*, p. 40.

⁸² *Estatistica*, 1913, p. xx.

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CHAPTER IV

THE SECOND PERIOD OF THE REPUBLIC

1915-1930

THE principal change in the distribution of the railway mileage of Brazil, as between governmental and private agencies, in this period was the increase in the percentage operated by state governments and a corresponding decrease in the percentage operated by private companies.¹ This is largely accounted for by the change from private companies to state governments in the renters of three important railways owned by the federal government: the *Rede Sul Mineira*, whose lines are within the bounds of the state of Minas Geraes, rented in 1920 to that state; the *Estrada de Ferro Sorocabana*, all of whose lines are located in the state of São Paulo, rented in 1919 to that state; and the *Viação Ferrea do Rio Grande do Sul*, situated in the state of Rio Grande do Sul, rented in 1919 to that state.

Probably the greatest single factor in bringing this change about was the financial and economic difficulties caused by the World War. Brazilian companies were shut off from fresh capital issues in North American or European countries. The rolling stock, rails and locomotives which Brazil must purchase abroad not only were high in price, but at times were unobtainable. It would be a mistake, however, to push the war explanation too far, because three of the renting companies survived this trying period: namely, the Great Western Railway Company of Brazil, the *Companhia*

¹ *Infra*, p. 87.

Ferrovialria E'ste Brasileiro, and the *Companhia Estrada de Ferro São Paulo Rio Grande*.²

The geographical order of the roads which were rented to state governments, going from north to south, is as follows: (1) *Rede Sul Mineira*, (2) *Estrada de Ferro Sorocabana*, and (3) *Viação Ferrea do Rio Grande do Sul*. These roads will now be considered in this order.

(1) THE REDE SUL MINEIRA

(1) *The Rede Sul Mineira* is the result of the consolidation of a number of short lines which had been recaptured in the first quinquennium of the century. The system was rented in 1909 to the *Companhia de Estradas de Ferro Federaes Brasileiras*.³ The contract called for the payment of rent on a sliding scale. The rent varied from 16 per cent of gross receipts, when gross receipts were not in excess of 6,000 milreis (\$1,843) per kilometer of line, to 55 per cent of gross revenue, when gross receipts exceeded 10,000 milreis (\$3,071) per kilometer of line.⁴ The company was to deduct from its rent payment, interest and amortization charges on its capital of 10,000,000 milreis (\$3,071,000). This capital of 10,000,000 was the sum which the company obligated itself to expend on the construction of new lines.⁵ The company was required to submit within a period of one year plans for this new construction.⁶ The contract was to terminate in 1970.⁷ The government obligated itself to

² The *São Paulo Rio Grande*, 1,997 kilometers in length, is partly an owning and partly a renting company. It rents from the federal government 605 kilometers and owns (and operates) 1,392 kilometers. *Estatística*, 1928, p. 25.

³ Decreto No. 7,704 de 2 de Dezembro de 1909, *Legislação Ferrovialria*, vol. xi, p. 341.

⁴ *Ibid.*, art. vi, p. 343.

⁵ *Ibid.*, art. vii, p. 343.

⁶ *Ibid.*, art. xiii, p. 346.

⁷ *Ibid.*, art. ii, p. 342.

ceded no new lines within twenty kilometers on either side of the line.⁸ Nine hundred and seventy-six kilometers were in operation at the time the company took it over.⁹ By 1910 the company had constructed 346 kilometers.¹⁰ *Freight and passenger rates were not to be variable with the foreign exchange value of the milreis.*¹¹

The company's report of 1910 says that the roadbed was in poor condition.¹² The average operating ratio for the decade 1910-1919 was 86.2 per cent.¹³ The operating ratio of the *Sorocabana*, which likewise had to give up its contract, was 57.6 per cent. For the same period, the operating ratio of the Great Western Railway of Brazil, a rental company which survived the World-War difficulties, was 71.4 per cent.¹⁴

The minister of communications in his 1912 *Report* reads that the rolling stock is insufficient to meet the growing needs of the line and the permanent way is poorly maintained.¹⁵ By 1914 the situation on some of the divisions of the line had improved, though a part remained in bad condition.¹⁶ In 1917 the minister mentions the inauguration

⁸*Ibid.*, art. xxxviii, p. 353.

⁹*Relatório da Companhia de Estradas de Ferro Federaes Brasileiras anno 1910*, Rio de Janeiro, 1911, p. 2.

¹⁰The total length was therefore 1,322 kilometers. *Estatística*, 1919, i.

¹¹Art. xxv, *Legislação Ferroviária*, vol. xi, p. 359.

¹²*Op. cit.*, p. 3.

¹³This figure was compiled from *Estatística*, 1910, p. 132; 1911, p. 194; pp. 148 and 192; 1914, p. 156; 1915, p. 154; 1916, p. 153; 1917, p. 142; p. 142; 1919, p. 206.

¹⁴Detailed figures for these roads will be found in the Appendix, 12-13, T. 34.

¹⁵*Relatório do Ministerio da Viação e Obras Publicas, anno de 1912*, Rio de Janeiro, 1913, pp. 77, 78.

¹⁶*Ibid.*, 1914, Rio de Janeiro, 1915, p. 156.

of shops at Passo Quatro and records no complaints.¹⁷ In 1918 the government inspector declared the condition of the crossties to be very bad and that the company did not have sufficient money to buy needed fuel. He further said that employees of the company had not been paid. One of the results of this nonpayment was the poor state of the ballast on certain sections of the system.¹⁸

During 1910-1919, 24.75 kilometers of rails were replaced per annum; during 1923-1928, 226 kilometers of rails per annum were replaced.¹⁹ The rate of replacement during state operation was practically nine times that prevailing during the administration of the *Companhia Federaes*. During 1910-1919, 199,482 ties were replaced per annum; for the period 1923-1928 the annual average was 286,921.²⁰ The right of way of the line, therefore, had unquestionably deteriorated during the administration of the *Companhia Federaes*. As the permanent way is the most vital part of a railway, the federal government was justified in demanding that the company either arrange for funds to make replacements or give up its contract.

The financial condition of the company made it impossible for it to borrow money from private sources.²¹ Its funded indebtedness in 1919 was 39,856,250 milreis and its floating

¹⁷ *Ibid.*, 1917, Rio de Janeiro, 1918, p. 159.

¹⁸ *Ibid.*, 1918, Rio de Janeiro, 1919, p. 173. The company report contents itself with declaring that conditions were becoming normal towards the end of the year. *Relatorio da Companhia Estradas de Ferro Federaes Brasileiras anno de 1918*, Rio de Janeiro, 1919, p. 5.

¹⁹ The averages above given were compiled from the following: *Estatistica*, 1910, pp. 142-3; 1911, pp. 204-5; 1912, pp. 202-3; 1913, pp. 158-9; 1914, pp. 164-5; 1915, pp. 164-5; 1916, pp. 218-9; 1917, pp. 152-3; 1918, pp. 152-3; 1919, pp. 222-3; 1923, pp. 310-11; 1924, pp. 339-40; 1925, pp. 358-9; 1926, pp. 368-9; 1927, 364-5; 1928, pp. 388-9.

²⁰ References are identical for those given for rail replacements.

²¹ *Relatorio do Ministerio da Viação e Obras Publicas anno de 1919*, Rio de Janeiro, 1921, p. xviii.

while not substantiated by documentary proof, shows that public opinion was not favorable to the grant to the company of a government loan.²⁷

It is natural that another private company, even with resources as great as those of the *Paulista* or the *Mogyana*, would hesitate to take over a line under such circumstances. The government, therefore, faced the alternatives of taking over operation or abandoning the line. The latter could not be considered because Minas Geraes had the largest population of any state in the country. The minister of communications, Dr. Pires do Rio, suggested that it be rented to the state of Minas Geraes.

It was a logical step. The republic of Brazil had been in existence thirty years. The coming of the republic had brought more power to the states, as against the central government. The central government hitherto had carried the burden of the responsibility for the building of railways. Provincial government guarantees of interest had been given in the beginning, but the provinces' guarantees were only 2 per cent as compared with the 5 per cent guarantee of the central government. Furthermore state governments owned in 1914 only 8 per cent of the total mileage of the country, as contrasted with 53 per cent owned by the federal government.²⁸ The advanced development of agriculture, the industrial progress, and the political importance of the states of Minas Geraes and Rio Grande do Sul made it just that they should be asked to assume part of the burden for the operation of railways not sufficiently remunerative for private capital. The state of São Paulo had already taken over an important road, the *Estrada de Ferro Sorocabana*.²⁹

²⁷ The fact that the cancellation of the contract was amicable would point to the government's belief in the honesty of the management.

²⁸ Text, p. 66.

²⁹ *Supra*, p. 63.

profits and the lessees 75 per cent.³⁶ This net profit was to be the difference between operating receipts and operating costs, after the following deductions had been made: (1) interest and amortization on the debt of the state of São Paulo to the Dresden Bank on the loan of 3,800,000 pounds floated by the state for the purchase of the road;³⁷ (2) interest payments at 6 per cent on monies expended by the state in the construction of extensions and improvement;³⁸ (3) interest payments at 6 per cent on the capital expended by the lessees and recognized by the state as part of the lessees' capital.³⁹ After the completion of payment of principal and interest of the debt to the Dresden Bank, the state would have the privilege of deciding whether to use the sums formerly expended for the service of this loan, in (1) new construction, (2) reduction of tariffs, or (3) reduction of the capital of the lessees.⁴⁰ The state was buying a road and renting it under an arrangement whereby the lessees were to pay the interest and amortization charges on the money borrowed by the state in purchasing the road. If, after the deductions above described, any profits remain, the 25 per cent accruing to the state represents clear gain to it. This is especially true if the road is considered as it was in the year of purchase. For the state had expended *no* money then. The outlay by the state for new construction came *later*. With the addition of new lines built by the state, its responsibility increased, even though interest on such amounts constituted the second charge on the net operating revenue.

Freight and passenger rates were to continue movable with

³⁶ *Ibid.*, art. xiv, p. 456.

³⁷ *Ibid.*, art. xiv, sec. i, par. 1, p. 456.

³⁸ *Ibid.*, art. xiv, sec. 1, par. 2, p. 456.

³⁹ *Ibid.*, par. 3, p. 456.

⁴⁰ *Ibid.*, art. iii, p. 456.

the exchange value of the milreis.⁴¹ Rates were to be fixed by mutual accord, being subject to revision every five years.⁴² In the absence of agreement between the state and the lessees, arbitrators with experience in railway management were to be selected.⁴³ Rates should be fixed so as to secure the development of the zone through which the railway passes and permit the exportation of its products.⁴⁴ Rates adopted must be in line with those on the other three great railway systems in the state.⁴⁵

In 1909 the state of São Paulo completed construction of the line to Itararé, on the border of the state with the state of Parana, thus giving rail connection between the states of Rio Grande do Sul and São Paulo.⁴⁶ The average operating ratio was a favorable one, being 52.7 per cent in the period preceding the World War, 1908 to 1914.⁴⁷ There were early reports of poor maintenance on parts of the Sorocabana Railway. The biennial report for 1910-1911 declared that accidents occurring on the line were attributed by some to the

⁴¹ *Ibid.*, art. xv, p. 456.

⁴² *Ibid.*, art. xv, p. 456.

⁴³ The law does not, however, say how many. In the absence of details, it is to be assumed that, following the federal government precedent, each side should select one and these two a third. *Ibid.*, art. xv, p. 457.

⁴⁴ *Ibid.*, art. xv, p. 457.

⁴⁵ It is to be assumed that the three roads here referred to are the *Companhia Paulista de Estradas de Ferro*, the *Companhia Mogyana de Estradas de Ferro*, and the São Paulo Railway Company, Limited, though the third might be the *Estrada de Ferro Central do Brasil*. *Ibid.*, art. xv, p. 456.

⁴⁶ Rio Grande do Sul is the southernmost state and is very important both economically and politically. James, Herman G., *op. cit.*, pp. 495-96. The connecting link between Itararé and the state of Rio Grande do Sul is formed by the São Paulo Rio Grande Railway.

⁴⁷ See Appendix, p. 189, T. 6, for the detailed figures from which the above average operating ratio was compiled.

bad state of the rolling stock. The report, however, formally accepts the explanation of the superintendent of the company that these accidents had been caused by damages to the permanent way resulting from exceptionally heavy rains.⁴⁸ The report for 1912-1913, while stating that an improvement had been made, declared that conditions were not yet satisfactory.⁴⁹

In 1914 the Brazil Railway Company, a holding and operating company which held all the capital stock of the Sorocabana Railway Company, went into the hands of a receiver.⁵⁰ The company was chartered in Maine in 1906 and paid the first dividend on its preferred shares in 1910.⁵¹ This shows that it had been in difficulties prior to the World War. It is difficult to discover precisely what effect the receivership of the parent company had on its subsidiary, the Sorocabana Railway. It would logically mean that the subsidiary would find it difficult, if not impossible, to secure new capital. And the contract with the state of São Paulo called for the outlay of capital, for the rapidly-growing traffic demanded new capital to pay for new rolling stock and other equipment.

It is not possible to discover the entire number of kilometers of rails replaced or the entire number of ties replaced per annum for the period of operation by the Sorocabana Railway Company. The reason is that prior to 1923 the

⁴⁸ *Relatorio da Secretaria da Agricultura do Estado de São Paulo, 1910-1911*, São Paulo, 1912, p. 169.

⁴⁹ *Ibid.*, 1912-1913, São Paulo, 1914, p. 231.

⁵⁰ The interests of this company were varied and included railways, port works, and land companies. In addition to the Sorocabana, it controlled the Estrada de Ferro São Paulo Rio Grande, and through its subsidiary operated the Viação Ferrea do Rio Grande do Sul. It also owned large amounts of stock in the *Companhia Paulista* and the *Companhia Mogyana*. *Stock Exchange Year Book, 1916*, London, Thomas Skinner and Co., 1917, p. 218.

⁵¹ *Ibid.*, p. 218.

Estatística gives figures only for that part of the system which has a federal government guarantee of interest.⁵³ The total mileage of the Sorocabana in 1910 was 1,310 kilometers. The average mileage for 1910-1919 was 1,461 kilometers.⁵⁴ The average mileage on which reports are available during that period was 571 kilometers. It is probable, however, that conditions were similar, if not identical, over the entire line, so that the 571 kilometers may be taken as a fair sample of conditions on the Sorocabana.

The Sorocabana Railway Company did not adequately maintain the permanent way. In a series of tests made by the Kansas City Southern Railway, it was found that the life of rails before replacement varied between 10.86 years and 15.74 years, depending on the size of rail, the quality of steel used in its construction, and the density of traffic.⁵⁵ Taking the longest figure, a life of 15 years would mean that 0.066 kilometers should be replaced per kilometer of line per year. The average number of kilometers of rail replaced per kilometer of line per year from 1910-1919 was 0.029 which is less than half the lowest Kansas City Southern figure.⁵⁶ Before the adoption of wood preservatives, the average replacement of cross-ties in the United States was 162 per kilometer of line per year. The average number of ties replaced per kilometer of line per year by the Sorocabana Railway Company for the period 1910-1919 was 139.⁵⁷

The Sorocabana Railway Company did not deny that conditions were unsatisfactory. In its official defense to the

⁵³ *Estatística*, 1923, Introdução.

⁵⁴ Compiled from figures given in *Relatório da Estrada de Ferro Sorocabana, 1929*, São Paulo, 1930, Table III.

⁵⁵ *Railway Age*, vol. 88, no. 21, May 24, 1930, p. 1233.

⁵⁶ See Appendix, p. 190, T. 8, for the bibliography from which this average was compiled.

⁵⁷ See Appendix, p. 190, T. 8. The bibliographical references for ties and rails are the same as for ballast.

secretary of agriculture of the state of São Paulo in 1918, the company contended that the cause of this poor condition was its inability to get a settlement of accounts with the state.⁶⁷ Under the terms of its contract, the state had the right to pass on all the expenditures for capital account.⁶⁸ The government report for 1914 records that the state and the company had been working all year to get some settlement.⁶⁹ The secretary of agriculture, in his 1918 report, prints a statement issued by the company purporting to show that the company had a deficit for 1918 of 1,198,679 milreis (\$299,669).⁷⁰ In his comment the secretary adds that this accounting was not accepted by the state.⁷¹ This is precisely the point made by the company in its 1918 defense.

The 1917 report of the secretary of agriculture goes into the details of the alleged inadequate maintenance. The line did not have enough roundhouses for housing locomotives.⁷² Buildings on the line were poorly kept, the report said.⁷³ It contains a table in which one may compare accidents on the Sorocabana with those on another line in many respects similar, namely, the *Companhia Mogyana*. A greater number have occurred on the Sorocabana, and the secretary does not hesitate to blame the management of the Sorocabana Railway.⁷⁴ For example, there were, during

⁶⁷ *Defesa apresentada ao Secretario da Agricultura, contra as acusações feitas a sua administração, pelo representante geral*, Luiz Tavares Pereira, Secção de Obras, O Estado do São Paulo, São Paulo, 1918, p. 52.

⁶⁸ *Leis... estado de São Paulo, op. cit.*, p. 454.

⁶⁹ *Relatorio do Secretario da Agricultura anno 1914*, São Paulo, 1915, p. 197.

⁷⁰ *Relatorio do Secretario da Agricultura anno 1918*, São Paulo, p. 199.

⁷¹ *Ibid.*, p. 199.

⁷² *Relatorio do Secretario da Agricultura, 1917*, São Paulo, 1918, p. 169.

⁷³ *Ibid.*, p. 168.

⁷⁴ *Ibid.*, p. 170.

the year, 37 collisions on the Sorocabana, and none on the Mogyana; there were 56 derailments reported, due to defects or the state of the line, for the Sorocabana, and none for the Mogyana; there were 75 derailments because of defects of the rolling stock on the Sorocabana, and none reported for the Mogyana; there were 130 accidents due to nonobservance of regulations by employees of the Sorocabana, and 12 for the Mogyana.⁶⁵

The report of the secretary also speaks of the poor freight service of the company, mentioning not only its slowness, but the difficulty of securing cars.⁶⁶ The company in its defense calls attention to the difficulties created by the War, particularly in the acquisition of material.⁶⁷ It also declares that part of the difficulty is due to the phenomenal increase in its freight traffic, pointing out that in the decade 1907-1917 the increase on the *Companhia Paulista* was 52 per cent, the increase of the *Companhia Mogyana* was 70 per cent, while that of the Sorocabana was 95 per cent.⁶⁸

The secretary of agriculture in his report for 1918 says that maintenance is still deficient despite the increased amount spent during that year.⁶⁹ Perhaps the most significant part of his report is the reference to the cumulative effect now being felt of past deficiencies in maintenance.⁷⁰ He sets the number of ties which should be replaced per annum as 384,000, and says that the smaller number actually replaced, 358,246, would not be serious were it not for the deficiencies of preceding years.⁷¹ The number of accidents

⁶⁵ *Ibid.*, p. 163-A.

⁶⁶ *Ibid.*, p. 169.

⁶⁷ *Sorocabana Railway Company, Defesa, et cet., op. cit.*, p. 10.

⁶⁸ *Ibid.*, p. 18.

⁶⁹ *Relatorio do Secretario da Agricultura, anno de 1918*, São Paulo, 1919, p. 199.

⁷⁰ *Ibid.*, p. 199.

⁷¹ *Ibid.*, p. 200.

was too great, there was insufficient maintenance of locomotives, and an increase of 95 per cent in the number of late trains.⁷² Authorization was given, by the law of December 31, 1918, for amicable or judicial rescission of the contract.⁷³ In beginning his report for this year, the secretary admitted that the controversy with reference to the adjustment of accounts between the state and the company had not been settled.⁷⁴ Three courses, the secretary said, were presented to him: (1) Continuance of the present contract. This was impossible because it was under the present contract that they had reached the unhappy position in which they found themselves.⁷⁵ (2) Revision of the contract. This would involve a substantial increase in tariffs, for present rates were not yielding a large enough balance to pay for the heavy capital expenditures necessary to put the road in proper repair.⁷⁶ To any elevation in rates, the government of the state of São Paulo was opposed.⁷⁷ (3) Therefore the alternative left to them was cancellation of the contract.⁷⁸ Prolonged negotiations were entered and an accord reached whereby the state of São Paulo paid to the Sorocabana Railway Company 27,576,000 milreis (\$7,169,760) as indemnity for rescission of the contract, and 21,036,000 milreis (\$5,471,160) on account of capital invested by the Sorocabana Railway Company.⁷⁹ From the first of

⁷² *Ibid.*, p. 202.

⁷³ Lei N. 1643, *Relatorio do Secretario da Agricultura anno de 1919*, São Paulo, 1920, p. 66.

⁷⁴ *Ibid.*, p. 66. This introduction also contains a sarcastic reference to the parent company, the Brazil Railway Company, and its bankruptcy. The secretary calls it the "master bloodsucker of our railway riches."

⁷⁵ *Ibid.*, p. 68.

⁷⁶ *Ibid.*, pp. 67, 69.

⁷⁷ *Ibid.*, p. 69.

⁷⁸ *Ibid.*, p. 69.

⁷⁹ Lei N. 1,695-A de 18 de Dezembro de 1919, *ibid.*, p. 74.

July, 1919, the administration of the railway was in the hands of the state.⁸⁰

While the reason given by the secretary for cancellation was the unwillingness of the state to raise rates enough to bring and keep the road in proper repair, the financial condition of the parent company also played a part. Rightly or wrongly, the Brazil Railway Company had attained a reputation in Brazil for reckless financing and poor business judgment.⁸¹ Public feeling, and indirectly the attitude of the government, were influenced by the poor maintenance and lack of equipment. In other words, there was not the good will between the company and the state which might have led the state to make them a loan on favorable terms. The Brazil Railway, doubtless, was glad to be rid of a contractual obligation which was probably more favorable to the state than to it.

