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Colombia during 1920-1950

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Too Late but Profitable: Railroads in Colombia during 1920-1950¹

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Abstract

During the 1920s, the Colombian economy experienced the highest rate of growth in its history. The economic reforms of 1923 (the central bank, gold standard, banking legislation, fiscal reorganization), the coffee boom, and the unprecedented influx of foreign capital were the driving forces behind this success. During that decade, the country received 25 million dollars from the United States as compensation for its role in the separation of Panama from Colombia. Those reforms and the growth in coffee exports also allowed for an enormous increase in foreign loans. The value of the loans obtained by 1929 came to 257 million dollars. Those funds were used mainly to build much needed public infrastructure, particularly railroads. Approximately 45% of the foreign loans during that period were invested in railroad construction. Additionally, 16 of the 25 million dollars received as reparation for Panama were invested in railroads. In this paper, we estimate the global rate of return and the internal rates of return on individual railroads. For those calculations, we consider that Colombia ended up paying only around 85% of the loans obtained in the 1920s's, owing to the effects of the Great Depression and the suspension of foreign debt payments. The rates of return on the railroads constructed and extended in the 1920's are comparable to those obtained for European countries in the nineteenth century.

Keywords: rate of return, investment, railroads, foreign debt, Colombia

JEL Codes Classifications: N26, N76, O16; O18

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*“El problema de los transportes puede ser el más fundamental en la historia económica del país”
Frank Safford (2010).*

1. Introduction

The development of an efficient system of transportation always has been a major challenge for Colombia. Its topography is one of the most rugged in the world, and the majority of its population lives in one of the three mountain ranges into which the Andes divide when they enter the south of the country. Gold was the main export during the colonial period and up to the mid nineteenth century, so the high cost of transportation was not a major obstacle to reaching international markets. However, in the second half of the nineteenth century, when Colombia tried to integrate into the world economy through the export of tropical products such as tobacco and coffee, internal freight costs became very important. Railroads were the main technological innovation of that century to improve land transportation. However, their construction in what is now Colombia started very late in the century, and only a few, unconnected lines were built, because the country was poor and the mountainous topography made construction costs extremely high. It was only when economic conditions changed, in the 1920s, that it was possible to build a significant amount of railroad lines. The efficiency of that boom in railroad construction was amply debated in the early 1930s. The debate was highly politicized and very few authors actually evaluated those investments from an economic point of view.

The purpose of this paper is to contribute to the discussion on the economic results of the railroad construction effort in Colombia during the 1920s, by rigorously estimating

the total annual rates of return for the period 1920-1950. We also calculate the annual rates of return for individual railroad lines and for freight and passenger transportation. In addition, our calculations consider the fact that, as a result of the Great Depression and the suspension of payments on foreign debt, Colombia ended up paying only a portion of the loans obtained in the 1920's. To that end, we construct a fairly detailed database of yearly investments, income, expenditures, number of passengers, tons of freight, and railroad tracks for fourteen Colombian railroads in the period under analysis.

In the next section, we present the main developments in the Colombian economy during the period 1920-1950, emphasizing the factors that explain its excellent performance. The third section looks at the development of the railroad network from the late nineteenth century to 1919. Next, the investments in railroads that were made in the 1920s, during the so called "Dance of Millions," are discussed. In section five, the annual rates of return on Colombian railroads in the period 1920-1950 are presented. The conclusions are presented in the last section.

2. The Colombian Economy: 1920-1950

The period from 1920 to 1950 was one of the most successful for the Colombian economy, even though, beginning in 1929, the Great Depression was felt across the world. In fact, if we exclude the spectacular expansion during the aftermath of the War of a Thousand Days (1899-1902), the three decades examined in this paper witnessed the highest rates of economic growth in Colombia's history. Four main factors

contributed to the rapid pace of economic growth throughout the first half of the twentieth century: export growth, foreign loans, advances in transport infrastructure, and import substitution industrialization. For the entire period from 1920 to 1950, the annual growth rate in real per capita GDP was 2.07%. Even during the years of the Great Depression, the country had relatively good economic results, since GDP per capita fell by only -2.8 and -3.6 in 1930 and 1931, and resumed its growth in 1932. By 1933, the country had surpassed its 1929 GDP per capita (see Table 1).