(3) *Viação Ferrea do Rio Grande do Sul*

The *Compagnie Auxiliaire des Chemins de Fer au Bresil*, the lessees of the *Viação Ferrea do Rio Grande do Sul*, like the Sorocabana Railway Company, was a subsidiary of the Brazil Railway Company.⁸² The first renting contract with the federal government was signed by the *Compagnie Auxiliaire* in 1898.⁸³ This was for only one line, the one from Porto Alegre to Uruguayana.⁸⁴ The federal government, from 1898 to 1903, greatly increased the mileage which it owned through the large recapture operations already referred to.⁸⁵ In 1905 the *Compagnie Auxiliaire* signed a new

⁸⁰ *Ibid.*, p. 114.

⁸¹ *Brasil Ferro-Carril*, vol. vi, p. 92, March 31, 1915.

⁸² *Supra*, p. 76.

⁸³ Decreto N. 2830 de 12 de Março de 1898, *Legislação Ferro-Viaria*, vol. viii, p. 606.

⁸⁴ *Ibid.*, p. 606.

⁸⁵ *Supra*, p. 50.

contract with the federal government, by which it rented the following additional lines: *Taquary a S. Leopoldo, Cacequy a Alegrete, de Sant' Anna do Livramento, de Colonia Caxias, Porto Allegre a Nova Hamburgo, and Nova Hamburgo a Taquara.*⁸⁶ The contract provided that the lines should revert to the government in 1958.⁸⁷ The company obligated itself to spend for new construction and improvements 37,000,000 milreis (\$11,840,000).⁸⁸ The amount of rent to be paid varied from 5 per cent of the gross operating income on some lines, to 10 per cent on others, with a provision for return to the government of a fixed percentage of all returns above 900,000 milreis per kilometer on certain lines, and above 2,000,000 milreis per kilometer on others.⁸⁹ In the event of the cancellation of the contract, the government was to pay the company indemnity, in addition to recognized capital, of $\frac{1}{4}$ of the average annual net operating revenue for the quinquennium preceding rescission.⁹⁰ In view of the considerable amount the company was to put into new construction, the contract was a good one for the government, as it had not obligated itself to pay interest on the capital invested by the company.

The company, not finding conditions as favorable as it had anticipated, asked for a revision of its contract, which revision it received in 1911.⁹¹ By this new contract, the company was given tariffs movable with the exchange.⁹²

⁸⁶ *Supra*, p. 34; *Legislação Ferroviária*, vol. ix, p. 70.

⁸⁷ Decreto N. 5548 de 6 de Junho de 1905, art. iv, *Legislação Ferroviária*, vol. x, p. 71.

⁸⁸ *Ibid.*, art. ix, p. 75.

⁸⁹ *Ibid.*, art. x, p. 75.

⁹⁰ *Ibid.*, art. xiii, p. 76.

⁹¹ *Legislação Ferroviária*, vol. xii, p. 475-81; Decreto N. 9,101 de 8 de Novembro de 1911.

⁹² *Ibid.*, art. iv, p. 476.

The contract for 1898 specifically provided for such sliding tariff scales, but this question is not mentioned in the 1905 contract.⁹³ In place of the clauses providing for the return to the government of gross revenues above a fixed rate per kilometer per annum, the new contract made a return applicable only when the total gross revenues of the line exceeded 20,000,000 milreis.⁹⁴ The total rent paid by the company from 1898 to 1919 was 13,388,950 milreis, or 6.8 per cent on its total gross receipts of 194,263 milreis for this same period.⁹⁵ But before there was sufficient time to see what the effects of the 1911 rate revision were going to be, the Great War came and with it the receivership of the parent company, the Brazil Railway Company.⁹⁶ From 1914 to 1920 the history of the *Compagnie Auxiliare* was practically a repetition of the history of the Sorocabana Railway Company. There was one difference, however. Conditions on the *Compagnie Auxiliare*, probably more clearly than on the Sorocabana, called for a revision in tariffs to meet the rising costs of the war period. This is also confirmed when it is remembered that the Sorocabana, unlike the *Compagnie Auxiliare*, did not have to pay a rent based on its gross income. The average operating ratio on the *Auxiliare* for 1914-1920 was 89 per cent; on the Sorocabana, 62 per cent.⁹⁷

By 1920 the condition of both the rolling stock and the

⁹³ *Legislação Ferroviária* (1898), vol. viii, p. 615.

⁹⁴ *Legislação Ferroviária* (1911), vol. xii, art. iii, p. 476. The gross revenues of the line did not reach the figure of 20,000,000 until the year 1918. *Relatório da Viação Ferrea do Rio Grande do Sul, 1929*, Porto Alegre, 1930, p. 24.

⁹⁵ These figures were computed from figures published in *Relatório da Viação Ferrea do Rio Grande do Sul, 1920*, Porto Alegre, 1921, pp. 15, 36.

⁹⁶ *Supra*, p. 76.

⁹⁷ The above operating ratios were compiled from the *Relatório da Estrada de Ferro Sorocabana de 1929*, São Paulo, 1930, Table 3; and those for the *Compagnie Auxiliare* from the *Relatório da Viação Ferrea do Rio Grande do Sul de anno 1929*, Porto Alegre, 1930, p. 24.

road bed of the *Auxiliare* had reached such a state that it was no longer safe to operate trains over its lines. The average number of kilometers of rails replaced per kilometer of line per year for the period 1910-1919 was 0.023; of cross-ties for the same period, 74 were replaced per kilometer of line per year.⁹⁸ On the basis of standards previously discussed, these averages should have been 0.066 and 162 respectively.⁹⁹ Maintenance was only average before 1914 and, with the World War, conditions became worse.¹⁰⁰ There was a strike of employees in 1917. The people of the state of Rio Grande do Sul wished for cancellation of the contract. The widespread complaint caused the president of the state of Rio Grande do Sul to send a telegram of appeal to the president of the republic.¹⁰¹

The *Compagnie Auxiliare* received an increase in rates in 1917.¹⁰² This increase, however, did not raise the level of rates on the line to that of roads like the Central do Brazil and the Sorocabana.¹⁰³ It was not sufficient to enable the company to keep pace with the mounting costs of operation. Total expenditures were 9,246,349 milreis in 1914; in 1920 they were 23,760,417 milreis (\$2,681,431 and \$4,989,687).¹⁰⁴ The operating ratio had mounted to 107 per cent in 1920.¹⁰⁵

⁹⁸ For the reports from which these averages were compiled, see Appendix, p. 231, T. 54.

⁹⁹ *Supra*, p. 77.

¹⁰⁰ *Relatorio do Director da Viação Ferrea do Rio Grande do Sul, anno de 1920*, Porto Allegre, 1921, pp. 3, 4.

¹⁰¹ *Ibid.*, p. 3.

¹⁰² *Relatorio do Ministerio da Viação, 1918*, Rio de Janeiro, 1920, p. 162.

¹⁰³ Pereira, Octacilio, "Os Transportes Pela Auxiliare," *Brasil Ferro-Carril*, vol. xviii, pp. 109-13. Senhor Pereira was traffic manager for the *Auxiliare*.

¹⁰⁴ *Relatorio da Viação Ferrea do Rio Grande do Sul, 1929*, Porto Allegre, 1930, p. 24.

¹⁰⁵ *Ibid.*, p. 24.

The state of Rio Grande do Sul took over operation of the road in 1920.¹⁰⁶ The detailed reports of the state show the condition which the rolling stock and permanent way had reached by that time.¹⁰⁷ Of the total number of cross-ties, 3,536,000, practically one-half, or 1,700,000, needed replacement. Facilities for the repair of rolling stock were very poor.¹⁰⁸ Of the total of 207 locomotives existing May 31, 1920, 24 per cent were in good repair, 32 per cent average, 10 per cent undergoing repairs, 14 per cent in bad condition, 3 per cent waiting repairs, and 17 per cent abandoned on the lines. In this last group were 35 locomotives, of which 29 were completely ruined.¹⁰⁹ To show the state of the passenger cars, the report points out that the company was using 20 of them for hauling wood!¹¹⁰ The two important roads connecting with the *Compagnie Auxiliaire*, the *São Paulo Rio Grande* and the Sorocabana Railway Company, would not permit their cars to enter the lines of the *Auxiliaire*.¹¹¹

Dr. Pereira, director of traffic of the *Compagnie Auxiliaire*, made a study of the number of ton kilometers awaiting shipment in the latter part of 1918.¹¹² His figures show that the total was 127,976,943.

The number of accidents in 1920 was 939.¹¹³ In the face

¹⁰⁶ *Relatorio do Ministerio da Viação e Obras Publicas, 1921*, Rio de Janeiro, 1922, p. 206.

¹⁰⁷ *Relatorio da Viação Ferrea do Rio Grande do Sul, 1920*, Porto Alegre, 1921.

¹⁰⁸ *Ibid.*, p. 23.

¹⁰⁹ *Ibid.*, p. 39.

¹¹⁰ *Ibid.*, p. 47. Out of 2,560 freight and passenger cars, 712 were out of service. *Ibid.*, p. 49.

¹¹¹ *Ibid.*, p. 23.

¹¹² Pereira, Octacilio, "Os Transportes pela Auxiliaire," *Brasil Ferro-Carril*, vol. xviii, p. 224, April 15, 1920.

¹¹³ *Relatorio da Viação Ferrea do Rio Grande do Sul, 1921*, Porto Alegre, 1922, p. 18.

of the disorganization of the economic life of the state, and the public clamor caused by these conditions, some action had to be taken. The same policy was followed by the federal government as had been adopted in the case of the *Rede Sul Mineira*. Amicable cancellation of the contract was agreed upon. The sum of 200,000,000 Belgian francs was paid to the *Auxiliare* (\$14,760,000).¹¹⁴ The *Auxiliare* got less than its recognized capital of 1919, which consisted of 89,149,286 milreis.¹¹⁵ It might have claimed a considerably larger figure on the basis of the clause of the agreement providing indemnity for the cancellation of the contract. But it had failed to live up to its contractual obligation to "maintain perfectly the roadbed and rolling stock."¹¹⁶ After the rescission of the contract, the road, which lies entirely within the state of Rio Grande do Sul, was rented to that state.¹¹⁷ By this agreement the state obligated itself to spend in improvements a sum equal to the amount expended by the federal government in rescinding the contract.¹¹⁸ Net operating income was to be divided equally between the state and the federal government, as was the case with the *Rede Sul Mineira*.¹¹⁹

The distribution of the railway mileage of Brazil with

¹¹⁴ *Relatorio do Ministerio da Viação e Obras Publicas, 1919, Introdução*, Rio de Janeiro, 1921, p. xv. Exchange figures, *Federal Reserve Bulletin*, Washington, Jan., 1928, p. 56.

¹¹⁵ \$14,760,000 converted into milreis at the rate of 1920 equals 67,009,090 milreis. Capital figures from *Estatística, 1919*, p. 9.

¹¹⁶ For the indemnity clause, *supra*, p. 82. Its obligation to maintain the roadbed perfectly is found in art. xvii of the 1905 contract, *Legislação Ferroviária*, vol. x, p. 77.

¹¹⁷ *Relatorio Ministerio da Viação e Obras Publicas, 1921*, Rio de Janeiro, 1922, p. 206. Decreto No. 14,222 de 18 de Junho de 1920.

¹¹⁸ *Relatorio do Ministerio da Viação e Obras Publicas, 1919*, Rio de Janeiro, 1921, p. xvi.

¹¹⁹ *Ibid.*, p. xvi.

respect to ownership and operation among governmental and private agencies, in percentages, was as follows:¹²⁰

	Ownership			Operation		
	1889	1914	1930	1889	1914	1930
Federal government	} 34 {	53	59	} 34 {	18	29
State government		8	9		2	23
Private.....	66	39	31	66	80	48
	100	100	100	100	100	100

The more striking changes were in percentages of total mileage operated by state governments and private companies. The shifting of the *Rede Sul Mineira*, *Estrada de Ferro Sorocabana* and *Viação Ferrea do Rio Grande do Sul* from private to state operation, explain the increase in percentage of mileage operated by states and the decrease in the percentage of total mileage operated by private companies. For the combined mileage of these three systems is 5,968 kilometers, which is 18 per cent of the total mileage of 31,967 kilometers.

The *Estrada de Ferro Sorocabana* and the *Viação Ferrea do Rio Grande do Sul* were the only Class I railways that changed type of operation in this period. The *Noroeste*, which ranks as a Class I railway for the first time in 1928, was in part government operated at the beginning of this period.¹²¹ The *Bauru-Itapura* division was taken over by an amicable rescission of the company's contract in 1918. Its length is 436 kilometers.¹²² The company did not have sufficient funds to carry out the construction and operation for which it had secured concessions.¹²³ The only Class

¹²⁰ *Estatística*, 1928, pp. 20-45. The 1889 figures added for comparison; *supra*, p. 40.

¹²¹ *Supra*, p. 65.

¹²² *Relatorio do Ministerio da Viação e Obras Publicas, anno de 1918*, Rio de Janeiro, 1920, p. 51.

¹²³ *Ibid.*, 1916, Rio de Janeiro, 1917, pp. 42, 48, 49.

II railways which changed their type of operation during this period were the *Rede Sul Mineira* and the *Estrada de Ferro Araraquara*. The latter is an illustration of the failure of a road possessing all the advantages of a rich zone, the coffee area of the state of São Paulo. It is 280 kilometers in length and is now owned and operated by the state of São Paulo.¹²⁴ The other changes, for example the increase in the relative amount of mileage owned and operated by the federal government, are explained by shifts in the Class III railways and by the larger amount of new construction on the federal government lines.

¹²⁴ *Relatorio do Secretario da Viação e Obras Publicas, 1919*, São Paulo, 1920, p. 119. The state expropriated this road in 1919. Conditions on the line have greatly improved since the state took it over.

PART II

CHAPTER V

THE REDE SUL MINEIRA UNDER PRIVATE AND PUBLIC OPERATION

1910-1919, 1920-1930

(1) THE first effort will be to discover the changes in basic traffic conditions under private and public operation of the three systems: the *Rede Viação Sul Mineira*, the *Estrada de Ferro Sorocabana*, and the *Viação Ferrea do Rio Grande do Sul*. Passenger and freight traffic density, changes in the kinds of freight carried, and the percentages of total receipts coming from passenger traffic, freight traffic, baggage and express, and livestock, will be considered.

(2) The development of the physical plant will next be studied. The emphasis will be upon the roadbed and rolling stock. Operating economies gained through increased capital investment in such ways as the elimination of grades, the straightening of curves, and better shop facilities, will also be taken up.

(3) The third general factor to be analyzed will be total costs to the public, either in the form of passenger or freight charges or direct government expenditure. Financial results of operation will be summarized. An attempt will be made to discover capital costs, and for purposes of illustration these will be reduced to terms of units of traffic, the passenger kilometer and the ton kilometer.

(4) In this group technical tests of operating efficiency under private and public operation will be made. Other criteria such as the safety, adequacy, comfort, number of employees per unit of traffic, and speed of service, will be examined. By way of conclusion, all these data will be summarized and an evaluation made of the results.

The time period in the case of private operation will be from 1910-1919; that of public operation usually for the years 1923-1928. The reasons for the gap of three years are two: (1) In 1923 the scope of the data given in the principal source book, the *Estatística das Estradas de Ferro do Brazil*, was enlarged to include all state concession lines. Previous to this only state concession mileages having federal government guarantees of interest were included. The figures for the *Sorocabana*, the state concession road included in this group, became very much more inclusive with the 1923 *Estatística*. (2) The contractual relations between the federal government and the states of Minas Geraes, lessee of the *Rede Viação Sul Mineira*, and Rio Grande do Sul, lessee of the *Viação Ferrea do Rio Grande do Sul*, were not finally settled until 1922. The contract for the operation of the *Rede Sul Mineira* by the state of Minas Geraes was signed April 6, 1922.¹

(1) The freight traffic density of the line declined during the administration of the *Companhia Federaes*. On the other hand there was a small increase in traffic density in the administration of the state of Minas Geraes. As the latter half of the period of operation of the *Companhia Federaes*, namely 1915-1919, was a period of prosperity and greatly increased exports, it may be concluded that the decline in traffic density was in part due to the condition of disrepair into which the line was allowed to fall during the administration of the *Companhia Federaes*.

TRAFFIC DENSITY²

	<i>Company</i>	<i>State</i>
	1910-1919	1923-1928
Ton kilometers per kilometer of line per year	19,613	28,123

¹ *Diario Official*, April 11, 1922, Rio de Janeiro, p. 7161.

² For details, see Appendix, p. 186, T. I. The averages for the time of the administration of the *Companhia Federaes* do not include the new

With the exception of a slight change in the percentages of coffee handled, there were no significant shifts in the relative percentages of the commodities hauled in 1910, 1919, and 1928; neither were there important changes in the percentages of total receipts coming from freight and passenger traffic for the same years.

TRAFFIC CHANGES ^a

	1910	1919	1928
Coffee—percentage of total	17	11	14
Percentages received from freight traffic	54	49	54
Percentages received from passenger traffic	21	23	23

(2) The contract signed by the state of Minas Geraes stipulated that the state should expend on improvements of the right of way, in the purchase of rolling stock and means for the repair of same, 14,000 milreis per kilometer (\$1,886).⁴ As the total length of the *Rede Sul Mineira* in 1922 was 1,141 kilometers this meant a total expenditure of 15,974,000 milreis. According to the latest figures available, this amount has already been exceeded by two-thirds, the total expended being 25,094,276 milreis.⁵

As previously stated, the number of kilometers of rails replaced per year during the administration of the state of Minas Geraes was practically nine times the number replaced per year during the administration of the *Companhia* construction, which would necessarily show a lower figure. Part of the new construction is, however, included in the figures for state administration, 1922-1928. The number of ton kilometers per kilometer of line in 1910 was 23,225, in 1919 it had declined to 18,265. For a summary statement on business conditions in Brazil, see Thorp, Willard L., *Business Annals*, National Bureau of Economic Research, Inc., 1926, New York, pp. 293-94.

^a Appendix, p. 187, T. 2. Bibliography, percentages of receipts from passenger and freight service, Appendix, p. 193, T. 12.

⁴ Art iii, *Diario Oficial*, *op. cit.*, p. 716r.

⁵ *Estatística*, 1928, p. 369; *Relatorio do Inspectoria Federal das Estradas de Ferro*, 1929, Rio de Janeiro, 1930, p. 156.

Federaes.⁶ The number of crossties replaced per annum was also greater during the administration of the state.

MAINTENANCE OF PERMANENT WAY⁷

1910-1919, 1923-1928

	<i>Company</i>	<i>State</i>
Number kilometers of rails replaced per year	25	226
Number of crossties replaced per year	199,482	286,921

The state has purchased new rock-crushing machinery for the purpose of supplying crushed rock for ballasting the permanent way. Figures for the beginning of the year 1927 show that 138 kilometers were ballasted with crushed rock. Perhaps most of this ballast was applied to the line during the administration of the *Companhia Federaes*.⁸ In 1927 when the new crushers began operating, 78 kilometers were ballasted with crushed rock; in 1928, 96 kilometers.⁹ Figures are not yet available for 1929 and 1930, but the work has gone on at a still more rapid rate.

Under its agreement with the federal government, the state has made considerable additions to rolling stock. The state of Minas Geraes inaugurated in 1930 completely equipped modern railway repair shops at Cruzeiro. The investment was made as a part of the capital expenditures agreement already mentioned.¹⁰ The state of Minas Geraes is main-

⁶ The total length of the *Rede Sul Mineira* in 1910 was 973 kilometers; in 1928 it was 1,288 kilometers. The detailed sources from which these averages were compiled are found in a footnote. *Supra*, p. 70.

⁷ *Supra*, p. 70.

⁸ Prior to the *Estatística* of 1923, the method of recording ballast laid was to give the number of cubic meters laid down. With the 1923 *Estatística*, it is given in kilometers of line. Inasmuch as the numbers of *Estatística* show no ballast laid between the years 1923-1926, it may be assumed that the 138 kilometers represented the work of the *Companhia Federaes*. See *Estatística*, 1927, p. 365.

⁹ *Estatística*, 1927, p. 365; 1928, p. 388.

¹⁰ *Supra*, p. 93.

taining both roadbed and rolling stock at a higher standard than that obtaining during the administration of the *Companhia Federaes*.

ROLLING STOCK ¹¹

<i>Percentage increase</i>	<i>Company</i> 1910-1919	<i>State</i> 1919-1928
Locomotives	44	31
Passenger cars	26	43
Freight cars	82	24
Total mileage	36	11

(3) The operating ratio was lower during company operation than it has been during state operation. The operating ratio of the *Companhia Federaes* indicates that freight rates were probably too low to give the company enough money to maintain the line, and purchase the new material needed. The higher ratio of state operation does not indicate that the management of the state is inferior to that of the *Companhia Federaes*. For the state has been making heavy expenditures to bring the line and rolling stock back to normal repair. The presence of a net operating revenue for the year 1929, for the first time since 1926, indicates that perhaps the period of the heaviest expenditures has passed.

The *Companhia Federaes* should have received a raise in its rates and it is difficult to understand why it secured none. Its inability to get one was possibly in part caused by the lack of confidence of the people of the state in the management of the company. The contract between the state of Minas Geraes and the federal government called for a revision of rates.¹² This revision was made and shows its effect in the higher receipts per ton kilometer in 1925. There has been little change in the levels of passenger rates. In terms of gold prices, tariffs are lower under state admin-

¹¹ Appendix, p. 231, T. 54.

¹² *Rel. do Min. da Viação e Ob. Pub.*, 1924, Rio de Janeiro, 1928, p. 170.

istration than they were under the administration of the company.

FINANCIAL RESULTS OF OPERATION ¹⁵

	<i>Company</i> 1910-1919	<i>State</i> 1922-1928
Operating ratio	87	112
Receipts per ton kilometer (milreis)	0.131 (3.7 cents)	0.244 (3.05 cents)
Receipts per passenger (milreis)	0.053 (1.48 cents)	0.066 (0.83 cents)

The capital investment of the federal government in the *Rede Sul Mineira* was 121,315,766 milreis (\$31,542,000) in 1919.¹⁴ The payment made to the *Companhia Federaes* for the cancellation of the contract was 39,685,000 milreis (\$8,333,850).¹⁵ If interest is computed at 6 per cent, the added fixed charges to the federal government are 2,401,100 milreis per year. Fixed charges for the state of Minas Geraes in 1930 were 1,595,640 milreis (\$159,564), computing interest at 6 per cent.¹⁶ The figure for the federal government, however, does not represent the full amount of added fixed charges, for there was a marked depreciation in the gold value of the milreis between 1919 and 1922. Now the funds which the federal government had invested prior to the rescission in the *Rede Sul Mineira* probably all came from abroad, and the federal government must pay service charges on these loans in terms of gold. The proper method of estimating the added fixed charges would be to find out the years in which the federal government borrowed money from abroad for the *Rede Sul Mineira* and make the con-

¹⁵ The effects of the increase in rates granted in 1924 is shown by the fact that average receipts per ton kilometer were 0.193 milreis in 1923 and 0.237 milreis in 1925. For details, see Appendix, pp. 186-188, Ts. 1, 3, 4.

¹⁴ *Estatística, 1919*, Rio de Janeiro, 1920, p. 28.

¹⁶ *Supra*, p. 73. This was probably paid in paper milreis, but the text is not clear.

¹⁶ *Supra*, p. 93.

versions in terms of those years. Even if the complete information could be obtained, which is very doubtful, such an inquiry would be beyond the scope of this study. It may be stated, however, with a reasonable degree of certainty that, both in terms of paper milreis and gold prices, the costs to the public per unit of transportation are greater during the administration of the state than they were during the administration of the company. But the reservation should be made, that this higher cost is in part what may be called a deferred payment for maintenance of roadbed and rolling stock during the administration of the *Companhia Federaes*. The money should have been spent then, and what the public might have thought cheap transportation during the time of the company was in the long run costly.

(4) The so-called "tests" of efficiency seem to favor company operation as against state operation. The superiority of the company in each of these tests does not, however, necessarily mean that operation by the company was better than operation by the state. As it had no funds with which to buy new rolling stock, and as there was a complete breakdown in 1919, the company was probably using existing material beyond a reasonable limit before taking it out of service for repair. Also there were larger locomotives during the time of the state's operation, and hence it is to be expected that fuel costs per locomotive kilometer should be higher. Furthermore, the relative proportions of coal and the cheaper fuel, wood, are not known. There is not sufficient evidence on which to base any conclusion as to the comparative technical operating efficiency of company and state management.

TESTS OF EFFICIENCY¹⁷

	<i>Company</i> 1910-1919	<i>State</i> 1923-1928
Car kilometers per car day	25.8	23.1
Net ton kilometers per car day	222.9	185.5
Locomotive kilometers per locomotive day..	72.9	66.6
Fuel cost (milreis) per 1,000 locomotive kilometers ¹⁸	390.6 (\$111)	1,250.0 (\$153)

There appears to be no appreciable difference in safety of travel under company and state operation.

SAFETY OF OPERATION¹⁹

	<i>Company</i> 1910-1919	<i>State</i> 1922-1928
Number of deaths per million ton kilometers	0.386	0.373

¹⁷ Appendix, p. 188, T. 5. These comparisons were suggested by the tests of efficiency employed by Dr. Julius Parmelee, in estimating the efficiency of American railways, and by Dr. Charles Morgan, economist, Interstate Commerce Commission. See *A Review of Railway Operations in 1930*, Bureau of Railway Economics, Special Series No. 57, Washington, 1931, p. 20.

The director of the *Rede Sul Mineira* for 1926-1930, Dr. Pinedo, is one of the ablest railway executives in Brazil. He was formerly superintendent of the *Companhia Mogyana*, which is one of the most efficiently managed private companies. The records of other directors, either of the *Companhia Federaes* or of the state of Minas Geraes, are not known to the writer.

¹⁸ It is not possible to get the tractive power of each locomotive during the period of the company, for the *Estatistica* at that period did not give complete figures.

¹⁹ Appendix, p. 186, T. 1. It is true that the number of accidents reported and the number of injured reported is greater during the administration of the state than during the administration of the company. But this may be due to greater care by the state in reporting accidents. The greater number of injured may be due to the fact that minor injuries, which formerly were not reported, are not included. Furthermore, the increase in the weight of rolling stock and the increased average speed of trains would give more liability to accidents.

The number of accidents is declining, particularly when figures for 1929 and 1930 are included. The total number of accidents reported from 1924 to 1930 are as follows: 1924, 1,106; 1925, 866; 1926, 1,162; 1927, 795; 1928, 419; 1929, 538; 1930, 504. The last information was obtained from the *Rede Sul Mineira* through the courtesy of Dr. Lima e Silva, Brazilian Ambassador to the United States.

The number of employees per kilometer of line increased 14 per cent from 1910 to 1928. At the same time freight traffic density increased 43 per cent. This shows that the state of Minas Geraes has not yet yielded to the temptation to reward political service by the creation of unnecessary positions on the *Rede Sul Mineira*.²⁰

The opinion of people acquainted with the line under both private and state administration is that adequacy, comfort and speed of service has improved under state administration.²¹ The conclusion is that the people using the *Rede Sul Mineira* have received and are receiving better service during the operation of the state than they received during the operation of the *Companhia Federaes*. This improved service is costing more money. If one thinks that it is wise for government to provide railway service in advance of traffic, he will probably conclude that the higher cost is justified by the improved service. The alternative in 1919, to subsidizing operation, either by federal government or state government funds, or both, was abandonment of the line. The rate policy followed by the federal government during the time of the company was in part responsible for the stern alternative of 1919. The people of Minas Geraes, however, apparently concurred in the policy of not granting the company an increase in rates. The ability of the traffic on the *Rede Sul Mineira* to stand the transport taxes imposed since the state took over the line, would indicate that the traffic could probably have supported higher charges during the administration of the company. But, even with higher tariffs, it remains a question whether the company could have survived the difficulties caused by the World War.

²⁰ *Estatística*, 1910, p. 140; 1919, p. 85; 1928, pp. 375-76.

²¹ The writer had an extended conversation with an American agricultural expert living on the line during the time of both company and state administration. His judgment was that standards of service have improved under state administration, as compared with the former administration. In going over the line, the writer found no individual who disagreed with that verdict.

CHAPTER VI

THE *Estrada de Ferro Sorocabana* UNDER PRIVATE AND PUBLIC OPERATION

1910-1919, 1920-1930

THIS road, it will be recalled, was operated by a private company from 1907 to 1919; from 1919 to the present time it has been operated by the state of São Paulo. The same method of treatment will be followed with the *Sorocabana* as was followed with the *Rede Sul Mineira*. (1) Traffic-density figures showed marked increases during both periods. Probably the new construction, which is reflected in the traffic-density figures for 1910-1919, should have shown a more rapid increase than the mixed old and new, which is included in the figures for 1922-1928. The chief evidence for this is the condition of rolling stock and roadbed at the time the state took the road over in 1919. The report of the secretary of agriculture of the state of São Paulo for 1920 indicates that there was a very considerable amount of freight delayed in shipment because of conditions on the *Sorocabana*.¹ The delayed freight was one of the chief reasons why the state brought about a rescission of the contract.

The most striking change in the types of commodities handled was the decline in the relative amounts of coffee carried during state operation as compared with that obtaining during company operation. Inasmuch as coffee is a product which can support a high freight rate, this was an

¹ *Relatorio da Secretaria da Agricultura do Estado de São Paulo anno de 1920*, São Paulo, 1921, pp. 67, 68.

important change. The relative importance of passenger receipts declined in the years of state operation as compared with company operation.

TRAFFIC CHANGES ²

	Company		State
	1910-1919		1923-1928
Yearly percentage of increase in freight-traffic density	31		28
Percentage of total receipts from freight service ..	58		59
Percentage of total receipts from passenger service	24		19
	1910	1919	1928
Percentage of coffee	18	3	10

(2) The average number of kilometers of rails replaced per kilometer of line per year was less during company administration than during state operation. The effects of the World War and of the receivership of the parent company are more clearly seen in the reduced amount replaced for 1914-1919. The number of crossties replaced per kilometer of line per year during company control was also less than during state control.

The amount of crushed-rock ballast applied by the Sorocabana Railway Company, 1910-1919, on that portion of the line having central government guarantees of interest, was insignificant. The average number of kilometers of ballast applied per year by the state was 52. Even if the amount of ballast laid in the period 1910-1919 on the part of the line not included in the figures given in *Estatística*, was four or five times as much as that laid on the part included, it would not modify the conclusion that more rock ballast was laid during state administration than during company control.

² Appendix, p. 189, T. 6; p. 210, T. 32; p. 233, Ts. 57, 58. *Estatística*, 1910, p. 96; 1919, p. 144; 1928, p. 270. The figures for the company operation include only that part of the line which had a government guarantee of interest. It is probable, however, that conditions on all parts of the line were similar.

MAINTENANCE OF PERMANENT WAY³

	<i>Company</i> 1910-1919	<i>State</i> 1923-1928
Number of kilometers of rails replaced per kilometer of line per year	0.029	0.033
<i>Idem</i> , 1914-1919	0.0099	
Number of crossties replaced per kilometer of line per year	139	216

The state of São Paulo has made considerable additions to rolling stock; the capacity of the units purchased has also been greater than those purchased during company operation. However, comparative figures for company and state purchases are not available. The state of São Paulo in 1924 voted the expenditure of 130,000,000 milreis (\$14,300,000) for the reconstruction of the line. The expenditures authorized under this appropriation, to 1926, were as follows:⁴

	<i>Milreis</i>
Double-tracking line, São Paulo-Santo Antonio . . .	48,413,716
New rolling stock and repairs	40,204,800
New shops	9,728,247
New passenger station, São Paulo	3,402,735
Replacing of rails	7,814,448
Other expenditures	14,776,597
	124,340,543

The expenditure made under this appropriation for the new shops did not complete the work. The new shops inaugurated in 1930 in Sorocaba are the most modern and complete shops in South America for the repair of the rolling stock of steam railways. The double tracking has involved

³ Replacement figures are from *Estatística*, 1910, no figures; 1911, pp. 204-5; 1912, pp. 204-5; 1913, pp. 160-61; 1914, pp. 166-67; 1915, pp. 166-67; 1916, pp. 220-21; 1917, pp. 153-54; 1918, pp. 152-53; 1919, pp. 224-25; 1923, pp. 310-11; 1924, pp. 338-39; 1925, pp. 358-59; 1926, pp. 366-67; 1927, pp. 364-65; 1928, pp. 386-87.

⁴ *Relatorio da Secretaria da Agricultura e Obras Publicas*, 1926, p. 255.

also a considerable amount of changing of the former right of way.⁶ As a result of this expenditure and other measures of the state, the *Sorocabana* has a better maintained right of way, and more adequate and better maintained rolling stock, than it had during the administration of the Sorocabana Railway Company.

(3) Complete figures are available for receipts and expenditures. The operating ratio has been higher during state operation than it was during company control. The most important single factor explaining the higher ratio of expenditures to receipts during the administration of the state is the heavy expenditures necessitated by the inadequate maintenance during the administration of the Sorocabana Railway Company. Milreis receipts per passenger kilometer and per ton kilometer are higher during the administration of the state than during the administration of the company; but on the basis of gold values, the reverse is true. Part of the difference in freight receipts, however, may be ascribed to the change in the relative percentages of coffee hauled. The lower percentage of coffee would naturally cause the average receipts per ton kilometer to go down.

FINANCIAL RESULTS OF OPERATION ⁶

	<i>Company</i>	<i>State</i>
	<i>1910-1919</i>	<i>1921-1929</i>
Operating ratio	58.9	73.5
Average annual receipts (milreis)	18,465,000	59,077,000
Average annual expenditures (milreis)	10,894,000	43,462,000
		<i>1922-1928</i>
Receipts per ton kilometer (milreis) .....	.0731 (2.07 cents)	.10077 (1.259 cents)
Receipts per passenger kilometer (milreis) .....	.0385 (1.09 ")	.0429 (0.53 ")

⁶ *Relatorio do Secretario da Agricultura do Estado de São Paulo anno de 1924*, São Paulo, 1925, p. 182.

⁶ For details, see Appendix, p. 189, T. 6; p. 212, T. 34; p. 206, T. 28 and p. 201, T. 23.

The amount of added fixed charges resulting from the state's administration of the *Sorocabana* is difficult to determine, because of the absence of an annual profit and loss statement showing the disposition of the annual net operating revenue. It is possible, though by no means certain, that the sum of 130,000,000 milreis already mentioned might be all that may be charged as additions to fixed charges. Part of the net operating income has gone to pay interest and amortization charges on the sterling loan of 3,800,000 pounds, which represented the purchase price of the road when the state took it over in 1905. Furthermore, service charges had to be paid on the amount of 44,010,156 milreis invested in new construction by the state of São Paulo prior to the rescission of the contract. As part of this sum was probably borrowed from abroad, milreis service charges to meet gold payments are higher because of the marked decline in exchange. Furthermore, there remain fixed charges on the amount of 48,694,982 milreis paid by the state of São Paulo to the Sorocabana Railway Company for the rescission of the contract. The records of the state show capital expenditures for the reconstruction and repair of the line to have been 234,551,325 milreis up to the end of 1929.[†]

Let it be assumed that it has taken all the net operating income of the *Sorocabana*, since the state took it over, to take care of service charges on the sterling loan, the sum invested in new construction prior to the rescission of the contract, and the payments on account of the rescission of the contract of the Sorocabana Railway Company. Then the added fixed charges to be charged to state administration will be interest on 234,551,325 milreis. At 6 per cent this amounts to 14,073,060 milreis per year. As freight receipts were 62.6 per cent of total receipts in 1928, let it be

[†] Detailed items of capital expenditures will be found on pp. 191-192 of the Appendix, T. 9 and T. 10.

further assumed, for the purpose of illustration, that 62.6 per cent of these added fixed charges can be allocated to freight costs to the public. This amounts to 8,809,698 milreis. The *Sorocabana* hauled 528,920,111 ton kilometers of freight in 1928. The added cost to the public for fixed charges would therefore be 8,809,698 divided by 528,920,111, or 0.017 milreis (0.204 cents). On this basis gold costs per ton kilometer were only slightly more in 1928 than they were in 1919; milreis costs, however, were much greater.

COMPARATIVE COSTS TO THE PUBLIC^a

	Milreis		Cents	
	Company 1919	State 1928	Company 1919	State 1928
Receipts per ton kilometer	0.056	0.107		
Amount of added fixed charges allocated to each ton kilometer.	.....	0.017		
Totals	0.056	0.124	1.456	1.488

But there is another variable factor which must be considered. For traffic density has been increasing steadily since 1919. Therefore operating costs per unit of traffic should be lower. But how much lower should they be? This is not susceptible of measurement. It is likewise not possible to measure the proportion of the added capital expenditure, which really represents a payment for deferred maintenance, which should have been made by the company. In assuming that all the new capital investment of 234,551,-

^a *Estatística*, 1928, p. 369. Number of ton kilometers, *ibid.*, p. 283. Interest computed at 6 per cent.

325 milreis is to be charged to the state's operation, the maximum charge has probably been made.⁹

(4) The tests of efficiency are inconclusive. There was a complete breakdown in service in the last year of operation by the company, and it may therefore be concluded that the company was using its equipment too long before taking it out of service for repair. The locomotives in use during the period of operation by the state average higher in weight than those in use during the time of the company; hence the larger costs per locomotive kilometer do not mean lower efficiency.

TESTS OF EFFICIENCY¹⁰

	<i>Company</i> 1910-1919	<i>State</i> 1923-1928
Car kilometers per car day	31.0	42.0
Net ton kilometers per car day	461	388
Locomotive kilometers per locomotive day..	219	138
Fuel costs per 1000 locomotive kilometers in milreis	372 (\$105)	1,222 (\$152)

Travel has probably been safer under the administration of the state than during the period of the company. The work of reconstructing and rebuilding the line has taken time. The improvement in the last four years is shown by the decline in the number of accidents per million train kilo-

⁹ Net operating revenue, for example, in 1928 apparently was ample to take care of the service on the sterling loan, the expenditure prior to rescission, and the sum for rescission. Interest on the sterling loan at 6 per cent, the construction prior to rescission converted *at the average rate 1910-1919* and computed at 6 per cent, and the rescission of the contract computed at 6 per cent and converted at the 1928 rate of exchange total, \$2,189,200 in United States money. On the other hand, the net operating revenue for 1928, computed at the 1928 exchange, is \$3,155,400 in United States money.

¹⁰ Unfortunately there are no detailed figures to show the differences in weight, because the *Estatística*, prior to 1923, does not give the average weight of locomotives. Appendix, p. 192, T. 11; p. 219, T. 40; p. 220, T. 41; p. 221, T. 42 and p. 222, T. 44.

meters. In 1927 there were 193 accidents per million train kilometers; in 1928, 153; in 1929, 149; and in 1930, 95.

SAFETY OF SERVICE ¹¹

	<i>Company</i>	<i>State</i>
	<i>1910-1919</i>	<i>1922-1928</i>
Deaths per million ton kilometers	0.047	0.053

The percentage of increase in the number of employees per kilometer of line has been much less than the increase in freight traffic density. We may conclude that, as yet, the state of São Paulo has not yielded to political pressure to create unnecessary positions on the *Sorocabana*.

NUMBER OF EMPLOYEES ¹²

	<i>Company</i>	<i>State</i>	<i>Percentage</i>
	<i>1910</i>	<i>1919</i>	<i>increase</i>
Employees per kilometer of line	1.30	5.14	295
Traffic density			906

The testimony of those living on the line is to the effect that service is more adequate, more comfortable and more rapid now than it was during the administration of the Sorocabana Railway Company. The public is getting better service now than it got during the time of the company. This improved service is costing more per unit of traffic, when measured in paper milreis. When measured in gold

¹¹ Although Brazilian figures give details of accidents, including the number of injured, the number of deaths has been taken as the most reliable index. There is great room for differences of opinion in reporting injuries. Furthermore, there may be considerable difference in the fullness of total accident figures. The superiority of the showing of the state is further borne out by the continued decrease in the number of accidents in 1929 and 1930. For example, the total number of accidents of all types in 1928 was 1,409; in 1929, 1,384; in 1930, 767. The 1929 and 1930 figures were supplied by the director of the *E. F. Sorocabana*, by courtesy of the Brazilian Ambassador to the United States. For details, see pp. 189, 215 of Appendix, Ts. 6, 36.

¹² *Estatística*, 1910, p. 80; 1919, p. 120; 1928, p. 374.

prices, total costs are probably slightly higher now than they were during the administration of the company. In this comparative showing, the administration of the state has been aided by two factors for which it is not responsible: first, the difficult war conditions, which made the purchase of new equipment difficult for the company; second, the marked increase in traffic density which has made possible a lower operating cost per unit of traffic.

CHAPTER VII

THE *Viação Ferrea do Rio Grande de Sul* UNDER PRIVATE AND PUBLIC OPERATION

1910-1919, 1920-1930

(1) The same method of treatment will be followed as was used with the two preceding roads. Freight traffic density increased more rapidly during company administration than it did during the administration of the state. As the most marked increase was in the war years, 1917 and 1918, it may be concluded that the stimulation of Brazilian exports by war conditions was probably the most important single factor causing the greater increase during the first period. The trend in kinds of freight commodities was towards a smaller percentage of high value per unit of weight or bulk. The change was not a marked one, however, and comparison is difficult because of the large percentage of unclassified products. The relative importance of passenger receipts in total receipts of the line declined during state administration as compared with company operation.

TRAFFIC CHANGES ¹

	<i>Company</i> 1910-1919	<i>State</i> 1922-1928
Ton kilometers per kilometer of line per year.....	75,423	126,800
Per cent increase per year	13.0	7.6
Percentage total receipts freight	58.3	61.8

(2) The maintenance of the roadbed declined during the

¹ Appendix, p. 195, T. 16; p. 210, T. 32; p. 194, T. 14.

period of operation by the *Compagnie Auxiliaire*, and during operation by the state it has gradually been brought back to normal. More rails and cross-ties have been replaced per year during state operation than were replaced during company operation. Available figures show that more ballast has been laid during the time of state operation than during company control. The federal government inspector in 1928 declared the condition of the line satisfactory.

MAINTENANCE OF PERMANENT WAY ²

	<i>Company</i> 1910-1919	<i>State</i> 1923-1928
Kilometers rails replaced per kilometer of line per year	0.023	0.063
Cross-ties replaced per kilometer of line per year ...	74	166
Kilometers ballast laid per year	1.5	25

The state has spent in its capital investment for the improvement of the system, considerable sums in straightening the line. The last itemization available of capital account expenditures shows that up to 1925, 10,303,558 milreis (\$1,236,426) had been spent for this purpose.³ The two outstanding deficiencies in the equipment and roadbed of the *Viação Ferrea do Rio Grande do Sul* are: first, its lack of adequate shops for the repair of locomotives and rolling stock; and second, bridges heavy enough to support heavier and more efficient locomotives.⁴

The state of repair of this rolling stock, while not up to the standard desired, is superior to that obtaining during the last

² Appendix, p. 190, T. 8 for bibliography; and *Relatorio do Inspector Federal Das Estradas de Ferro, 1928*, Rio de Janeiro, 1929, p. 280.

³ *Relatorio do Director da Viação Ferrea do Rio Grande do Sul, 1925*, Porto Alegre, 1926, p. 21.