A rapid expansion in coffee exports was the main stimulus for the high rate of economic growth witnessed in Colombia during the first half of the twentieth century. In 1920, coffee exports accounted for 51.2% of total exports; by 1950, that share had increased to 77.8%. The rate of growth in coffee exports during this period was unprecedented in Colombian history. The country's efforts in the nineteenth century to integrate into the world economy via commodity exports faced enormous difficulties. However, between 1905 and 1919, the real annual rate of growth in coffee exports was 5.92%; from 1920 to 1929, these exports continued to increase at an annual rate of 5.83% (see Table 2). The expansion in coffee exports was helped by high prices on international markets during the 1920s. In the 1930s, the price of coffee remained low, but recovered after 1940 (see Graph 1).

Table 1
Colombian GDP and Exports: 1920-1950

Year	GDP per Capita (1975 pesos)	Exports per Capita (1975 pesos)	Coffee Exports / Total Exports	Real External Price of Coffee (US cents per pound)^{1/}
1920	4,802.76	909.3	51.2%	17.09
1921	4,978.62	1,418.6	66.5%	10.52
1922	5,210.46	1,073.1	69.6%	13.51
1923	5,433.10	1,221.3	74.8%	13.89
1924	5,628.09	1,296.7	79.8%	18.01
1925	5,814.14	1,137.7	78.4%	22.30
1926	6,243.08	1,465.1	76.9%	21.48
1927	6,670.61	1,517.0	65.1%	18.71
1928	7,018.71	1,724.9	66.0%	21.79
1929	7,127.29	1,791.0	60.6%	20.87
1930	6,926.02	1,896.9	54.4%	13.80
1931	6,680.45	1,723.8	56.1%	11.61
1932	6,982.18	1,756.3	61.1%	11.67
1933	7,228.60	1,713.8	67.2%	10.67
1934	7,531.28	1,690.3	54.1%	11.54
1935	7,562.55	1,932.5	55.5%	9.75
1936	7,804.90	1,985.5	58.3%	9.74
1937	7,769.35	1,994.5	53.8%	10.86
1938	8,110.98	2,063.2	54.4%	8.60
1939	8,403.59	1,834.3	49.2%	8.69
1940	8,381.06	2,069.3	44.1%	7.73
1941	8,318.64	1,412.3	47.3%	9.38
1942	8,137.29	1,690.8	75.4%	12.89
1943	7,976.20	2,028.1	80.5%	12.57
1944	8,312.56	1,961.2	72.5%	12.46
1945	8,495.19	2,009.5	74.0%	12.37
1946	9,089.94	2,120.6	76.6%	15.42
1947	9,218.01	1,992.2	70.5%	18.81
1948	9,254.37	2,026.0	70.7%	18.30
1949	9,822.58	1,988.1	72.3%	20.06
1950	9,694.49	1,696.8	77.8%	32.58

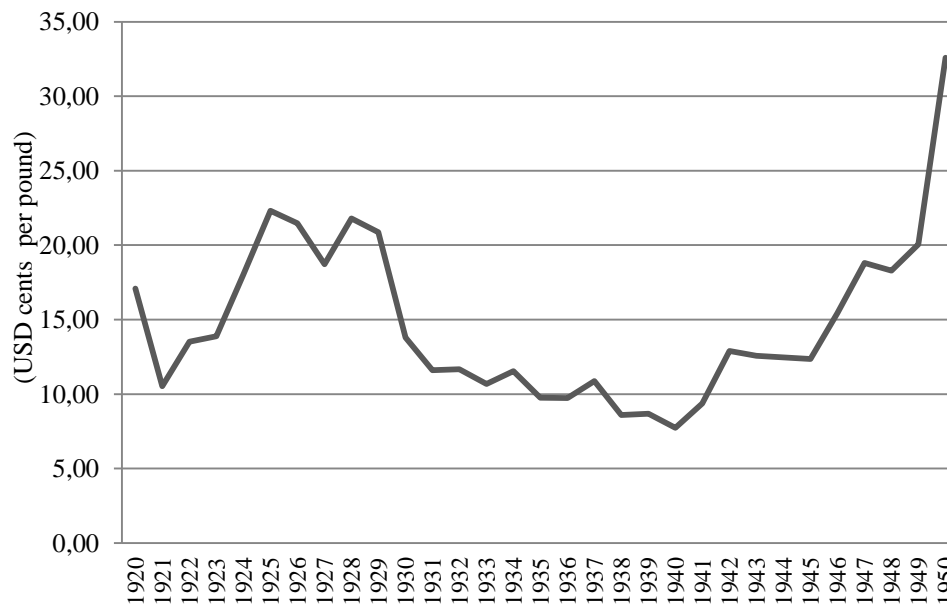
^{1/}The external coffee prices correspond to the external price for green coffee in US / US CPI (1925=1).
Source: GRECO (2002) for macroeconomic variables, and Flórez, C.E. (2000) for population.