⁴ *Relatorio do Director da Viação Ferrea do Rio Grande do Sul, 1927*, Porto Alegre, 1928, p. 49. *Ibid.*, 1928. Report of C. R. Nasmith, American Consul in Porto Alegre, No. 877, June 6, 1930, p. 7. Appendix, p. 231, T. 54.

years of the administration of the *Auxiliaire*.⁵ Satisfactory maintenance of rolling stock will probably not be obtained until the new shops planned for are built and equipped. However, at the present time the maintenance of the rolling stock of the *Viação Ferrea* is superior to that of its privately-operated neighbor to the north, the *Estrada de Ferro São Paulo Rio Grande*.

(3) Operating ratios were lower during company operation than they have been during state control. Apart from other evidence, this financial showing does not necessarily mean that the management by the *Compagnie Auxiliaire* was superior to that of the state. For what happened was that capital was diminished in the form of inadequate maintenance and replacement, which capital the state has been replacing. In terms of paper milreis, both freight and passenger charges have been higher during state operation than they were during company operation; in terms of gold equivalents, they have both been lower.

FINANCIAL RESULTS OF OPERATION ⁶

	<i>Company</i> 1910-1919	<i>State</i> 1922-1928
Operating ratio (1920-1929)	80	104
Receipts per ton kilometer (milreis).....	0.0579 (\$1.64)	0.116 (\$1.42)
Receipts per passenger kilometer (milreis)	0.0554 (\$1.56)	0.0630 (\$0.78)

The federal government received as rent, however, 6.8 per cent of total receipts from 1910 to 1919, amounting to 10,228,628 milreis. When total costs to the public, therefore, are being considered, this sum must be deducted. As receipts were practically equal to expenditures during the period of 1920-29, no corresponding offset exists for the period of state operation.

⁵ *Relatorio do Director da Viação Ferrea do Rio Grande do Sul, 1927, Porto Alegre, 1928, p. 49.*

⁶ For details, see Appendix, p. 195, T. 16.

The question of capital investment during the period of the *Compagnie Auxiliaire* is a difficult one to unravel. The 1912 *Estatistica*, which is the only source which gives the investment of the federal government for this period, has the figure of 45,202,000 milreis for the investment of the federal government. The recognized capital of the *Compagnie Auxiliaire* is put at 40,242,000 milreis (\$12,800,000). However, the total cost of the system for the same year is given as 201,836,000 milreis. It is difficult to say in just what this discrepancy consisted. Probably it was the difference between the capital of the *Compagnie Auxiliaire*, as approved by the central government, and the total capital investment claimed by the *Auxiliaire*. The total cost of the system is set forth as 217,187,000 milreis, and the capital of the *Auxiliaire* put at 88,001,000 milreis. Here again the difference of 13,984,000 milreis between the total given and the total of central government investment and approved capital of the company, in the absence of other evidence, must be ascribed to capital investment claimed by the *Compagnie Auxiliaire*, but not approved by the central government.

The amount of investment of the federal government in 1923, not counting the 84,391,535 milreis paid the *Compagnie Auxiliaire* for the rescission of the contract, is given as 68,774,976 milreis. The record does not make clear in what year these additional expenditures made by the federal government, as compared with 1912, were made. At any rate, for the years following 1922, down to 1928, the capital investment indicated for the federal government remains at the total of 68,774,976 milreis, plus the sum paid for rescission, 84,391,535; making a total of 153,166,501 milreis.⁷

⁷ The 1922 *Estatistica* lists an expenditure by "companies" of 75,554,840 milreis. It is not possible to say, on the basis of records available, what this item is. It is possible that the government is saying that it recognized this amount as spent by the *Compagnie Auxiliaire*, and

At any rate it is fairly clear that the minimum increased capital investment of the federal government as the result of the change in operation from the *Compagnie Auxiliaire* to the state of Rio Grande do Sul was 84,391,000 milreis. This was the sum paid to the *Compagnie Auxiliaire* for the cancellation of its contract. The capital investment of the state of Rio Grande do Sul increased from 36,849,000 milreis in 1923 to 89,149,000 milreis in 1928. Therefore the total certain added capital cost of the change is represented by the sum of the rescission payment of the federal government and the total investment of the state of Rio Grande do Sul namely, 173,540,535 milreis. At 6 per cent, the public has added fixed charges of 10,412,430 milreis (\$1,249,391). On this basis, costs per ton kilometer to the public were much higher in milreis, but only slightly higher in terms of gold values.

COMPARATIVE COSTS TO PUBLIC ^a

	Milreis		Cents	
	Company 1919	State 1928	Company 1919	State 1928
Receipts per ton kilometer	0.062	0.130		
Amount of added fixed charges allocated to each ton kilometer		0.017		
Total	0.062	0.147	1.61	1.76

that it was paying them 8,836,695 milreis indemnity for the rescission of the contract, 8,836,695 milreis being the difference between the amount paid in rescission and the item specified as spent by the "companies." *Estatística*, 1912, p. 7; 1922, p. 9; 1923, p. 293; 1928, p. 369.

^a Receipts per ton kilometer, Appendix, p. 195, T. 16; p. 206, T. 28. In 1928, 388,421 ton kilometers of freight were hauled and freight receipts were 63 per cent of the total income. Sixty-three per cent of the added fixed charges, divided by the total number of ton kilometers, gives 0.017 milreis added fixed charges. Possibly 6.8 per cent of the 1919 figure should be subtracted because the state received that percentage of rent. But the percentage of added expenditures by the state made necessary by the inadequate maintenance of the company was probably much greater than 6.8 per cent.

However, by another line of analysis it may be argued that gold costs are lower during the administration of the state than during the time of the company. For the amount paid by the federal government for cancellation of the contract *was in reality a deferred payment for new construction and equipment*. This capital should have been charged to the federal government for the period of operation by the *Compagnie Auxiliaire*, as new construction was put into operation and equipment installed. And it may be assumed that at least 50 per cent of the capital outlay of the State of Rio Grande do Sul was made necessary by the inadequate maintenance of the *Compagnie Auxiliaire*. This analysis, if accepted, would reduce the new capital charges to be assigned to state operation by three-fourths. Accepted or rejected, it shows how difficult it is to prove that total gold costs per unit of traffic to the public are greater under state operation than they were under company operation.

(4) The tests of efficiency are inconclusive. The state was able to show more net ton kilometers of freight per car day because of the greater average carrying capacity of the cars during its administration. The higher cost per locomotive kilometer during state administration was caused by the greater average weight of the locomotives used during its administration.

TESTS OF EFFICIENCY⁹

	<i>Company</i> 1910-1919	<i>State</i> 1923-1928
Number of car kilometers per car day	46.80	37.00
Net ton kilometers per car day	385.10	418.80
Locomotive kilometers per locomotive day	66.00	95.00
Fuel costs (in dollars) per 1,000 locomotive kilometers	\$170.00	\$181.00

⁹ Appendix, p. 195, T. 15; p. 219, T. 40; p. 220, T. 41; p. 221, T. 42; p. 222, T. 44. The numbers of *Estatistica* prior to 1923 do not give average tractive power of locomotives.

Travel has probably been safer during the administration of the state than it was during the administration of the company. The number of employees per kilometer of line has declined despite a marked increase in traffic density.

SAFETY OF SERVICE AND NUMBER OF EMPLOYEES ¹⁰

	Company	State
	1910-1919	1922-1929
Deaths per million ton kilometers	0.092	0.061
	1919	1928
Employees per kilometer of line	4.62	4.52
Index freight traffic density	100	145

Conditions were very bad on the line during the administration of the company and improvement has necessarily been slow. As previously stated, the state has made large capital expenditures to bring the system back to normal. The report of the secretary of public works in 1924 stated that the worst was not yet over.¹¹ However, by 1925, the year the writer went over the system, conditions were definitely better. Dr. Getulio Vargas, in 1929 president of the state of Rio Grande do Sul, said, in his message to the legislature of the state in that year, that it "is beyond dispute that service on the *Viação Ferrea do Rio Grande do Sul* had been constantly improving."¹² Service is now more adequate, comfortable and rapid than it was during the administration of the company. The cost of this improved service in terms of gold values is probably not appreciably larger per unit of traffic than it was during the administration of the

¹⁰ Appendix, p. 195, T. 16; p. 215, T. 36; p. 224, T. 46; p. 195, T. 16; p. 210, T. 32. Number of employees, *Estatística*, 1910, p. 79; 1919, p. 97; 1928, p. 375.

¹¹ *Relatorio do Secretario das Obras Publicas, 15 Agosto, 1924*, Porto Alegre, p. 9.

¹² *Mensagem a Assembleia do representantes do Estado do Rio Grande do Sul na 1 sessão ordinario da 11 Legislatura*, Porto Alegre, 1929, p. 59.

company. It is indeed possible to make a good case for lower gold costs per unit of traffic during the control of the state.

As in the case of the *Sorocabana*, the state of Rio Grande do Sul has been aided in this showing by two factors for which it is not responsible: first, the war conditions prevailing during the latter part of the administration of the company made it exceedingly difficult to secure needed supplies; and second, the increased traffic density has made possible lower costs per unit of traffic.

PART III

CHAPTER VIII

COMPARISON BETWEEN THE *Companhia Mogyana de Estradas de Ferro* AND THE *Estrada de Ferro Sorocabana*

It is difficult to find roads in Brazil which are really comparable. Terrain and traffic, to say nothing of length, gauge, history, management, and capital, present such divergences that no two are in any large degree similar. Instead of seeking for two roads, the one privately operated and the other government operated, which are really alike, the effort has been to find roads which have the greatest number of points in common.¹

The first pair thus selected is the *Companhia Mogyana de Estradas de Ferro*, privately owned and operated; and the *Estrada de Ferro Sorocabana*, owned and operated by the state of São Paulo.² They both have the same gauge, one meter. Their length is practically the same, the *Mogyana* having 1,966 meters, and the *Sorocabana* 1,868 meters.³ The transportation of coffee is the principal single source of revenue of each.⁴ The operation of both is likewise in the

¹ For attempted pairings of Class I railways, see Appendix, p. 184.

² *Estatística*, 1928, p. 72.

³ *Estatística*, 1928, p. 17.

⁴ Receipts of the *Mogyana* from coffee were 13,708,706 milreis in 1929. Total revenue was 60,828,106 milreis, for both passenger and freight traffic. Freight receipts from all other classes of freight, excepting animals on foot and express, totaled 26,868,193 milreis.

The *Sorocabana* income from coffee for the same year was 12,455,240 milreis. Total revenue was 83,096,411 milreis. Total receipts from all

hands of Brazilians.⁵ If we except the *Mayrink-Santos* link of the *Sorocabana*, which is not yet in operation, the terrain of the two is similar.

The *Companhia Mogyana de Estradas de Ferro* was organized in *Campinas, Estado de São Paulo*, in 1872.⁶ From the beginning, operation has continued in the hands of this company. The *Sorocabana* has not had continuity of type of operation, but has changed its type of operation three times.⁷

The comparative study of these lines will be divided, as in the historical studies of changes of operation, into four parts. The first will take up traffic conditions, traffic density, percentages by weight of the different commodities carried, and percentages of total income received from the different kinds of traffic. The second will consider the nature of the physical plant which serves the public, including the relative percentages of grade, condition of roadbed, and condition and amount of rolling stock. The third will take up comparative costs to the public of transportation, both from the point of view of revenues paid and drafts on the public treasury. The fourth group of factors will embrace such things as the safety, adequacy, comfort and speed of service, the number of employees per unit of traffic, and the comparative treatment of labor.

(1) The most striking differences in traffic conditions

other merchandize hauled, excluding animals on foot, were 41,144,438 milreis.

Relatorio No. 77 da Directoria da Companhia Mogyana de Estradas de Ferro, Campinas, 1920, p. 10; Annexos ao Relatorio, No. 77, Table XII; Relatorio da Estrada de Ferro Sorocabana, 1928, São Paulo, 1930, pp. 8, 55. See also Appendix, p. 211, T. 33.

⁵ *Estatistica, 1928, pp. 124, 131.*

⁶ *Cincoenterario da Companhia Mogyana de Estradas de Ferro, 1872-1922, Campinas, Lynotypia da Casa Genoud, 1922, p. 5.*

⁷ *Supra, pp. 63 and 100.*

are the greatly superior traffic density of the *Sorocabana*, the larger part played by coffee in the freight traffic of the *Mogyana*, and the longer average haul on the *Sorocabana*. The longer average haul and superior traffic density of the *Sorocabana* probably more than counterbalance the greater percentage of coffee in the total freight hauled by the *Mogyana*.

TRAFFIC CONDITIONS ^a

1923-1928

	<i>Mogyana</i>	<i>Sorocabana</i>
Ton kilometers per kilometer of line per year	100,380	206,768
Passenger kilometers per kilometer of line per year	89,240	135,129
Coffee's percentage of total ton kilometers	21.4	11.0
Average number kilometers, each ton hauled	119	225
Average number kilometers, each passenger hauled.	46	82
Percentage total income from passenger service	21	19
Percentage total income from freight service	64	59

(2) The terrain of the *Sorocabana* is less difficult than that of the *Mogyana*. Topographical maps of the two roads are not available. The standard deviations of the altitudes of the stations were, therefore, selected as fair samples of the terrain of both systems. The writer has been over the main divisions of both systems and the standard deviations of the stations are adequate samples. Short radius curves are also more numerous on the *Mogyana*.

The former operator of the *Sorocabana*, the Sorocabana Railway Company, failed to complete the work of ballasting the line and replaced an inadequate number of rails and cross-ties.^b The *Sorocabana* has, therefore, been obliged to replace a larger number per kilometer than the *Mogyana*; and this superior showing does not mean that the *Sorocabana* is maintaining its lines better than the *Mogyana*. The state has had to do more work to make up for the deficiencies of

^a Appendix, p. 210, T. 32; p. 205, T. 27; p. 211, T. 33; p. 235, T. 60 and p. 232, T. 56.

^b *Supra*, p. 102.

the previous maintenance of the line. Furthermore, the heavier traffic on the Sorocabana makes it necessary to replace material more rapidly.

TERRAIN, ROLLING STOCK, AND ROADBED¹⁰

	1923-1928	
	<i>Mogyana</i>	<i>Sorocabana</i>
Standard deviation of altitudes of stations (201 stations on <i>Mogyana</i> and 208 on <i>Sorocabana</i>)	140 meters	112 meters
Kilometers rock ballast laid per year	5	61
Kilometers of rails replaced per year	36	65
Ties replaced per kilometer of line per year	175	197

As to rolling stock, each road possesses enough tractive capacity and freight cars to take care of its needs. Possibly the passenger equipment of the *Mogyana* is *more adequate*, though the writer saw little evidence of overcrowding on the *Sorocabana* when going over its lines. If overcrowding exists, it is on the suburban traffic to and from the city of São Paulo. The new shops of the *Sorocabana* were inaugurated in 1930; hence the effects of superior repair facilities do not appear in any of the statistics given below. The management of the *Mogyana* has worked out an excellent system for removing from traffic rolling stock needing repairs. Its machinery for repair, however, is less modern than that of the *Sorocabana*.

ROLLING STOCK¹¹

	1928	
	<i>Mogyana</i>	<i>Sorocabana</i>
Number of locomotives	185	256
Average tractive power	7,922	11,280
Number of passenger cars	224	235
Number of seats for passengers	8,708	10,629
Number of freight cars	2,915	3,688
Total capacity in millions of tons	47	92
Ratio tons carried to total capacity	55	53
Percentage of utilization of passenger capacity	42	47

¹⁰ Altitudes of stations, *Estatística*, 1928, pp. 123-37. For detailed annual figures, see Appendix, p. 230, T. 52.

¹¹ The ratio of tons carried to total capacity is the average number of

(3) There is little difference in the operating ratios of the two systems, and the lower ratio of the *Mogyana* may be explained on the ground of the added expenditures on the *Sorocabana* made necessary by the inadequate maintenance of the former operator of the system, the Sorocabana Railway Company. Average receipts per passenger kilometer were greater on the *Mogyana* for the period 1923-1928, and rates for 1930 per passenger kilometer were likewise higher. The difference in 1930 is more marked in the base rates for the longer distances.

FINANCIAL RESULTS OF OPERATION ¹²

1920-1929

	<i>Mogyana</i>	<i>Sorocabana</i>
Average annual receipts (in thousands of milreis) ..	48,023	56,615
Average annual expenditures " " ..	31,774	41,119
Average annual operating ratio	67	73

PASSENGER RATES

(in milreis)

	<i>Mogyana</i>	<i>Sorocabana</i>
Average annual receipts per passenger kilometer,		
Average annual receipts per passenger kilometers,		
1923-1928 .....	.065	.046
1930 base rate for 100 kilometers or less	13.5	12.3
1930 base rate for 300 to 200 kilometers	29.2	26.9
1930 base rate for 600 to 500 kilometers	49.3	35.8

Freight rates also have been higher on the *Mogyana*. The average annual receipts per ton kilometer of freight for the period 1923-1928 was 0.190 milreis on the *Mogyana* and 0.107 milreis on the *Sorocabana*.¹³ There are 16 classifica-

tions hauled per car kilometer, times one hundred, divided by the total number of car kilometers, multiplied by the average capacity in tons per car. The detailed figures will be found in the Appendix, p. 231, T. 54; p. 223, T. 45; p. 232, T. 56 and p. 234, T. 59.

¹² For details and sources, see Appendix, p. 212, T. 34; p. 201, T. 23 and p. 204, T. 26.

¹³ For annual figures, see Appendix, p. 206, T. 28.

tions in the 1930 rate structure, which embrace 80 per cent of the total tonnage carried by both systems. Charges are higher on the *Mogyana* in 9 of these 16 classifications for distances of 100 kilometers or fractions thereof; higher in 13 of these 16 classifications for distances of 200-300 kilometers; and in all 16 classifications for distances of 500-600 kilometers.¹⁴

It has been estimated that for the year 1928 the total cost to the public of transporting a ton kilometer of freight on the *Sorocabana* was 0.124 milreis.¹⁵ This includes a liberal estimate for fixed charges not included in the amounts paid by shippers to the railroads. As the taxes paid by the *Mogyana* are relatively small, it may be assumed that the cost to the public of transporting a ton kilometer of freight over its lines is the average price paid by the public for this unit of transportation.¹⁶ This amount was 0.193 milreis, and therefore freight transportation is probably costing the public less on the *Sorocabana* than on the *Mogyana*. By the same analysis the total cost to the public in 1928 of transporting one passenger one kilometer over the *Sorocabana* was 0.056 milreis.¹⁷ Receipts per passenger kilometer on the *Mogyana* in 1928 were 0.069 milreis and therefore passenger transportation is costing the public less on the *Sorocabana* than on the *Mogyana*.

¹⁴ See Appendix, p. 209, T. 31.

¹⁵ *Supra*, p. 105.

¹⁶ The taxes paid by the *Mogyana* in 1929, including the amount paid for federal government supervision, was only 236,392 milreis. *Relatorio No. 77 da Companhia Mogyana de Estradas de Ferro, anno de 1929, Campinas, 1930, p. 19.*

¹⁷ *Supra*, p. 103 and p. 104. Passenger receipts were 22 per cent of total receipts in 1928. The total number of passenger kilometers was 304,642,449. Twenty-two per cent of 14,073,060, divided by 304,642,449, equals 0.010 milreis per passenger kilometer. Receipts per passenger kilometer were 0.046; hence the total costs to the public may be estimated as 0.056 milreis per passenger kilometer.

(4) The tests of efficiency appear to favor the *Sorocabana*, but they do not necessarily indicate that the management of the *Sorocabana* is more efficient than that of the *Mogyana*. The terrain is more difficult on the *Mogyana* and, therefore, trains cannot make the speed that they can safely make on the *Sorocabana*. The freight cars on the *Sorocabana* have greater average capacity and therefore it is to be expected that they carry more.¹⁸ Furthermore during this period the *Sorocabana* had been making more purchases of new equipment than had the *Mogyana*, and from this new equipment greater mileage could safely be obtained. Fuel costs per locomotive kilometer on the *Mogyana* are 98 per cent of the cost on the *Sorocabana* for the same distance. However, the average tractive capacity of locomotives on the *Mogyana* is only 70 per cent of the average tractive capacity of locomotives on the *Sorocabana*.¹⁹ The relative amount of wood burned by the *Mogyana* is probably the same as that of the *Sorocabana*. Hence it would seem that the *Sorocabana* is taking advantage of its easier terrain. A part, however, of this superior showing of the *Sorocabana* may be due to its use of more modern locomotives, machines which possibly make more economical use of fuel.

EFFICIENCY TESTS²⁰

1923-1928

	<i>Mogyana</i>	<i>Sorocabana</i>
Freight car kilometers per car day	27.0	42.6
Net ton kilometers per car day	228.6	388.0
Locomotive kilometers per locomotive day	113.0	138.0

¹⁸ The average capacity of each car on the *Mogyana* was 15,000 tons in 1928, that of the *Sorocabana* for the same period, 25,000 tons. Appendix, p. 231, T. 54.

¹⁹ Fuel costs per locomotive kilometer on the *Mogyana*, 1923-1928, were 1.207 milreis, and on the *Sorocabana*, 1.222 milreis. The average tractive capacity of locomotives on the *Mogyana* was 7,922 tons in 1928, compared with 11,280 tons on the *Sorocabana*. See Appendix, pp. 222-223, T. 44 and T. 45.

²⁰ Appendix, p. 219, T. 40; p. 220, T. 41 and p. 221, T. 42.

Travel has been safer on the *Mogyana* than on the *Sorocabana*. It will be recalled, however, that during this period the *Sorocabana* has been engaged in the work of reconstructing its lines. Furthermore, as this work has neared completion, the number of accidents has shown a tendency to decline.

ACCIDENTS ²¹

1923-1928

	<i>Mogyana</i>	<i>Sorocabana</i>
Number of deaths per million ton kilometers	0.069	0.053
Number of deaths per million passenger kilometers	0.067	0.074

The number of employees per unit of both freight and passenger traffic is greater on the *Mogyana* than on the *Sorocabana*. The *Sorocabana*, however, with its greater traffic density should have fewer employees per unit of traffic. The figures given below show that the *Sorocabana* is not appreciably overstaffed; that is, if it be assumed that the *Mogyana* is not overstaffed. The thoroughgoing reconstruction in process on the *Sorocabana* would likewise require a larger number of employees.