Table 2
Rates of Growth in GDP and Exports per Capita: 1905-1950
 (Percentage)

Period	GDP per Capita	Exports per Capita
1905-1919	2.93	5.92
1920-1929	4.63	5.83
1930-1939	2.34	1.31
1940-1950	1.96	0.87
1951-2000	1.95	2.28
1920-1950	2.07	1.79

Source: GRECO (2002) for GDP and exports, and Flórez, C.E. (2000) for population.

Graph 1
Real External Price of Coffee: 1920-1950



Source: GRECO (2002).

The Colombian economy grew quite slowly during the nineteenth century. For example, circa 1912 Colombian exports per capita were, together with those of Haiti and Honduras, among the lowest in Latin America.² Consequently, government revenue was very limited and, as a result, the international debts acquired during the War of Independence could not be paid in the nineteenth century. This led to a lack of access to

² Bulmer-Thomas, V. (1994), p. 69.

foreign loans. Since a successful export product had yet to be found, the country was not attractive to foreign investors. The situation began to change at the beginning of the twentieth century, when the revenue from coffee exports enabled the government to pay Colombia's external debt. It also gave the government the possibility of accessing foreign loans for the first time since independence. Even so and although the economic situation in the early 1920s generated a new optimism, private bankers in New York expressed a great skepticism about the country's economic institutions when approached by Colombian government authorities; namely with respect to: the monetary regime, the banking sector and state of public finances, among other aspects. Colombian government officials were advised to hire an expert in financial reforms to gain the confidence of US bankers and Edwin W. Kemmerer, a professor at Princeton University, was engaged for that purpose.³

In 1923, a group of US economic experts led by Edwin W. Kemmerer, and hired by the Colombian government, arrived in Bogotá. As a result of the recommendations of the Kemmerer Mission a number of reforms were instituted. For example, an independent central bank was organized, the gold standard was adopted, a new banking law was passed, and a bank-supervisory agency was created, along with an entity to audit government expenditure. This institutional renovation paved the way for an influx of loans to the public and the private sectors. In 1913, Colombia was the Latin American country with the least US investment; however, from that year up to 1929, its growth rate for US investment was the highest in the region.⁴

³ Meisel, A. (1990), p. 235.

⁴ Ibid, p. 234.

In 1922, Colombia began to receive 25 million dollars in compensation for US intervention in the separation of Panama. Moreover, an influx of private loans was observed following the Kemmerer reforms in 1923. This was an unprecedented volume of resources available for economic development of the country. By 1929, the level of public foreign debt had reached 162 million dollars (see Table 3). The flow of foreign loans ceased with the Great Depression and, the debt/export ratio dropped drastically as a result (see Graph 2).

How did the country spend the 25 million dollar payment for Panama and the more than 160 million dollars borrowed by the public sector? Most of these resources were invested in public works related to transportation: canals, roads, bridges and especially railroads. This is entirely understandable, because the country had an enormous lag in transportation infrastructure as a result of its poor export performance during the nineteenth century and its extremely rugged topography. In 1920, for example, Colombia surpassed only Nicaragua and Haiti among the Latin American countries with more kilometers of railroad per capita.⁵ At the beginning of the 1920s, many Colombian leaders and foreign observers agreed the country's main problem was its precarious transportation infrastructure. For example, in Edwin W. Kemmerer's view, "Colombia is comparatively isolated from the rest of the world, mainly for lack of railroads. The great problem of Colombia is currently that of transportation."⁶ Thus, it is understandable that most of the foreign capital obtained through loans and that the US compensation was invested in public works related to transportation. Advances in the

⁵ See <http://moxlad.fcs.edu.uy/en/databaseaccess.html>

⁶ Kemmerer, E. (1923), p. 12.