NUMBER OF EMPLOYEES ²²

1928

	<i>Mogyana</i>	<i>Sorocabana</i>
Number per kilometer of line	3.20	5.14
Number per 25,000 ton kilometers	0.66	0.45
Number per 25,000 passenger kilometers	0.94	0.81

It is not possible to say which line pays higher wages.²³

²¹ Unfortunately, however, the number of deaths for 1929 and 1930 are not available. See *supra*, p. 107 and Appendix, pp. 215-216, T. 36 and T. 37.

²² These figures from *Estatística*, 1928, pp. 327, 375.

²³ Average annual wages paid for 1929 on the *Mogyana* were 3,196 milreis and on the *Sorocabana* 3,206 milreis. A five-year average for the *Mogyana* from 1923-1929, excepting the years 1924 and 1928 for which figures are not available, is 2,797 milreis; and for the *Sorocabana* from

However there is a factor at work in Brazil tending to equalize labor conditions. All railroads, whether government or privately operated, are subject to the same pension, accident and employment laws. Each road has its own pension and retirement fund, which is under the supervision of the *Conselho Nacional do Trabalho*, the administrative and judicial body of the federal government charged with the supervision and enforcement of the national railway employees law.²⁴ The pension and retirement fund is constituted as follows: monthly contribution by employees of 3 per cent of their wages, annual contribution by the railroad of a sum equal to 1½ per cent of its gross income, and a 2 per cent increase in the tariffs in force on the line.²⁵ This law sets forth in detail the grounds upon which an employee may be discharged,²⁶ as well as the amount of compensation for accidents, and payments to be made during illnesses of the employee.²⁷ This law makes equal the working hours of all railway employees in the nation.

1924 to 1928 it is 2,636 milreis. In view of the fact that the figures for the *Mogyana* may possibly include more of the higher-paid executives, this would tend to lower slightly the general average. For example, the 1928 figures for the *Mogyana* record one employee receiving a yearly salary above 60,000 milreis per year and 10 employees with salaries above 36,000 milreis per year, while the *Sorocabana* lists none in these classes.

No reliable cost of living indexes exist in Brazil. The terminal of the *Sorocabana* is in the city of São Paulo where unquestionably the cost of living is greater than in the terminal city of the *Mogyana*, Campinas. However, the *Mogyana* has one other large city, namely Riberão Preto, with cost of living greater than any city passed by the *Sorocabana* with the exception of São Paulo. For further details, see Appendix, p. 228, T. 50.

²⁴ Decreto No. 17,941 de 11 de Outubro de 1927, *Regulamento das Coisas de Aposentadoria e Pensões dos Ferroviários*, *Imprensa Nacional*, Rio de Janeiro, 1927, pp. 5 and 23.

²⁵ *Ibid.*, p. 5.

²⁶ *Ibid.*, p. 23-27.

²⁷ *Ibid.*, pp. 8-11.

Other services rendered by the two roads include the free transport of immigrants, their equipment and animals. In this respect there is no difference between the roads.²⁸

Discussion of the extension of the *Sorocabana* from Mayrink down the Coastal Mountain Range to Santos will be given later.²⁹

The *Sorocabana* has longer average hauls, greater traffic density, and easier terrain than the *Mogyana*. It should be expected, therefore, to produce transportation at a lower cost per unit than the *Mogyana*. If the analysis given above is correct, it is producing transportation at a lower cost per unit. It may then be asked, is this difference proportionate to the more advantageous operating conditions of the *Sorocabana*? This would be a difficult question to answer even if the *Sorocabana*, like the *Mogyana*, had had one type of operation from the beginning. There are two reasons, apart from the weighting of traffic and operating conditions, why no satisfactory answer can be given to this question. The first is the short period of time for which complete figures are available for the *Sorocabana*, namely, 1923-1928. The second and more important reason is the reconstruction process which has been under way on the *Sorocabana* for this period. As has already been shown, the state took over the operation of a badly run-down line. So much effort and money have been given to this rebuilding process that precise answers cannot be given to questions of comparative efficiency.

²⁸ *Estatística*, 1928, pp. 260-61.

²⁹ Up to 1930, 92,973,000 milreis had been expended by the state for this extension, which is not yet complete. It is not certain, at this writing, whether the state with its present liabilities will be able to complete construction. There are those who say that the extension will never pay, because of the better operating conditions of the British line. This would seem, however, to be a question which can be settled only by the actual operation of the extension now in process of construction. *Infra*, pp. 168.

The *Mogyana* undoubtedly possesses an advantage in its greater continuity of operating policies. Whether this will be offset, for example, by the more modern shop equipment and rolling stock of the *Sorocabana* is a matter which time alone can decide.⁸⁰ The only conclusion that the data seem to justify is a negative one, namely, that pending a further period of trial the *Sorocabana*, compared both with the preceding management of its own lines by the Sorocabana Railway Company and with the *Mogyana*, may not be singled out as an example of the inefficiency of government operation.

⁸⁰ If political conditions in the state were such that the same management were in control for a long period of time, it is possible, of course, that a notable record of efficiency might be made on the *Sorocabana*. The Director of the *Sorocabana* since 1926, Doctor Gaspar Ricardo, is probably one of the most progressive railway-operating officials in Brazil. The secretary of public works in the new state government which came into power with the Revolution of October, 1930, is Doctor Francisco Monlevade, a railway executive with a distinguished record as the superintendent of the standard railway of Brazil, the privately-operated *Paulista*. Under his administration, Doctor Ricardo has been retained as director of the *Sorocabana*.

CHAPTER IX

A COMPARISON BETWEEN THE *Estrada de Ferro Central do Brazil* AND THE *Companhia Paulista de Estradas de Ferro*

THE most important government-owned and operated railway in Brazil is the *Estrada de Ferro Central do Brazil*. This road connects the capital of the republic with the capitals of the two most important states, namely São Paulo and Minas Geraes. The most important railway in Brazil owned and operated by private Brazilian capital is the *Companhia Paulista de Estradas de Ferro*. In the first place, they are comparable because they are both owned and operated by Brazilians. In the second place, they are comparable because they have both wide and narrow-gauge lines. In 1929 the *Estrada de Ferro Central do Brazil* had a total mileage of 2,901 kilometers, of which 1,239 is of one meter 60 centimeters gauge and 1,662 narrow gauge, one meter. (In Brazil, however, the narrow gauge is known as the standard gauge.¹ The Paulista, in 1928, had a total mileage of 1,497 kilometers, of which 705 kilometers are wide gauge and 729 kilometers narrow gauge.²

In addition to the difference in size which the above figures show, the roads cover terrain of a different character. Comparatively speaking, the lines of the *Paulista* traverse a level area. The altitude of its highest station is 938 meters, and its lowest, 422 meters. On the other hand, the altitude of the highest station of the *Central* is 1,939 meters and its low-

¹ *Estatística*, 1928, p. 20.

² *Ibid.*, p. 30.

Central receives a larger percentage of its revenue from passenger service than does the *Paulista*, while the *Paulista* gets a bigger percentage of total income from freight service than does the *Central*. A much higher percentage of total freight is in the form of coffee on the *Paulista*.

TRAFFIC CONDITIONS ⁸

1923-1928

	<i>Central</i>	<i>Paulista</i>
Ton kilometers per kilometer of line per year	350,000	277,000
Average kilometers travelled by each ton	273	188
Passenger kilometers per kilometer of line per year . .	189,000	213,000
Coffee's percentage of total tons hauled	1.8	33
Percentage total receipts from freight traffic	50.7	65.8
Percentage total receipts from passenger traffic	32	18

(2) As has already been stated, the *Central* operates under terrain conditions very much more difficult than the *Paulista*. The effect of this on operating costs is, however, difficult to express in percentage form. It makes especially significant the absence of electrification on the sections of the *Central* which have the greatest density of traffic. Sixty per cent of the main line of the *Paulista*, in the sections over which the densest traffic passes, is electrified.⁹ In 1922 a bond issue of \$25,000,000 was floated in New York for the electrification of the *Central do Brazil* and "other purposes."¹⁰ Plans

⁸ Appendix, p. 210, T. 32; p. 205, T. 27; p. 211, T. 33 and p. 198, T. 20. No figures for suburban traffic are included in the above passenger traffic figures. The *Paulista* has no suburban traffic, while the *Central*, for the period 1924-1928, handled an average of over 63,000,000 passenger kilometers per kilometer of line per year in its suburban zones.

⁹ In 1930 the line of the *Paulista* was electrified to Rincao, 285 kilometers from the beginning of the main line at Jundiaby, *Estatística*, 1927, p. 108.

¹⁰ *Moody's Governments and Municipals*, 1922, Moody's Investors Service, New York, p. 32. Moody's, however, says nothing of the "other purposes." A confidential source, which I believe to be reliable, informed me that it was in the original contract.

were made and bids submitted for electrification of the *Central* from Rio de Janeiro to Barra da Pirahy, junction point of the São Paulo division of the *Central* and 108 kilometers from Rio de Janeiro.¹¹ Traffic is heaviest on this section. The line makes a practically continuous ascent from sea level at Rio de Janeiro to Barra da Pirahy, 357 meters above sea level.

The *Paulista* estimates that the saving in fuel costs due to electrification is equal to 18.9 per cent interest on the capital employed in electrification.¹² It is probable that the economies on the *Central* would be even greater. The reason is twofold: first, because of the very large number of commuters' trains handled over the *Central*. Under present conditions a large number of locomotives must be kept with steam up for the entire twenty-four hours, to take care of the peak loads for the morning and afternoon traffic. The *Paulista* has no comparable commuter traffic. Secondly, grades on the proposed *Central* electrification are much steeper than any of those on the electrified divisions of the *Paulista*.

The proposed electrification of the *Central* has never been carried out. The "other purposes" absorbed all the loan. With electrification, the *Central* might be able to continue to handle the big volume of suburban traffic at the very low rates now prevailing and show a net operating revenue. Without electrification, it will probably continue to have operating deficits. No adequate explanation has yet been given to the public of the disposition of the \$25,000,000 loan. The failure to electrify the heaviest traffic division of the

¹¹ *Estatística*, 1927, p. 84.

¹² The cost of electrification was 64,886,702 milreis, and saving on fuel in 1929 was estimated as being 12,291,408 milreis. *Relatório No. 81 da Directoria da Companhia Paulista de Estradas de Ferro*, São Paulo, 1930, p. 14.

Central is a severe indictment of government operation of the line.¹³

The *Central* has more curves and greater traffic density, and therefore it should replace rails more quickly than the *Paulista*. The inside rails on curves of the *Central* showed definite marks of wear in 1930. All important divisions of both lines are ballasted with crushed rock; that of the *Paulista* is perhaps deeper than that of the *Central*.

MAINTENANCE OF PERMANENT WAY¹⁴

	1918-1928	
	<i>Central</i>	<i>Paulista</i>
Number of kilometers of rails replaced per kilometer of line per year	0.028	0.058
Number of ties replaced per kilometer of line per year	140	147

Owing to incomplete reports, it is not possible to secure quantitative evidence on the relation of tonnage hauled to total tonnage capacity. This is likewise true of passenger capacity. However, from 1924 to 1930 the suburban passenger trains on the *Central* have been overcrowded during the rush hour. The vestibules and platforms are usually filled and passengers have ridden on the tops of the cars. There is no similar overcrowding on the *Paulista*. It is probably true also that freight cars have had a better relation to traffic requirements. For example, there were severe crises on the *Central* in 1917, 1919, and 1923, due to lack of equipment. In 1923, for example, the Director of the *Central* reported that the *Central* lost in that year freight revenue in the amount of 12,000,000 milreis owing to the

¹³ The provisional government will probably begin work on electrification, if it can arrange for financing. In October, 1931, it asked for bids on electrification to the *Barra da Pirahy*, estimates also to include methods of financing. The government has been in negotiation with a number of companies. It proposes to pay for electrification in fifteen years out of the saving in fuel, but is willing to consider other methods of financing. *Diario Oficial*, Rio de Janeiro, Oct. 23, 1931, p. 3.

¹⁴ For details, see Appendix, p. 198, T. 19.

lack of sufficient locomotives and freight cars for hauling the available freight.¹⁵ This condition has been alleviated by the beginning of the custom of purchasing rolling stock and locomotives through the giving of liens on freight receipts.¹⁶ These crises have also been in part caused by the inadequacy of the shop equipment of the *Central* for the work of repair. For example, in 1924, 200 freight cars of the *Central* were repaired by an outside company.¹⁷ Twenty-four badly needed cranes have been purchased, being financed under the lien-on-freight-receipts plan, mentioned above, but the shop equipment of the *Central* is still inadequate to the needs of the road.¹⁸

Locomotives and rolling stock, freight and passenger equipment, are better maintained on the *Paulista* than on the *Central*. As the shop equipment of the *Paulista* is superior to that of the *Central*, this difference can be laid in part to lack of capital on the part of the *Central* for the purchase of shop equipment.¹⁹ It is also probable that part of this difference may be due to the superiority of management of the *Paulista*. Furthermore, the repair problem of the *Paulista* is simplified by electrification.

The passenger equipment of the *Paulista* is superior to that of the *Central*. While the all-steel Pullman night trains between Rio de Janeiro and São Paulo on the *Central* are the equal, if not the superior, of any of the trains of the

¹⁵ *Relatorio da Estrada de Ferro Central do Brasil, anno de 1929*, Introduction, p. xxvi. There have been no comparable crises on the *Paulista*.

¹⁶ *Ibid.*, p. xxvi.

¹⁷ *Ibid.*, p. xxvi.

¹⁸ *Ibid.*, p. xvii.

¹⁹ On the last loan negotiated by the *Paulista*, the interest rate was 7 per cent. This loan was floated in 1922. *Relatorio da Companhia Paulista de Estradas de Ferro, 1929*, São Paulo, 1930, p. 7. Its credit standing is high.

Paulista, the general average of the *Paulista* is better. This is especially true of the main lines of both systems. For example the through day trains of the *Paulista* carry all-steel coaches even down to second class. In the fall of 1930 there were no all-steel day coaches in service on the *Central*. Also, owing to the great volume of traffic which must be handled, the maintenance of the rolling stock used in suburban traffic is inferior to the maintenance of the *Paulista* on its least traveled, narrow-gauge lines.

A recent wreck on the *Central*, caused by the fracture of a worn-out rail, brought forth an unusually frank statement from the director, Dr. Arlindo Luz, on the condition of the rails. The wreck occurred on the main line, between Rio de Janeiro and São Paulo on the morning of July 4, 1931. An official investigation was made and the conclusions were published July 6. The official statement of the director to the minister of communications stated that the wreck was caused by the breaking of a rail which was laid in 1906, and which should have been replaced ten years ago.²⁰ The attention of the Minister is called to the very great increase in the traffic over this division since 1906. Many sections, he stated, are in the same conditions as the one in which the rail gave way. Despite this serious situation not one kilometer of new rails has been bought for the *Central* since 1928. There is most urgent need for 416 kilometers of new and heavier rails.²¹ This inadequate purchase of rails for re-

²⁰ "O trilho que agora deu causa ao accidente é de 1906 e considerando o trafego que ja supportou e o estado em que se achava, devia já ter sido substituido ha dez annos." Report of Dr. Arlindo Luz, Director da Estrada de Ferro Central do Brasil, to Dr. José de Americo, Minister of Communications, *Journal do Commercio*, Rio de Janeiro, July 6, 1931, p. 5.

²¹ *Ibid.*, p. 5. Dr. Luz quotes from a report made to him by the sub-director of the road, under date of June 24: "O sympto alarmante desse estado de coisas sao as frequentes facturas de trilhos como actualmente se

placement vividly illustrates the chief defect of federal-government administration, namely, too large a portion of expenditures going to excess personnel and too little to the purchase of material.

The conclusion is that in total amount, quality and maintenance the physical plant of the *Paulista*, including roadbed and rolling stock, is superior to that of the *Central*. This is further confirmed by the testimony of sellers of material that the *Central* purchases the cheapest grade.²² The *Paulista* spends a larger proportion of its total expenditures on material than does the *Central*.

RELATIVE EXPENDITURES FOR WAGES AND MATERIAL ²³

	1923-1928	
	<i>Central</i>	<i>Paulista</i>
Percentage spent on wages	54.2	48.9
Percentage spent on material	45.8	51.1
	100	100

(3) Since 1902 the *Central* has shown continuous deficits. This includes no interest charges on capital investment.²⁴ The *Paulista* has never had a deficit.

observa no ramal de São Paulo. Nessa linha o trafego representava in 1905 por 184 milhoes de toneladas kilometros, e em 1929 por 727 milhoes. Naquelle anno de 1905, passaram pelo ramal 305,000 eixos, e em 1929 1,844,000... É verdade que uma administracao cautelosa e consiente de seus deveres nao pode deixar que semelhante situacao permanca por mais tempo e e necessario que sejam tomadas urgentes providencias para remedial a." The writer inspected this division from the cab of a locomotive in 1930 and he believes this statement is in no sense an exaggeration.

²² This is not true, however, of locomotives, and special equipment for the night train between Rio de Janeiro and São Paulo, known as the Southern Cross.

²³ Unfortunately only one year's figures are available for the *Central*. However, I believe it to be representative of all years. See Appendix, p. 225, T. 47.

²⁴ It has been noted, however, that part of the receipts of the *Central*, by reason of liens on freight receipts, goes to the purchase of equipment and therefore should be charged to capital account. However, as no

OPERATING RESULTS ²⁵

1920-1929

	Central	Paulista
	(In thousands of milreis)	
Average annual gross receipts	125,921	71,562
Average annual expenditures	145,610	43,535
Average operating ratio	115	68

Passenger receipts for long-distance travel on the *Paulista* are lower than those of the *Central*. All classifications, first, second, one-way and round-trip, for all long distances, are higher on the *Central* by the rates in force in 1930. On the other hand, the rates for suburban passenger traffic on the *Central* are very much lower than any of the rates on the *Paulista*. The suburban traffic was hauled from 1923 to 1928 at an average figure of 0.011 milreis per passenger kilometer. This suburban zone of the *Central* extends for approximately 70 kilometers from Rio de Janeiro.

PASSENGER RATES ²⁶

(In milreis)

	Central	Paulista
Receipts per passenger kilometer 1918-28	0.067	0.047
Index of 1930 passenger tariffs, including first and second class, 100, 300 and 600 kilometer zones ..	0.070	0.051
	173	100

Receipts per ton kilometer of freight average higher on the *Paulista*. This figure alone, of course, would not indicate that rates on the *Paulista* are higher. For the *Paulista*, as has already been shown, carries a higher percentage of coffee than the *Central*.²⁷ On the basis of 1930 tariffs, and includ-

figures exist of the amount the *Central* spends per year in this manner it cannot be ascertained whether these figures are in excess of what should be set aside in a depreciation account.

²⁵ See Appendix, p. 199, T. 21 and p. 212, T. 34 for bibliography from which these averages were compiled.

²⁶ For details, see Appendix, p. 201, T. 23 and p. 236, T. 62.

²⁷ *Supra*, p. 132.

ing the 10 per cent additional tax, the general level of freight rates is higher on the *Central*.

FREIGHT CHARGES ²⁸
(In milreis)

	<i>Central</i>	<i>Paulista</i>
Average receipts per ton kilometer, 1918-1928	0.075	0.128
1930 average base rates of 11 classifications:		
(1) 100 kilometer zone, 1 ton hauled 100 kilometers	23.9	21.3
(2) 300 kilometer zone, 1 ton hauled 100 kilometers	21.3	17.8
(3) 600 kilometer zone, 1 ton hauled 100 kilometers	17.7	12.1

Now the freights paid by shippers do not represent the total cost of service on the *Central* to the people of Brazil. According to the latest edition of *Estatística* available, the total capital investment of the people of Brazil in the *Central* was 679,891,920 milreis (\$81,587,000 United States money) in 1928. Interest at 6 per cent amounts to 40,793,000 milreis. As 47 per cent of the income of the *Central* in 1928 came from freight, this percentage of fixed charges can be allocated, for the purposes of illustration, to freight, giving a total of 19,173,000 milreis. Dividing this sum by the 1,110,000,000 ton kilometers hauled in 1928, gives 0.017 as the capital cost which must be added to each ton kilometer. On this basis, the total cost to the people would be 0.104 milreis per ton kilometer on the *Central*, as compared with 0.164 on the *Paulista*.²⁹

The outstanding difficulty about this comparison of costs

²⁸ These eleven classifications include 75 per cent of the commodities handled by the two systems. Appendix, p. 206, T. 28 and p. 199, T. 22.

²⁹ Capital investment of the *Central* is found in *Estatística*, 1928, p. 369; for the *Paulista*, *Relatório da Companhia Paulista*, 1920, São Paulo, 1930, p. 26. For percentage of income from freight on the *Central*, see *Estatística*, 1928, p. 302; for total ton kilometers on the *Central*, *ibid.*, p. 283; for receipts per ton kilometer, not including capital costs, *ibid.*, p. 312. Total taxes paid by the *Paulista* were only 606,489 milreis in 1929. This item would not greatly affect the total cost to the public. *Relatório da Companhia Paulista*, 1929, São Paulo, 1930, p. 31.

to the public is the absence of an annual balance sheet, and profit and loss statement for the *Central*. As before stated, the amount of the investment of the government in the railroad is put at 679,891,000 milreis. But it is not possible to say whether or not allowance has been made in these figures for the depreciation in the value of the milreis. This is important, for the capital investment largely came through loans which must be repaid in terms of gold. Hence the figure of capital charges may or may not be a correct figure. Furthermore, the year 1928 is not a typical year. Largely through postponing obligations which should have been charged to that year, the road showed a favorable operating balance. If the whole period of 1920-1929 is taken into consideration, an annual addition to the total costs to the public must be made in the form of allocation to freight and passenger services of the amounts of the annual deficit. In view of these facts, one may hazard the guess that transportation on the *Central* is costing the people more per unit than on the *Paulista*.⁸⁰

(4) The accident record of the *Central* is inferior to that of the *Paulista*. Figures for the *Paulista* are not given in the *Estatística*. Figures for only a few years are available for the *Central*. In view of the political controversy and newspaper publicity which was given to the accidents on the *Central* in 1926, the absence of reported accidents on the *Central* for that year does not, of course, indicate that there were no accidents. Likewise the absence of reports from the *Paulista* does not necessarily mean that there were no accidents on its lines. The writer, however, has examined all the reports of the secretary of agriculture and public works of the state of São Paulo since 1900 and in none of them has he found complaints of accidents on the *Paulista*. Its accident record is probably the best in Brazil.