1920s and road construction in the 1930s and 1940s were the third reason why the Colombian economy grew so much between 1920 and 1930.

Table 3
Foreign Debt / Exports: 1923-1950
(Millions of US dollars)

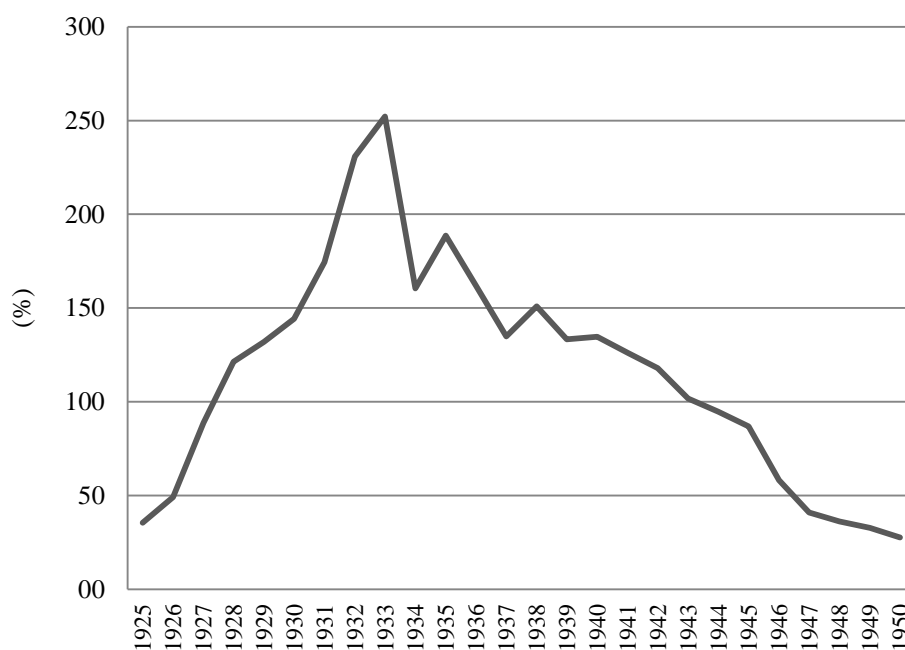
Year	Public Foreign Debt ^{1/}	Exports ^{2/}	Debt/Exports (Percentage)
1925	29.6	83.5	35.4
1926	54.0	109.8	49.2
1927	94.5	106.4	88.8
1928	158.7	130.7	121.4
1929	162.0	122.8	132.0
1930	157.9	109.5	144.3
1931	165.9	95.1	174.4
1932	154.4	66.9	230.8
1933	148.6	58.9	252.1
1934	150.4	93.7	160.5
1935	151.0	80.1	188.5
1936	145.8	90.0	162.0
1937	140.5	104.2	134.9
1938	137.8	91.3	151.0
1939	134.7	101.0	133.3
1940	129.0	95.8	134.6
1941	126.7	100.4	126.2
1942	129.2	109.5	118.0
1943	127.3	125.1	101.7
1944	123.2	130.1	94.7
1945	122.1	140.5	86.9
1946	117.0	201.2	58.1
1947	113.3	276.2	41.0
1948	114.6	317.0	36.2
1949	109.0	333.5	32.7
1950	109.0	393.6	27.7

Source: ^{1/} Avella, M. (2004) and ^{2/} GRECO (2002).

The annual growth rate of real exports fell to 1.31% in the period 1930-1939 and to 0.87% in 1940-1950. Although the real per capita GDP growth rate also declined during