⁸⁰ On this point, see the *Niemeyer Report*, submitted to the Brazilian government by Sir Otto Niemeyer, July 4, 1931, pp. 6, 7.

The data on wages are fragmentary and inconclusive. Furthermore, as stated in the comparison of the *Mogyana* and *Sorocabana*, there is another factor tending to equalize wages and salaries.⁸¹ The railway pension law gives retirement and accident benefits to all employees alike, irrespective of whether the road is government or privately owned or operated. The provisions of this law with reference to conditions for discharge are also identical.

The charge most frequently made against the *Central* is that of overstaffing. The number of employees per unit of traffic is lower on the *Central*. However this should be true, because the traffic density of the *Paulista* is much less than that of the *Central* and therefore the *Central* should have fewer employees per unit of traffic. The overstaffing is probably in the number of employees who are reported in the annual reports as being on leave. This number was 1,056 in 1928 or 3.9 per cent of the total number of employees. These men are probably on leave because political influence relieves them of the responsibility of working. The salaries of the men on leave are probably higher than the average wages paid. Figuring them, however, at the average wage, this practice cost the railroad 4,490,000 mil-reis in 1928. The 1929 figures show that this percentage of men on leave has been reduced from the 3.9 per cent of the previous year to 3.2.⁸² It is costly, not simply in the direct money costs, but also in its effects on the efficiency and morale of the remaining workers who, having no political influence, must work. This constitutes one of the blackest marks against the administration of the *Central do Brasil* by the government.

⁸¹ *Supra*, p. 127.

⁸² *Relatorio da Estrada de Ferro Central do Brasil, anno de 1929*, Rio de Janeiro, 1930, page lxxxii. The former Director, Sr. Zander, gave especial attention to reducing this number.

Recent events afford striking confirmation of the estimate given above of the extent of overstaffing on the *Central*. The provisional government made a radical administrative reorganization of the *Central* in October, 1931.⁸³ As a part of this reorganization, 967 employees were discharged. This number was officially announced in a statement given to the press on November 4, 1931, by the minister of communications, Dr. José Americo.⁸⁴ In this statement the minister also said that it *was possible that the Central really had 3,000 superfluous employees.*⁸⁵ The writer knows of no impartial observer in Brazil who has denied the existence of superfluous employees on the *Central*. A casual inspection of the general offices of the line in Rio de Janeiro would show it. High officials of the preceding régimes primarily responsible for the condition frankly admit it, but contend that under the existing political system it is inevitable.

NUMBER OF EMPLOYEES⁸⁶

	<i>Central</i>	<i>Paulista</i>
Number of employees per kilometer of line.....	9.33	7.34
Number of employees per 25,000 ton kilometers.....	0.60	0.64
Number of employees per 25,000 passenger kilometers..	0.29	0.87

As yet the government has not refrained from changing

⁸³ The details of this reorganization are found in the official decree number 20,560 issued Oct. 23, 1931. It is published in the *Diário Oficial*, Rio de Janeiro, Oct. 31, 1931, pp. 1-23.

⁸⁴ *Journal do Commercio*, Rio de Janeiro, Nov. 4, 1931, p. 5.

⁸⁵ This part of the ministerial statement reads as follows (*ibid.*, p. 5): "De resto, se foram cerca de mil os dispensados, poderiam ter sido tres mil ou mais quantos são desnecessarios ao servico da Central. Nisso reforma foi tolerante não chegando aos limites da compressão." One of the reasons why the provisional government has not discharged a larger number is that it hesitates to add to the already large number of unemployed in Brazil.

⁸⁶ Unfortunately these figures are for 1927 for the *Paulista* and 1928 for the *Central*, these being the only figures available. *Estatística*, 1928, p. 381; 1927, p. 357.

the director of the *Central* with each change in presidents. It is reported in Rio that one of the ablest directors which the road has ever had left the service because he would not suffer the political interference of the government in the management of the line. This ex-director, Dr. J. Assis Ribeiro, is now rendering efficient service as the superintendent of the Great Western Railway of Brazil, a privately operated line.⁸⁷ In continuity of direction the *Paulista* has had an advantage over the *Central*.

In the general field of service to the nation the *Paulista* has three constructive innovations to its credit. The first of these was its pioneering in 1883 in the practice of granting free transportation to immigrants and their equipment.⁸⁸ If the value of colonizing a thinly populated country like Brazil is assumed, then this initiative becomes significant. In the second place, the *Paulista* was the pioneer in introducing the growing of eucalyptus forests systematically and on a large scale in Brazil. Strange as it may sound, timber near the railroads was being rapidly exhausted, particularly in the areas near Rio de Janeiro and São Paulo. Though eucalyptus grows very rapidly, it is a relatively hard wood and makes excellent material for crossties and engine fuel. Naturally this forestry service is bringing in a profit for the company in providing wood and timber at a much lower price than they could be bought for elsewhere. However, the *Paulista* has freely placed the results of its elaborate research

⁸⁷ This information was given the author by a former director of the *Central of Brasil*, in whose impartiality he has complete confidence. Doctor Assis Ribeiro was in North Brazil during the time the author was in Rio and he was unable to get personal confirmation of the report.

⁸⁸ *Relatorio da Companhia Paulista de Estradas de Ferro, anno de 1929*, São Paulo, 1930, p. 5. The report of the preceding year as summarized in *Brasil Ferro-Carril* estimates that the amount of free service thus given by the *Paulista* is 6,408,747 milreis. *Brasil Ferro-Carril*, vol. xxxvi, no. 613, p. 756 (1929).

at the disposal of the general public. The *Central do Brazil*, the *Mogyana* and the *Sorocabana* have followed the *Paulista's* lead in establishing forestry services for the growing of eucalyptus.³⁹ In the third place, the *Paulista* is the first Class I railway in Brazil to demonstrate the economy, convenience, speed and safety of electrification. One other innovation has been made, which, while not as important as those mentioned, is significant as a factor making for safety. The *Paulista* is the only railway in Brazil providing any all-steel passenger cars for regular first and second class travel.⁴⁰ So far as known to the writer, the *Central* has pioneered in no items of the importance of the three first mentioned. It might be claimed that the transport of workers into the city of Rio de Janeiro by the *Central* should be so reported. No adverse criticism is intended, if the nation wishes to furnish transportation for part of its citizens at less than cost. But in economic significance it does not rank with the three things above enumerated. The only comparable innovation sponsored by a state railway is the commendable initiative of the *Viação Ferrea do Rio Grande do Sul* in using national coal in its locomotives.⁴¹

Trains on the *Paulista* run more punctually than those on the *Central*. Despite the improvement brought about on the *Central* under the administration of Dr. Romero Zander, under whom the percentage of trains running on time increased from 12 per cent in 1926 to 80 per cent in 1929, the

³⁹ Edward Navorro de Andrade, *Chefe do Servico Florestal da Companhia Paulista, O Eucalypto e Suas Aplicações*, Typ. Brazil de Rothchild, São Paulo, 1928, vol. i, pp. 126, 129. One of the forests of the *Central* is at Governador Portella, state of Rio de Janeiro.

⁴⁰ These are confined to the through trains on the main line. The *Central* and the *Paulista* both have all-steel compartment sleeping cars. *Railway Age*, vol. 84, no. 12, March 24, 1928, p. 679.

⁴¹ *Estatistica*, 1928, p. 230.

long-time record favors the *Paulista*.⁴² The density of the suburban traffic on the *Central* from Rio de Janeiro makes it, of course, more difficult to run the trains on schedule.

In deciding which railroad of the two ought to be able to produce transportation more cheaply, there are two factors not susceptible of measurement. Does the more difficult terrain of the *Central* find full offset in the presumed advantages of its greater traffic density? The other question is whether the greater traffic density of the *Central* is counter-balanced by the much larger percentage of coffee handled by the *Paulista*. In the absence of profit and loss statements of the *Central*, it is impossible to measure accurately total costs to the people of Brazil of transportation. And this is made more difficult by the steadily depreciating currency medium. This affects both the value of the annual receipts and the amount which should be charged as capital costs. And it is highly probable that the *Paulista*, even with its large amounts of coffee and its friendly terrain, could not have reached its present strong position without the tariffs which varied with the exchange value of the milreis. This right to a flexible tariff was relinquished only in 1920. The *Central* has not had the advantage of a similar provision.⁴³

In the absence of flexible tariffs, the rates on the *Central* have not proportionately increased with the depreciation of the milreis. Furthermore, the *Central* has been hauling a constantly increasing number of suburban passengers for less than out-of-pocket costs. Under such circumstances deficits are not unexpected. The government of Brazil has a fiscal situation which does not make it easy to provide transportation at less than out-of-pocket costs. As a result,

⁴² For the record of Dr. Zander, see *Relatorio da Estrada de Ferro Central do Brasil, 1929*, Rio de Janeiro, 1930, p. xiii. The trains on the *Paulista* run with a regularity comparable with the standard railways in the United States.

⁴³ *Infra*, p. 153.

insufficient funds have been available for the purchase of rolling stock and equipment for repair of the same. Furthermore, the presence of a number of political appointees who do no work probably has damaged the road in two ways: first, by taking funds which might have gone for better paying of those who work, or for badly needed supplies; second, by making more difficult the creation of discipline and loyalty to the road on the part of the real workers. On top of this is the economic sin of the government in using the electrification loan for "other purposes." Standards of the physical plant and operation on the *Central* are, therefore, lower than those of the *Paulista*.

There remains the question, to what extent conditions on these two roads are typical of government and private operation of railways in Brazil. Certain aspects of government operation of the *Central* are probably typical of federal-government operation.⁴⁴ The *Paulista* is one of the only two financially successful Class I roads owned and operated by Brazilian capital. It may well be doubted whether the management of the *Paulista* could succeed with the *Central* unless the rates for suburban traffic were radically increased.

⁴⁴ Appendix, p. 146, T. 34.

CHAPTER X

FACTORS COMMON TO ALL CLASS I RAILWAYS

THIS chapter will discuss certain factors common to all Class I railways. In some cases Class II, and less often, Class III, railways will be considered. Comparative passenger and freight rates, percentages of various commodities carried by the different roads, transportation taxes, and flexible tariffs, will be examined. Then operating ratios and explanations of differences between the financial records of the different types of operation will be taken up, followed by questions of comparative safety, comfort, convenience, and speed of service. The chapter will be concluded by an analysis of the results of the so-called tests of efficiency and the relative proportions spent by the different types of operation for personnel and equipment. The time period will be 1923-1928.

Receipts per passenger kilometer were at approximately the same level on government- and privately-operated roads for the period 1923-1928. The only exception to this is the very low rate at which the suburban traffic on the *Central* is handled, namely, at an average rate of 0.010 milreis per passenger kilometer (0.12 cents). The average passenger traffic density is slightly larger for the privately-operated lines, if the suburban traffic of the *Central* and the *Paulista* be disregarded.

The long-distance rates in force in the Rio de Janeiro area in 1930 were higher for the *Central* in all classes and for all distances than for the *Leopoldina*, a privately-operated line. The rates on the federal-government roads, including Class

II and Class III railways, were higher than those on the privately-operated roads in this area, and higher than those on the road operated by the state of Minas Geraes, namely, the *Rede Sul Mineira*.

In the northern area including both Class II and Class III railroads, the passenger rates on the privately-operated (but government-owned) lines are slightly higher than those on the government-operated lines. A 10 per cent tax is collected on the tariffs of all government-operated lines and, when this is added, the rates in the northern area are approximately equal. In the São Paulo area the rates on the privately-operated lines are lower than on the government-operated systems. Present-day rates are slightly lower on the privately-operated lines but no lower than their superior traffic density would seem to justify.

PASSENGER RATES ¹

	<i>Government</i>	<i>Private</i>
Relative of receipts per passenger kilometer, 1923-1928..	100	100
Relative of 1930 tariffs, Rio de Janeiro area	122	100
Relative of 1930 tariffs, Northern area	97	100
Relative of 1930 tariffs, São Paulo area	106	100
Average of relatives	106	100
Relative of passenger traffic density (suburban travel not included)	86	100

Freight receipts per ton kilometer were lower on the government-operated lines than on the privately-operated lines for the period 1923-1928. In the Rio de Janeiro area for 1930 the tariffs in every classification are lower on the federal-government lines than they are on the privately-operated lines and the state-government-operated lines. Traffic conditions, however, are more difficult on the privately-operated group. For example, the Leopoldina uses special means of traction to make the ascent of the

¹ Appendix, pp. 201-205, Ts. 23-27. Relative, as here used, is synonymous with index.

coastal mountain range on two of its three lines from Rio de Janeiro to the interior. Furthermore, the traffic density of the federal-government lines is greater than that on the privately-operated lines.

In the northern area the rates on the privately-operated but government-owned lines are all higher than the rates on the government-operated lines. Likewise in the São Paulo area the rates on the privately-operated lines are higher than on the government-operated lines.

COMPARATIVE FREIGHT RATES^a

	<i>Government</i>	<i>Private</i>
Relative of receipts per ton kilometer, 1923-1928 ...	72	100
Relative of 1930 tariffs, Rio de Janeiro area	67	100
Relative of 1930 tariffs, Northern area	69	100
Relative of 1930 tariffs, São Paulo area	91	100
Average of relatives	75	100
Relative of traffic density 1923-1928	161	100

The most striking and important difference in the commodities handled by Brazilian railways appears in the relative percentages of coffee handled. Coffee, for the past decade, has comprised 67 per cent of the value of the annual exports of the nation.^b It has high value in proportion to weight and bulk. It is the most profitable single commodity handled by Brazilian railroads. The only Class I roads in Brazil which have remained under private ownership and operation are roads which carry a considerable proportion of coffee. These roads are the *Paulista*, the *Leopoldina* and the *Mogyana*. Only two of the government-owned roads have large percentages of coffee. One of these, the *Sorocabana*, is the only government-operated line which has always had

^a The 1923-1928 figures include only the Class I railways. The 1930 tariffs include Class II and Class III railways. The classifications embraced in the 1930 indices include 80 per cent of commodities handled. Appendix, pp. 206-210, Ts. 28-32.

^b *Infra*, p. 150.

a substantial net operating revenue. The other, the *Noroeste*, has a very small traffic density, part of it running through a sparsely settled area.

RELATIVE AMOUNTS OF COFFEE HANDLED ⁴

1923-1928 (Paulista 100)			
Privately owned		Government owned	
<i>Paulista</i>	100	<i>Noroeste</i>	46
<i>Leopoldina</i>	73	<i>Sorocabana</i>	34
<i>Mogyana</i>	64	<i>Este Brasil</i>	16
		Great Western	6
Partly privately owned, but having guarantee of interest		<i>Central</i>	5
		<i>V. F. R. G. S.</i>	1
<i>S. P. R. G.</i>	10		

COFFEE IN THE ECONOMIC LIFE OF BRAZIL

Annual Averages, 1920-1929

<i>Exports</i> (60 kilogram bags)	<i>Value</i>	<i>Value all exports</i>	<i>Percentage value of coffee in total exports</i>
13,597,000	\$291,615,000	\$429,735,000	67.8

The question of comparative freight rates as between government-operated and privately-operated lines is further complicated by the government's levy of transportation taxes. In 1920 the government placed a flat tax of two milreis on each ton transported whatever the distance.⁵ While this tax was collected on all roads, the tax went to federal govern-

⁴ For details, see Appendix, p. 211, T. 33. The road having the highest percentage of coffee, the *Paulista*, is taken as 100. The figures for the São Paulo Railway would be 60 on the basis of 1928 alone. The situation of this road is so special that it is not included in the Class I railways. At the present time it has a monopoly on all rail transport from the principal coffee-producing area, the state of São Paulo, and its seaport, Santos. The averages of coffee's position in the commerce of Brazil are from *O Brasil Actual*, 1930, *op. cit.*, p. 38.

⁵ Decreto No. 4,230, December 31, 1920, and supplementary decree No. 17,534, November 10, 1926, *Estatística*, 1925, *Legislação*, p. 6.

ment roads for operating expenses and new construction.⁶ The 10 per cent tax collected on all tariffs, freight and passenger, of federal-government lines was instituted in March, 1925.⁷ This tax formed the security for the issue of railway bonds, the proceeds from which were used to buy needed equipment for the government lines.⁸ It seems also that this 10 per cent is applied to all the roads, government and private, of the Rio de Janeiro area.⁹ This last tax has been included in the indexes of comparative rates already given.¹⁰ The tax of two milreis per ton has not been included because it is collected from both government- and privately-operated roads.

Unfortunately for shippers in Brazil, this is not the end of transport taxes. Further taxes, usually ad-valorem, are levied by the federal government and the state governments on articles transported over the railroads. The practical effect of these taxes is the same as if they were levied as additional freight charges.¹¹ The railroads are paid a commission for collecting them.¹² Dr. Feliciano Aguiar, of the general railway accounting office, has prepared a study in which he shows graphically the relation of these ad-

⁶ *Ibid.*, p. 6.

⁷ Decreto No. 16,842, March 24, 1925, *ibid.*, p. 19.

⁸ *Ibid.*, p. 19.

⁹ The writer has not been able to discover the reason for this. It seems correct as it is given in the base rate book issued to station agents by the general railway accounting office. *Classificacao Geral das Mercadorias*, C. C. F. 1, *Contadoria Central Ferroviaria*, 1928, Rio de Janeiro, p. xxviii.

¹⁰ *Supra*, pp. 148-49.

¹¹ This is especially true in the competition of the railroads with the rapidly increasing motor trucks. As yet the truck companies have not been collecting these charges and hence the trucks can offer a cheaper rate than the regular railway freight charges plus these taxes.

¹² *Relatorio No. 77 da Companhia Mogyana, anno de 1929*, Campinas, 1930, p. 13.

valorem taxes to the regular freight rates. His study includes the states in the Rio de Janeiro area. The political units applying the highest taxes are the states of Espirito Santo, Rio de Janeiro, Minas Geraes, and the federal district. The state of São Paulo has the lowest taxes of this character. The taxes on six of the commodities considered are particularly high: every one of the six commodities is taxed in at least one state by an amount greater than the regular freight charges for hauling the commodity 800 kilometers on the highest rate railway.¹⁸ When these taxes are considered, direct costs for freight transportation to the public are probably not much lower on the government-operated lines than on the privately-operated lines.

In so far as articles are taxed so heavily by the federal government that commerce in these articles is retarded, the policy of the federal government in building railways in advance of traffic in order to develop the country is nullified. In so far as articles in the states having federal-government railways are so heavily taxed by the state government as to retard commerce in these articles, the purpose of the federal government in building railways in advance of traffic to develop the resources of the country is being nullified by the state concerned. Likewise where a state by this type of taxation retards commerce on a state-operated railway, the

¹⁸ *Graphics Comparativos Entre O Valor das Mercadorias Fretes e Impostos Estaduaes*, Organizados na Contadoria Central Ferroviaria, Rio de Janeiro, 1928. Unfortunately the study of Senhor Aguiar lacks a summary. In the freight charges are included the two milreis per ton tax and the 10 per cent tax.

At the time this was being written the full report of Sir Otto Niemeyer on Brazil had not been published. On the subject of these taxes, the published summary said: "Internal export taxes and any similar internal charges should be abolished and no further external export duties imposed." *New York Times*, July 25, 1931, p. 11.

See also the spirited denunciation of these taxes by the São Paulo deputy, Dr. Cincinnato Braga, *Braslian American*, Aug. 13, 1921.

purpose of the state of developing the state through the railway is to that degree nullified. One reason, of course, for this type of taxation is that it is easily collected.¹⁴

It has already been pointed out that the roads which have remained under private ownership are roads having a substantial percentage of coffee. There are three of these, the Leopoldina, the *Mogyana* and the *Paulista*.¹⁵ Of these three, two are in the state of São Paulo, and one of the reasons for their success has been that they have had, until recently, an agreement with that state whereby they could raise their rates *pari passu*, in the event of a depreciation of the value of the milreis. These two are the *Mogyana* and the *Paulista*. The renewed contract of 1893 between these two roads and the state of São Paulo gave them this right.¹⁶ The *Companhia Paulista* gave up this privilege in 1920.¹⁷ It is not clear when the *Mogyana* finally gave up the right to a flexible tariff schedule, but a start was made in 1923, during which year the company relinquished the right on certain specified commodities.¹⁸ Without such a rate agreement, there is usually a considerable time lag between declines in the value

¹⁴ *Brasil Ferro Carril*, in its issue of July 9, 1931, refers to a recently signed decree of the provisional government ending these interstate taxes. Up to the time this went to press, the writer has not been able to find the decree, but the *Brasil Ferro Carril* has a reputation for accuracy and hence it is probable that this most desirable step has been taken. *Brasil Ferro Carril*, Rio de Janeiro, vol. xli, no. 719, July 9, 1931, p. 4.

¹⁵ There is one other Class I railway which is partly privately owned, the *Estrada de Ferro São Paulo Rio Grande*. But it has a federal-government guarantee of interest payable in gold. *Estatística*, 1928, p. 371.