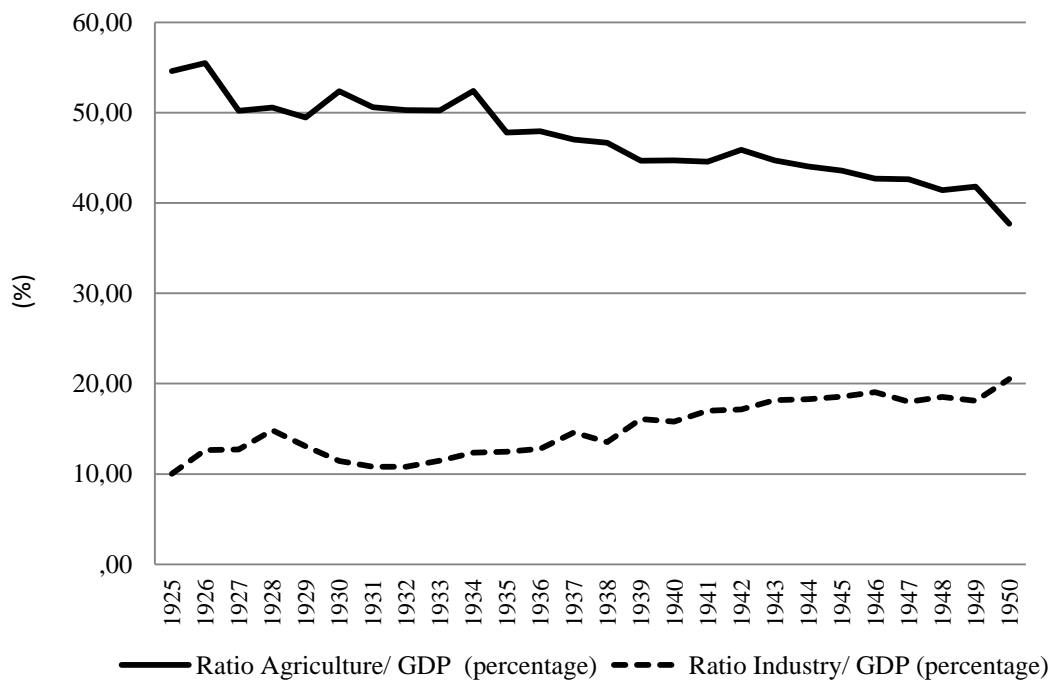
those same periods, the reduction was not as drastic as that of exports (see Table 2). The reason is the domestic non-traditional manufacturing sector began to experience high annual growth rates: 10.05% in 1930-1939 and 7.78% in 1940-1950. As a result of peso devaluation with respect to the dollar in the early 1930s, a process of relatively spontaneous import substitution industrialization took place. This led to a shift in the sectorial composition of GDP, with industry gaining and agriculture losing share (see Graph 3).

Graph 2
Foreign Debt/Exports, 1925-1950



Source: Avella, M. (2004) and GRECO (2002).

Graph 3
GDP by Type of Economic Activity: 1925-1950



Source: Cuadernos de la CEPAL (1978).

3. Development of Railroads in Colombia: Late Nineteenth Century to 1919

The railroads in Colombia were built rather late. Progress in the construction of railways was extremely slow, mainly because of the country's topographical and geographical conditions, a lack of economic resources, weak institutions, and the inability of the government to set priorities for the development of transport infrastructure.⁷ According to Frank Safford (2010, p. 566), there were no strong incentives for foreign capital to invest in the construction of railways. In addition, the spatial dispersion of the population made it difficult and expensive to improve land transportation.

⁷See Safford, F. (2010) for a study of the evolution of infrastructure development in Colombia during the nineteenth century and Pachón, A. and Ramírez, M.T. for the twentieth century (2006).

Railroad development in Colombia began in the 1870s, while other Latin American countries began much earlier.⁸ By the time Colombia built its first railroad, Brazil had more than 2,000 kilometers of railroad tracks and Mexico, more than 1,600 kilometers. As shown in Map 1, most of the railroads in Colombia were constructed to transport commodities, especially coffee, from producing regions to the Magdalena River and the seaports (i.e., the Antioquia, Cucuta, La Dorada, Girardot, and Pacifico lines).