¹⁶ *Leis, decretos, e contractos relativos as concessões vigentes de estradas de ferro outorgadas pelo Governo de São Paulo, 1869-1913*, Directoria de Viação, São Paulo, 1914, pp. 84-85.

¹⁷ *Relatório do Secretário da Agricultura e Obras Públicas, Estado de São Paulo, 1923*, São Paulo, 1924, p. 200.

¹⁸ *Ibid.*, p. 206. The *Sorocabana* gave up the right in 1922 to a flexible tariff. The only company retaining this right is the São Paulo Railway. *Ibid.*, p. 155.

of the milreis and elevation of tariffs. And as there has been an almost continuous decline in the value of the milreis, the railroads have faced almost continuously the question of raising rates,

There are, however, obvious difficulties in the application of a flexible tariff arrangement. While internal prices tend to adjust themselves to changes in the gold value of the milreis, there is always a time lag before this adjustment is completed. On commodities of international trade, such as coffee, it can be applied without undue difficulty because there is immediate response in the price of such a product to changes in the exchange value of the milreis. When the milreis is depreciating, other things being equal, the coffee planter gets more milreis for each sack of coffee. He therefore can afford to pay a higher freight charge. But others, shippers and passengers, receive incomes or sell commodities which do not change so quickly. Hence they resent tariff schedules which are movable with the exchange. They know that it more rarely happens that the milreis appreciates in gold value and hence are not often greeted with declining tariffs.

The government can quickly raise rates on its own lines. It may do it by raising tariff schedules, or it may do it by applying a transportation tax, which amounts to the same thing. But to make advances which are equally applicable to all commodities, such as the tax of two milreis per ton, is not a scientific way of making rates. When the milreis declines, and the private company has no flexible tariff provision in its concession contract, it must petition the government for authority to raise rates. Considerable delay may ensue, to the point of crippling the road, before the petition is granted. And by the time the request is granted the milreis may have depreciated still more, making necessary a new petition. The federal government, however, has made

a step forward in organizing the Rate Making Advisory Committee of the General Railway Accounting Office.¹⁹ This committee is composed of representatives of all the railroads in the area around Rio de Janeiro, and meets weekly to discuss changes and make recommendations. The minister of communications must, however, approve these suggestions before they can go into effect. The action may prove the means through which more adequate and rapid changes in rate structures can be made.

However, from the point of view of the economic development of the country as a whole, nothing short of the permanent stabilization of the milreis can meet the situation. For changing railway rates, however finely adjusted to changes in the gold value of the milreis, make business more difficult.²⁰

The lowest operating ratios are attained by the privately-operated roads; next above them are the state-operated roads. The highest operating ratios are made by the roads operated by the federal government. The most important single factor in bringing about this situation, as has already been pointed out, is the difference in the percentages of coffee handled by the government-operated and privately-operated lines.²¹ The government began with a policy of subsidizing

¹⁹ The account of the organization of the General Railway Accounting Office (*Contadoria Central Ferroviaria*) is found in *Estatística, 1924 (Legislação)*, p. 9.

²⁰ This is one of the points strongly emphasized in the recent report of Sir Otto Niemeyer, July 4, 1931, *op. cit.*, p. 4. The problem of stabilization of the milreis is made more difficult by the existence of a large and politically potent class in Brazil who temporarily profit by the depreciation of the milreis. The coffee planters, for example, get more milreis for each sack of coffee when the milreis goes down, other things being equal. Labor costs usually do not go up as fast as the milreis goes down. Taxes, likewise, do not increase as rapidly as the milreis depreciates. For details and exchange rates since 1808, see Appendix, p. 183.

²¹ *Supra*, pp. 150.

private capital for the building and operation of the railways. The result of this policy was that the profitable lines remained in private hands and the government had to take over the unprofitable ones. And the rule in Brazil is that a high percentage of coffee means profits, and a low percentage of coffee, other things being equal, spells deficits.

OPERATING RATIOS ²²

1923-1928

	<i>Federal government</i>	<i>State government</i>	<i>Private</i>
Class I and II railways	127.6	93.2	75.2
Class III railways	198.6	130.2	77.5

The Great Western Railway of Brazil, privately operated but government owned, is comparatively prosperous because of the high percentage of sugar which it carries. For 33 per cent of its total tonnage is sugar, while the highest percentage of sugar carried by any other Class I railway is 3 per cent. While sugar cannot bear as high a freight rate as coffee, in comparison to timber or livestock for example, it is a profitable commodity. Three of the roads carry high percentages, by weight, of timber: namely, the *São Paulo Rio Grande*, privately operated, the *Sorocabana*, operated by the state of São Paulo, and the *Noroeste*, operated by the federal government. Timber is over 50 per cent of the total tonnage of the first-named line and is the most important single factor affecting its annual income.²³

Traffic density and comparative freight and passenger rates also affect the operating ratio: these have already been discussed. The tax of two milreis per ton and the 10 per

²² These averages are weighted according to the relative amounts of receipts and expenditures. For details, see Appendix, pp. 212-216, Ts. 34-5.

²³ Timber is 56.1 per cent of the total tonnage of the *São Paulo Rio Grande*; 38.6 of the *Sorocabana*; and 25.4 of *Noroeste*. The period for which this has been true is 1923-1928. See Appendix, p. 211, T. 33.

cent tax, already referred to, are not included in the total receipts, as given in *Estatística*, of either the *Central do Brasil*, or the private companies, or of the state-operated *Sorocabana*.²⁴ It may, therefore, be concluded that it is not included in the total receipts, as given in *Estatística*, of any of the roads.²⁵ If these additional sums had been included in the total receipts of the federal-government lines, these lines would have better operating ratios. This is another of the reasons why great emphasis should not be placed upon operating ratios, taken alone, as indices of comparative operating efficiency.

Making the fullest allowance for these taxes in augmenting the real receipts of the federal government, it remains true that if capital charges are considered, the federal-government lines show annual deficits. For capital costs are not included in any of the total expenditures of government-operated lines, federal or state.²⁶ And the fiscal position of Brazil is such that it cannot easily bear these deficits. According to the report of a Brazilian senate committee of finance in 1928, there has been a budget deficit for every year since 1907. The favorable trade balance of 1929 was not enough to take care of the service on the funded foreign debt, to say nothing of payments on account of state and municipal foreign debts, and interest payments on foreign investments in Brazil.

²⁴ *Relatorio da Estrada de Ferro Central do Brasil, 1929*, Rio de Janeiro, 1930, p. v; *Relatorio No. 77 da Companhia Mogyana de Estradas de Ferro, anno de 1929*, Campinas, 1930, p. 10; *Relatorio da Companhia Paulista de Estradas de Ferro, anno de 1929*, São Paulo, 1930, pp. 16, 30; *Relatorio da Estrada de Ferro Sorocabana, anno de 1929*, São Paulo, 1930, p. 8, T. III; *Estatística, 1928*, p. 299.

²⁵ For a statement of the difficulty of ascertaining the total receipts of the government-operated lines, see Sir Otto Niemeyer's *Report*, dated July 4, 1931, p. 7.

²⁶ *Ibid.*, p. 6.

THE FINANCIAL SITUATION IN BRAZIL²⁷

Average annual budget deficit, 1890-1926 (milreis)	127,027,000
Budget deficit, 1930 (dollars)	78,300,000
Average annual favorable trade balance, 1920-1929 (dollars) ..	71,027,000
Favorable trade balance, 1929 (dollars)	39,294,000
Annual service on federal-government foreign debt (dollars) for the year 1930	51,488,787

The data on wages are inconclusive, it being impossible to say in which group, government-operated or privately-operated, the level of real wages is higher.²⁸ The Railway Pension and Retirement Act, already discussed, tends to equalize labor conditions. By the provisions of this act, the same regulations regarding retirement, compensation for accidents, and conditions under which an employee may be discharged, apply to government and to private railways.²⁹

The number of deaths of both employees and passengers has been chosen as probably the most accurate index of safety of travel. The reason for this is the differences in reporting injuries and minor accidents. Under one type of management only the most serious injuries are reported, while under another slight bruises may be recorded. Under one type only those accidents may be reported which result in serious delays to traffic, while another might report the slightest

²⁷ These figures are computed from data in: *Diario do Congresso Nacional*, 12 de Outubro de 1928, p. 4550; *Brasil Actual*, 1930, *Imprensa Nacional*, 1930, Rio de Janeiro, p. 134; *Niemeyer Report*, Appendices I and IV.

Brazil has paid her obligations in the past partly by fresh borrowings. Her present position is made more difficult by the 1929 collapse of the coffee "valorization" scheme. *Ibid.*, p. 24; and Waddell, Miss Agnes S., *The Revolution in Brasil*, Foreign Policy Association, vol. vi, no. 26, March 4, 1931, p. 500. Miss Waddell estimates that the "invisible items" in Brazil's international account cancel the nation's favorable trade balance. On the credit side, the "invisible items," she estimates, are negligible. *Ibid.*, p. 500.

²⁸ For further data on this point, see Appendix, p. 228, T. 50.

²⁹ *Supra*, p. 127.

interruption in the flow of traffic. Travel is apparently safer on government roads in the Class I group and safer on privately-operated lines in the Class II and Class III groups.

NUMBER OF DEATHS⁸⁰

1923-1928

	<i>Federal government</i>	<i>State government</i>	<i>Private</i>
Class I railways:			
Number per million ton kilometers	0.063	0.057	0.142
Number per million passenger kilometers	0.0635	0.097	0.166
Class II and Class III railways:			
Number per million ton kilometers	0.249	0.234	0.061
Number per million passenger kilometers	0.167	0.153	0.072

With the exception of the *Paulista*, which has the best equipment in Brazil, there is not much difference between passenger equipment on government and privately-operated lines. Complete data are not available as to the punctuality of trains. There is some evidence of overcrowding on the government-operated lines, chiefly, however, in the suburban traffic of the *Central do Brasil*.⁸¹ In the Rio de Janeiro area, the government-operated roads in sparsely settled areas have more rock ballast than the privately-operated lines in the same territory. Comparative data are not available as to conditions in the northern area. In the São Paulo area there is more ballast on the privately-operated lines, and this is also true for the southern states of Parana, Santa Catharina and Rio Grande do Sul.⁸²

⁸⁰ One of the difficulties in working out these figures is the absence of any reports from the *Paulista*, a privately-operated railway with a very limited number of accidents. For details, see Appendix, pp. 215-218, Ts. 36-39.

⁸¹ The percentage of available passenger-car capacity utilized on government-operated lines for the period of 1923-1928 was 50 per cent; on the privately-operated, 44 per cent. However the figures of the *Central* are not available on this point. For details, see Appendix, p. 234, T. 59.

⁸² Based on *Estatística*, 1928, p. 386, and the writer's travel over the

Quantitative information is not obtainable as to the rapidity and reliability of freight service. It is probable that the best freight service is offered by the *Paulista*. There have been complaints of shippers about lost and damaged merchandize on the *Central do Brazil* but it is a problem on which it is difficult to get comparative figures.

Differences of traffic density, terrain and commodities handled are so great as to make technical tests of operating efficiency of doubtful value. Another difficulty is that the records are not complete, particularly for the two most important railways in Brazil operated by Brazilians, the *Central do Brazil* and the *Paulista*. Seven of these tests have been applied and in six of them the government-operated roads make the best showing. These are: number of car kilometers per car day, net ton kilometers per car day, locomotive kilometers per locomotive day, percentage of serviceable locomotives, fuel costs per locomotive kilometer after adjustment for difference in tractive power, and number of employees per 10,000 tons of revenue freight. The privately-operated roads make the better showing in one, percentage of available freight capacity utilized.

TESTS OF EFFICIENCY⁸⁸

1923-1928

	<i>Government</i>	<i>Private</i>
Car kilometers per car day	44.9	30.2
Net ton kilometers per car day	362.5	241.7
Locomotive kilometers per locomotive day	106.0	101.0
Percentage of serviceable locomotives	82.2	70.9
Fuel costs per locomotive kilometer (milreis) .....	.925	1.065
Number of employees per 10,000 tons revenue freight..	0.32	0.39
Percentage utilization, freight car capacity	44.6	48.7

lines, 1926 and 1930. Conditions in the São Paulo area and the southern states are partly the result of the limited amount of ballast applied when the *Sorocabana* and the *Viação Ferrea do Rio Grande do Sul* were in the hands of private companies.

⁸⁸ In the item of fuel costs, figures are adjusted for average size of

If other things were equal, it might be possible to argue on the basis of the above figures that standards of operation are higher on the government-operated lines; but the point is that other things are not equal. These tests do show, however, the danger of generalizations like that made by a recent writer on the subject, who said:

The efficiency of Brazilian railroads increases in direct proportion as the roads approach private ownership. For instance those roads owned and operated by the Government are least efficient.⁸⁴

This conclusion might possibly be substantiated if applied to Class III railways only. But the efficiency already demonstrated in the management by the state of Minas Geraes of the *Rede Sul Mineira*, the state of São Paulo in the control of the *Sorocabana*, and the state of Rio Grande do Sul in the operation of the *Viação Ferrea*, as compared with the privately-operated lines in the same class, shows the conclusion to be not proved. This writer makes no distinction in his discussion between operation by the federal government and by state governments.

The *Oeste de Minas* (Western of Minas) is probably a fairly typical federal-government railway; the line, 2,666 kilometers long, serves the states of Minas Geraes, Rio de Janeiro and São Paulo. It receives its name from the line running from Bello Horizonte, capital of the state of Minas Geraes, to Uberaba, a point in the extreme western part

privately-operated locomotives. The reason it is possible for the privately-operated lines to show a higher percentage of utilization, of freight-car capacity, while having a lower number of car kilometers and net ton kilometers per car day, is that the average capacity of the cars on the government lines is higher. For details, see Appendix, pp. 219-24, Ts. 41-46; p. 232, T. 56.

⁸⁴ Splawn, Walter M. W., *Government Ownership and Operation of Railroads*, The Macmillan Company, New York, 1928, p. 152.

of the state. The road is comprised of the following: 1,538 kilometers of one-meter gauge, and 733 kilometers of 70-centimeter gauge. It began under private operation, and went into bankruptcy in 1903, at which time it was purchased at public auction by the federal government. While its mileage is considerable, its low receipts per kilometer keep it among the Class II railways. The reason for considering it here is the very excellent analysis of this road which was made in 1926 by Dr. Alcides Lins, at that time director of communications and public works of the state of Minas Geraes. His analysis deals particularly with the relative proportions of expenditures going to personnel and supplies.

Inspired, no doubt, by the success of the state of Minas Geraes in handling the *Rede Sul Mineira*, the federal government proposed to the state that it rent the *Oeste de Minas* also. As director of communications and public works, Dr. Lins was designated by the president of the state to study the project. The report which Dr. Lins made to the president is published in the annual report of the department of communications and public works of Minas Geraes for 1927.

One of the first conclusions is that the productivity of the zone through which it passes is very small, when compared with that of other important railways in the nation. Population is sparse. The freight which the road handles, mainly cattle, has a low value with reference to weight and hence must be handled at very low rates. These are basic factors in explaining the constant deficits of the line.⁸⁵

The expenditure of the line for wages is out of line with its expenditure for material. Seventy per cent of annual expenditure goes to wages, while on the *Paulista* 47 per cent,

⁸⁵ *Relatorio do Anno de 1927 da Directoria de Viação e Obras Publicas do Estado de Minas Geraes, Bello Horizonte, 1929, p. 188.*

on the Leopoldina 53 per cent, and on the *Sorocabana* 44 per cent, is thus spent.³⁶ In relation to the amount of traffic handled, the number of workers is excessive.³⁷ This excess of workers is employed in the offices. Out on the line, in the shops, and at the stations, the number is not greater than for other roads.³⁸

The right of way is 69.4 per cent in grades and 50.9 per cent in curves. The maximum grade is slightly in excess of 3 per cent.³⁹ Neither the roadbed nor the rolling stock is properly maintained.⁴⁰ Another cause of the perennial deficits is the existence of the two gauges.⁴¹

The writer would summarize Dr. Lins' study of the situation under three categories: First, factors for which the management may not be held responsible. Most important among these are: (1) the low traffic density, and (2) the low value of the freight to be hauled resulting in small receipts per unit hauled. Second, factors for which the state is partly responsible, in that it has made little effort to correct them since the government took over the roads. These are the presence of two gauges and the high percentage of the right of way which is in curves and in grades. Third, factors for which the management of the government is directly responsible, (1) too high a percentage of the annual expenditure going to personnel as compared with the purchase of material, and (2) the excessive number of employees per unit of traffic. The effects of this policy are seen in

³⁶ *Ibid.*, p. 197.

³⁷ For example, for each worker the following number of tons of useful weight are transported: *Oeste de Minas*, 12,000; *Central do Brasil*, 40,000; *Mogyana*, 34,000. *Ibid.*, p. 198.

³⁸ *Ibid.*, pp. 211, 217.

³⁹ *Ibid.*, p. 234.

⁴⁰ *Ibid.*, p. 242.

⁴¹ *Ibid.*, p. 247.

poor maintenance. This deficient maintenance logically leads to lowered efficiency and poor service to the public.

Since this book was begun, negotiations have been in progress between the federal government and the state of Minas Geraes for the lease of the *Oeste de Minas* to the state of Minas Geraes. Discussions have included, also, another short line operated by the federal government, the *Paracatú*. In May, 1931, the contract for the renting of the two, the *Oeste de Minas* and the *Paracatú*, was signed.⁴² In commenting on this new responsibility of the state, its president, Dr. Olegario Maciel, said that it was possible that the state of Minas Geraes might also rent the narrow gauge lines of the *Central do Brazil* in Minas Geraes.⁴³ The *Rede Sul Mineira*, the *Oeste de Minas*, and the *Paracatú* have been consolidated into one system.⁴⁴ The good results which the state of Minas Geraes has secured with the *Rede Sul Mineira* undoubtedly influenced the federal government in making this new lease.

It has already been pointed out that the *Central* and the *Oeste de Minas*, two federal-government roads, spend too large a proportion of annual outgo for wages. While this is apparently not true of the *Noroeste do Brazil*, a Class I railway, there are indications that it is true of the majority, if not all, of the Class II federal-government railways. The combined average of the percentage of expenditure for labor for all Class I and Class II railways is higher on the federal-government than on the private or state-government lines. The percentage of annual expenditures going to personnel is greater for both federal-government and state-government

⁴² Report of H. Sheahan, trade commissioner, Rio de Janeiro, May 28, 1931.

⁴³ *Brasil Ferro Carril*, Rio de Janeiro, June 6, 1931, vol. xl, no. 714, p. 501.

⁴⁴ *Ibid.*, p. 501.

Class III railways than it is for privately-operated lines in the same group.

These figures for Class II and Class III railways gain added significance when it is seen that the government-operated lines have a greater number of employees per unit of traffic. In view of the better safety record of the privately-operated Class II and Class III railways, it is not probable that the privately-owned lines are understaffed. It would seem probable, therefore, that the central-government lines are overstaffed.

Furthermore, the fact that a smaller percentage of the total expenditures of the Class II and Class III railways goes to labor does not mean that the per-capita wage is less on the privately-operated lines. Figures are fairly complete for the period 1923-1928, and there is little difference between the two, the average annual wage on the privately-operated lines being practically equal to that on the federal-government lines. Wages on the state-operated lines are lowest. If we omit from the federally-operated group the *Estrada de Ferro Rio do Ouro*, a short line connected with the water-supply system of Rio de Janeiro, and, therefore subject to the higher living costs of that city, wages will average higher on the privately-operated lines. None of the other railways in this group enters a city the size of Rio de Janeiro. Data on Class I railways are not complete.

RELATIVE EXPENDITURES FOR WAGES AND MATERIAL ⁴⁸

1923-1928

	<i>Federal government</i>	<i>State government</i>	<i>Private</i>
Class I and Class II railways:			
Percentage spent for wages	58.6	49.9	52.6
Percentage spent for material	41.4	50.1	47.4
Class III railways:			
Percentage spent for wages	61.4	63.0	56.7
Percentage spent for material	38.6	30.8	43.3

NUMBER OF EMPLOYEES PER 10,000 TONS USEFUL WEIGHT

1923-1928

	<i>Federal government</i>	<i>State government</i>	<i>Private</i>
Class I railways (federal and state joined)	0.32		0.39
Class II and Class III railways	1.71	1.31	0.89

AVERAGE ANNUAL WAGES PAID

1923-1928 (milreis)

	<i>Federal government</i>	<i>State government</i>	<i>Private</i>
Class II and Class III railways	2,311	2,060	2,299

There is not enough evidence to constitute proof that operation by the federal government involves inadequate expenditures for material and overstaffing in all instances. It appears probable in the case of the *Central* and the *Oeste de Minas*.⁴⁵ Data for the remaining Class II and Class III railways point in this direction. State-government Class I and Class II railways do not show this tendency, but the Class III railways operated by state governments seem to resemble those operated by the federal government. If this analysis is correct, the special weakness of operation by the federal government is that money is spent to pay for superfluous employees, which should be spent for material.

It is generally recognized in Brazil that the excessive issue of passes is one of the evils of federal-government administration of railways. The *Central do Brasil* furnishes daily to the press the amount of requisitions of the various de-

⁴⁵ Appendix, pp. 225-29, Ts. 47-51.

⁴⁶ The *Noroeste*, the only Class I federal-government railway other than the *Central do Brasil*, it is true, does not show an unduly high expenditure for labor. However, this is a new line and the federal government has had to reconstruct it within the past decade. The writer went over it in 1930 and much remains to be done to put it into proper condition. Traffic was inaugurated on the first sections of the *Noroeste* in 1906. *Estatística*, 1927, p. 155.

partments of the government for transportation over its lines. Unfortunately the statements do not specify whether the persons so favored are traveling on government business or not. Some of the transportation is unquestionably furnished to those who are traveling on the public business. But part of it probably goes to those who are traveling for private purposes. The ministry of communications recently issued a statement in which it disclosed that there were outstanding 1,250 annual free passes on the *Central*, 184 on the *Noroeste*, and 77 on the *Rede Viação Cearense*.⁴⁷ The bulletin stated that, among others, politicians and journalists held these passes. No information, so far as known to the writer, has been given out on this question by the state-operated railways and the privately-operated lines. It is probable, however, that they both issue single-trip and annual passes to those whom they wish to favor.

The writer's conclusions, after talking with both Brazilians and technical experts among the foreigners in Brazil, are that the most flagrant abuse had been on federal-government lines, especially on the *Central do Brasil*. A conductor on a through train on the *Central* once showed the writer the results of a day's collections. The pile of passes was about as high as the pile of tickets. Impartial observers have reported trips on which they discovered that the majority of the passengers in the car in which they were riding were traveling on government passes. A useful corrective would be a law permitting the publication in the daily press of the names of all those traveling on passes, whether on federal-government, state-government, or privately-operated lines. The campaign which has been waged in independent sections of the press against the practice has undoubtedly lessened it.

The problems of local and personal discrimination have, as yet, been relatively unimportant because competition be-

⁴⁷ *Estado de São Paulo*, São Paulo, Aug. 5, 1931, p. 1.

tween systems is negligible. The state of São Paulo is the only area in which there is any considerable competition between different lines. In this state the *Paulista* competes with the *Sorocabana* for the traffic of the *Noroeste*. Both the *Sorocabana* and the *Paulista* connect with the terminal point of the *Noroeste* at Baurú. Some of the lines of the *Paulista* are also in competition with the *Mogyana* for traffic in the northwestern part of the state. The competition of the *Paulista* and the *Sorocabana* seems about to be settled by these lines jointly renting the *Noroeste* from the federal government.⁴⁸ State regulation of the shipment of coffee from the warehouses also tends to lessen the competition between the *Paulista* and the *Mogyana*.

The completion of the Mayrink-Santos link of the *Sorocabana* will make the *Sorocabana* a competitor of the British-owned São Paulo Railway Company for the traffic from the plateau to the sea.⁴⁹ Up to the present the São Paulo Railway Company has had a monopoly on traffic from São Paulo to Santos. The Brazilian government has had the right, since 1927, to disappropriate this line.⁵⁰ In 1925 there existed a serious congestion of traffic on the line.⁵¹ This occasioned an energetic newspaper campaign against the renewal of the contract with the São Paulo Railway Company.

⁴⁸ The federal government has been negotiating with the state of São Paulo and the *Paulista* for some time. On Sept. 3, 1931, the publicity department of the state of *São Paulo* officially announced that the federal government had proposed the rental of the *Noroeste* to the *Sorocabana* and the *Paulista* jointly. Report of Consul Cameron, São Paulo, Nov. 5, 1931, No. 382. This report, which is admirably illustrated and documented, gives a detailed picture of the economic possibilities of the *Noroeste*.

⁴⁹ *Supra*, p. 128.

⁵⁰ Decreto No. 1999, *Novacao dos Contractos da São Paulo Railway Company, Limited, Legislação Ferroviaria*, vol. vii, Clause xi, p. 849.

⁵¹ Report No. 176,198, of Consul General Gaulin, Rio de Janeiro, June 1, 1925, p. 13.

This campaign had in view the year 1927, when it became possible to disappropriate the line. Consul General Gaulin summed up the points made by the critics of the São Paulo Railway:

1. The Sao Paulo Railway is the key to the economic prosperity of the richest part of Brazil and should not be in foreign hands. 2. The railway, because of its inability to cope with the present traffic, is an obstacle to Sao Paulo's economic expansion. 3. It is responsible for the congestion at Santos. 4. Because the road has been operated at a profit, it is accused of exploitation.⁸²

The contract of the company calls for the equal division of the profits, above 8 per cent, with the government.⁸³ The exploitation charge above referred to, involves two aspects. The first is that the company has put money into useless improvements in order to increase its amount of capital and thus escape the necessity of dividing profits with the government. It is alleged, for example, that far too much money has been spent for the system of drains of the railway. Secondly, it is charged that the accounts of the company are padded. A friendly contractor sells the company a bill of goods. But the contractor does not receive the full amount named in the bill.⁸⁴ The difference is one of the means that the company uses to keep from dividing any profits with the government.

Since 1925 traffic conditions on the São Paulo Railway have improved, and the demand that the government disappropriate the line is not so insistent. Up to the time this

⁸² *Ibid.*, p. 6.

⁸³ Section 33 of Decreto No. 1759 of April 26, 1856, *Legislação Ferroviária*, vol. i, p. 120.

⁸⁴ This second charge was made to the writer by a foreign engineer who has lived for over twenty years in the state of São Paulo. He has no political or financial interest in any of the railways of Brazil.

is being written (January 2, 1932) no agreement has been reached between the provisional government and the São Paulo Railway. It is not probable that the government will disappropriate it. And the reason is that Brazil's financial situation will not permit her to buy the line.⁵⁵ On October 19, 1931, the fiscal agents of Brazil, Dillon Read and Company, announced a partial moratorium on foreign obligations of the federal government.⁵⁶ Since that time, not only have issues of the federal government been in default, but also those of states and municipalities.⁵⁷

Two facts, however, will give the Brazilian government an advantage in negotiating with the São Paulo Railway for the renewal of the contract. The first, the building of the Mayrink-Santos link of the *Sorocabana*, has already been mentioned. The second is the fact that the construction of a great hydroelectric power plant on the slopes of the coastal mountain range between Santos and São Paulo has made possible an economical canal-barge route between the two cities.⁵⁸ Locks can be employed for part of the lift and the barges can be raised by a system of cradles over the steepest part of the incline.⁵⁹ The water route already exists; it will

⁵⁵ Consul General Gaulin concluded the report, previously cited, as follows: "In view of the deplorable condition of the country's finances and taking into consideration the large sum that would be required to disappropriate the São Paulo Railway, it is doubtful whether such action will be taken in the near future." Report No. 176,198 of Consul General Gaulin, p. 8.

⁵⁶ A copy of the text of this announcement was furnished the writer through the courtesy of the finance division of the department of commerce.

⁵⁷ For an itemized list of Brazilian dollar issues in default, see the list as made public by the senate finance committee, Jan. 1, 1932. *New York Times*, Jan. 2, 1932, p. 2.

⁵⁸ The details of this route are set forth in a report of the American consulate in Rio de Janeiro, under date of Sept. 1, 1929.

⁵⁹ The report above referred to, states that work has already begun

only be necessary to construct a few additional locks and to provide the cradle lifts above mentioned.

It is beyond the scope of this study to go into the merits of the exploitation charge made against the São Paulo Railway. Freight rates on the São Paulo Railway are slightly lower than those of the *Araraquara*, a short line owned and operated by the state of São Paulo.⁶⁰ But there is no road in the state with operating conditions similar to that of the São Paulo Railway. And it does not seem possible to determine whether the steep grades but heavy traffic of the São Paulo are balanced by the level terrain but light traffic of the *Araraquara*. The point which interests us chiefly here is that, given its present financial situation, Brazil will probably be unable to acquire the São Paulo Railway. And the existence of two new potential competitors makes acquisition less desirable.

The question of local discrimination which is most discussed affects port charges more than railway rates. The commercial community of Rio de Janeiro feels that goods are being imported through São Paulo which ought to be handled through Rio de Janeiro. The areas in dispute are in the north and west of the state of Minas Geraes. Parts of this area are closer to Rio de Janeiro than to São Paulo. It happens that a 2 per cent gold surtax is levied on all goods entering the port of Rio de Janeiro. The tax is not collected

on this project. The writer, however, has not been able to get confirmation of this point.

⁶⁰ An index number of the thirty-six freight classifications of the *Contadoria Central Ferroviario de São Paulo* shows 100 for the São Paulo Railway and 108 for the *Araraquara*. The length of the average haul on the São Paulo Railway is 76 kilometers, and the length of the average haul on the *Araraquara* is 147 kilometers. The index number was calculated through figures furnished the writer by the *Contadoria Central Ferroviario de São Paulo*. The length of average haul is taken from *Estatística*, 1928, pp. 283, 285.

at Santos, the port of São Paulo.⁶¹ Rio de Janeiro partizans contend that the port works, for which this tax is nominally collected, have long since been paid for.⁶² Competition for business between the railways and other means of communication, such as the truck, the steamship, and the aeroplane, is of more significance than competition between different railway systems.

⁶¹ *Bulletin of the Division of Foreign Tariffs of the Department of Commerce*, dated Dec. 15, 1931, p. 1.

⁶² In the budget of 1932 of the provisional government, it is specified that the 2 per cent gold tax will be collected at *all* ports. Jackson, Carlton, Commercial Attaché, United States government, Rio de Janeiro, Dec. 31, 1931, courtesy of foreign tariffs division, department of commerce.

CHAPTER XI

SUMMARY AND CONCLUSIONS

(1) IN summarizing it is worth while to repeat that the Brazilian government began with a policy of subsidizing private capital for the construction and operation of the railways. The force of circumstances brought the government into the picture as the owner and operator of railway lines. Private capital has remained the owner and operator of the profitable lines. The government had to take over the unprofitable ones.¹

(2) The most significant changes in types of operation within the past two decades have been from private to state operation; the outstanding cases were the *Rede Sul Mineira*, the *Estrada de Ferro Sorocabana*, and the *Viação Ferrea do Rio Grande do Sul*. Standards of both maintenance and operation have been higher under state operation than they were under the preceding private operation. Costs to the public have not been much greater per unit of transportation than they were under the preceding private administration.

The *Rede Sul Mineira* and the *Viação Ferrea do Rio Grande do Sul* are owned by the federal government. In changing the rentors from private companies to state governments, the federal government seems to have bettered its position, for it has secured the assistance of the states in furnishing transportation. The states of Minas Geraes and Rio Grande do Sul had reached that stage in their development where they appeared able to share with the federal

¹ There are two exceptions to this rule, the *Estrada de Ferro Sorocabana* and the *Estrada de Ferro Araraquara*, both located in the rich coffee producing area, the state of São Paulo. The circumstances under which they came into the hands of the state have already been recounted.

government the task of providing transportation. The responsibility previous to this time had been carried chiefly by the federal government. The federal government has secured lessees whose rate policies will probably be more in accord with its own. The people of these two states are getting better transportation from the two lines; possibly they would answer that the better service justifies the added cost to the states.

The state of São Paulo's operation of its line, the *Sorocabana*, is complicated by connection with the problem of breaking the monopoly of a foreign company on transportation from the chief city, São Paulo, to the port of Santos. The *Sorocabana* is constructing a line from Mayrink to Santos, one of the purposes of which is to take from the English company this monopoly. This extension is not yet completed; it is not possible, therefore, to say whether it will be able to transport goods cheaply enough to make it a serious competitor of the English company. But the Mayrink-Santos link apart, the state of São Paulo is getting better service from *Sorocabana* than it was when the *Sorocabana* was operated by the private company. The physical plant is more nearly adequate and standards of maintenance and operation are higher. Costs to the public are not much higher than they were during private operation. Probably the taxpayers ask themselves if the higher cost is not offset by the improved service.

These conclusions regarding the *Sorocabana* are confirmed by comparing it with the efficient, privately-operated line, the *Companhia Mogyana*. Four main factors have been responsible for this excellent comparative showing of the states of Minas Geraes, São Paulo, and Rio Grande do Sul. First, these states have the greatest agricultural development and are more advanced industrially than the country as a whole. Climate is more favorable. There is definite state

pride, and a feeling of keener responsibility of the citizens of these states towards state enterprises than towards federal-government enterprises. Protests against abuses in state administration would be more prompt and energetic. Second, the empire represented centralization. The Republic has fostered development of power and responsibility in the states. It was logical, therefore, not simply that the states should be asked to assume a larger share of the railway responsibility, but also that the responsibility be ably discharged. Third, the presidents of these states usually aspire to be presidents of the republic; and these ambitions probably stimulate them to make the best possible showing with important public utilities. The presidents of the republic have, with few exceptions, come from these states.³ Fourth, the preceding private companies faced the very difficult World-War conditions not confronted by the states; and the lines have been able to show comparatively low costs per unit of traffic under state operation because of increases in traffic density.

(3) The comparison of the federal government line, the *Central do Brasil*, with the privately operated *Paulista*, results in a verdict in favor of the latter. The *Central* has too many employees; too large a proportion of annual income has to go into the payment of personnel; and therefore insufficient funds are available for the purchase of material, equipment and supplies.

(4) Comparison of all railways, and a detailed analysis of a Brazilian's study of a Class II railway operated by the federal government, reveal that this excessive expenditure for personnel, with its consequent weakening of the physical

³ The present head of the provisional government was formerly the president of the state of Rio Grande do Sul; the national president from 1926 to 1930 was formerly president of the state of São Paulo; his predecessor in office, 1922-1926, was formerly president of the state of Minas Geraes.

plant, is probably the outstanding weakness of federal-government administration. These considerations seem to justify the conclusion that physical plants are more nearly adequate, and that standards of maintenance and operation are higher on the state-government lines and private-operated lines than on the lines operated by the federal government. The factors which have been significant in this result may be divided into three groups: (a) The first group is composed of factors for which the federal government administration is not subject to criticism. If it be assumed that it is wise economic policy for an undeveloped and thinly-populated country to spend money on railways, built to encourage settlement of all suitable areas and development of all the resources of the country, then the government's administration of the railways is not responsible for the deficits of operation caused by low traffic density or low value in relation to weight of the products hauled. Neither can the federal government be held responsible for difficult terrain; for however skillful the engineer, it costs money to run railways from the coast cities up the Coastal Mountain Range to the interior plateau. The government, likewise, should not be held responsible for the misdeeds and errors of private companies, later taken over by the government, in selecting the routes which the lines followed.

(b) The second group is composed of factors for which the government is subject to mild criticism. For example, the government is partly responsible when one of its roads is financially crippled through the government's failure to adjust rates promptly to a depreciating currency medium. Another factor in this group is the failure of the government to take energetic and systematic measures to correct the more glaring errors in the early laying out of the roads. Such a policy, had it been pursued continuously, would have resulted in a straightening of curves and leveling of grades, and thereby lowering the cost of operation.

(c) The third group is composed of factors for which the federal government management is subject to just criticism. These include the continued selling of transportation at a figure admittedly below out-of-pocket costs in handling the traffic. The outstanding example of this is the suburban traffic on the *Central*. The government is likewise responsible for the expenditure for excess personnel, appointed for political purposes, of funds needed for more and better supplies and equipment. In the same class, and perhaps less defensible from any point of view, is the complete diversion of funds borrowed for the purpose of electrification of the *Central do Brasil* to "other purposes." It seems impossible to avoid the conclusion that the political slant of the management of the railways of the federal government has retarded their development as transportation units.

It is not possible to decide between state-government operation and private operation for the following reasons: first, the relative shortness of time in which the states have been operators of the systems; second, the difference in the war conditions which faced the companies from the conditions which later faced the states; third, the differences in traffic density, kinds of freight handled, and the nature of the terrain through which the systems run. State operation, so far, compares favorably with private operation.

It is possible, of course, that the states of Minas Geraes, São Paulo, and Rio Grande do Sul, may in the management of the *Rede Sul Mineira*, the *Estrada de Ferro Sorocabana*, and the *Viação Ferrea do Rio Grande do Sul*, develop the same deficiencies as the federal government's administration has shown. Up to the present, however, their willingness to raise rates to meet rising costs, and particularly the farseeing provisions which the states of Minas Geraes and São Paulo have already made for the repair of rolling stock, and for which the state of Rio Grande do Sul has made plans, do not so indicate.

An interesting field for further inquiry is suggested by the mutual effects on each other of the existence of the two types, government and private operation, side by side. The dual or more correctly, the triple system, so far, has probably stimulated the activity of each and is perhaps most noticeable in the state of São Paulo. It is possible that standards of efficiency are higher in the government's railway staff than in other divisions of the government's service. And it may be said without hesitation that they are just as high. If they are higher, the most important single cause is probably the presence of the privately-operated lines. Railway mileage is so limited in Brazil that there is not much competition between lines for traffic. But one cannot talk with the railway executives of Brazil without realizing that there exists a healthy rivalry between the two types of operation for public confidence and approval. It is probable also that the presence of the government-operated lines has been a factor in causing the privately-operated lines to reduce their rates. And, on the other hand, the presence of private companies collecting fares high enough to pay operating expenses and fixed charges has probably caused the government lines to adjust their rates, more quickly than otherwise would have been the case, to changes in operating costs, thus lowering or wiping out their deficits. As a result of this, the burden to be met by the taxpayer has been lower. If the federal-government lines ever pay their own way, including fixed charges, the presence of the privately-operated lines will have been partly responsible.

The author, in addition to the formal summary and conclusions above given, has been impressed by the relatively minor role played by strictly technical factors. The relative technical ability of management has played a less important role than have factors growing out of the general financial and political situation of Brazil. The first big shift in

government policy was the recapture operations, 1900-1905; this came chiefly as the result of the financial crisis through which the nation passed in 1898. The financial crisis was mainly brought about by the over issue of inconvertible paper currency. The habit of budget deficits, coupled with the heavy expenditures necessary to put down disturbances of public order, made this inflation inevitable. And railway expenditure is one among many factors causing the budget deficits. The second shift was the entry into the field of the three most important states as operators of railways, in 1919 and 1920. This change in policy was primarily a result of the unusual conditions caused by the World War. Equipment could not be purchased abroad; and while the foreign exchange value of the milreis did not greatly decline, operating costs, as in other countries, greatly increased.

The most difficult single feature of railway operation in Brazil is the unstable currency medium, the secular trend of which has been depreciation. It is hard to operate utilities, even in the most highly developed country, if the money medium is fluctuating. It is particularly so in Brazil, because locomotives, rails, other steel equipment, and coal have to be purchased abroad and paid for in terms of gold prices. Home prices, for the most part, do not quickly follow changes in the exchange value of the milreis.

A given private railway, for example one of Marshall's representative firms, might be able to expand its lines and equipment to take care of growing traffic, if the currency medium were stable. The milreis declines and the company petitions the government for a raise in rates. The government, knowing the popular feeling, acts slowly and possibly rejects the application. The government is persuaded to act only when the conditions become really serious. Perhaps the company is now past the point of being saved. It has no credit and cannot purchase needed equipment. Conditions

finally become so bad that public clamor compels the government to take over the road. Under such circumstances foreign capital naturally hesitates to invest in Brazilian railways. The national financial policy, resulting in a depreciating currency, has handicapped the railways, increased their costs, and decreased their efficiency.

Compared with the expenditures necessary to put down the revolutionary outbreaks, the deficits of government-operated railways are relatively small. Furthermore, two factors, not closely connected with railways, contribute to the over-staffing of government railways. First, the economic prospects of many citizens are such that government jobs with relatively small pay are eagerly sought for. As long as the standard of life for the masses is as its present level, there will continue to be heavy pressure on the government for the creation of jobs. Second, there is the habit of mind, inherited from the empire, of looking to the government for help. In neither the mother country, Portugal, nor in Brazil was there anything in the eighteenth century comparable with the development of what Professor Wesley C. Mitchell, speaking of eighteenth-century England, has called "individual initiative becoming a mass phenomenon."

One may agree with Sir Otto Niemeyer's suggestion that the railroads of the government be made self-supporting, and at the same time realize that this is but a part of the larger task of developing in Brazil the habit of a balanced budget. For the exchange fluctuations, the outstanding problem for public utilities, are one phase of the constantly difficult fiscal situation. The annual budget deficits, by encouraging new currency issues, depress the milreis; and the depression of the milreis, by increasing the amount of paper currency necessary to meet gold payment on the foreign debt, adds to the budget deficit. The action is circular.

APPENDIX

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 *Comercio 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. *Comp. Ferroviaria Este Brasileiro* (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. *Companhia Mogyana de Estradas de Ferro*
 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. *Estrada de Ferro Sorocabana*
 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. *Cia. E. F. São Paulo Rio Grande*
 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. *Viação Ferrea do Rio Grande do Sul*
 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)	1910-1919		Receipts per P. K. (In Milreis)	Receipts per T. K. (In Milreis)	Number Killed
		Receipts (In Millions of Milreis)	Expendi- tures (In Millions of 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

<i>Year</i>	<i>Percentage</i>	<i>Year</i>	<i>Percentage</i>	<i>Year</i>	<i>Percentage</i>	<i>Year</i>	<i>Percentage</i>
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	<i>Central</i>		<i>Paulista</i>				<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		
	<i>Cent.</i>	<i>Paul.</i>	<i>Cent.</i>	<i>Paul.</i>	<i>Cent.</i>	<i>Paul.</i>	
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	<i>Central</i>		<i>Paulista</i>		<i>Estadística</i> Page
	Passenger		Freight		
	<i>Cent.</i>	<i>Paul.</i>	<i>Cent.</i>	<i>Paul.</i>	
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.

APPENDIX

TABLE 26
COMPARATIVE PASSENGER RATES SAO PAULO AREA

CLASSIFICATION AND DISTANCE	In Milreis						
	1930						
	GOVERNMENT- OPERATED ROADS			PRIVATELY OPERATED ROADS			
	<i>E. S.</i>	<i>N. B.</i>	<i>E. F. A.</i>	Aver.	<i>C. P.</i>	<i>C. M.</i>	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	Average op. rat. 1923-28
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	
<i>Paulista</i>	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	
<i>São Paulo R. G.</i> ...	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 Operated Lines</i>	7,284

Estatística, 1928, pp. 186-7.

APPENDIX

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
Paulista	—	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>Ilheos 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							
Great Western ...	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
Leopoldina	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			Maximum Weight			Minimum Weight		
	(Total owned)			(Thous. of tons)			(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—			Passenger Cars—								
	Average Capacity			Average Number								
	(Total owned)			(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
1923....	—	1927....	—
1924....	—	1928....	81
1925....	—	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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