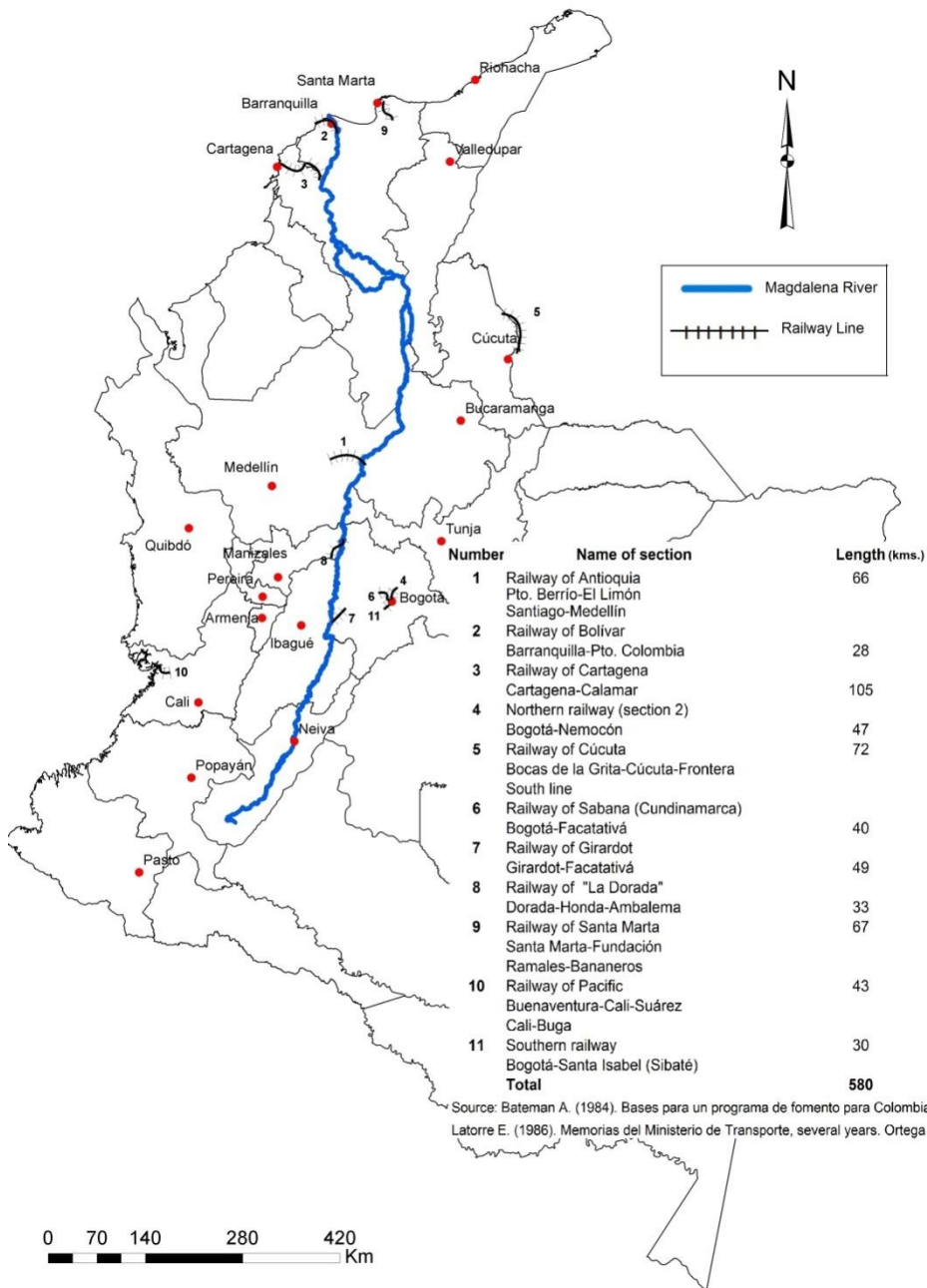
Due to financial constraints and underdeveloped capital markets, these railroads were built under a concession system, financed by subsidies, and with guarantees of interest on capital investment and tax exemptions. According to Pachón and Ramírez (2006), this system was not successful in Colombia due to the lack of well-defined contract terms, property right problems, and unclear regulations, which generated extra costs for the government, not only because of higher construction costs and incomplete works, but also because of the legal costs associated with litigation against the contractors.

Less than 600 kilometers of railroad were built between 1850 and 1900. By 1900, Colombia had 0.15 kilometers of railroad per 1,000 inhabitants, which was well below the average for Latin America. As shown in Graph 4, Colombia had fewer kilometers of railroad per 1,000 inhabitants at the beginning of the twentieth century than most Latin American countries, and surpassed only Nicaragua, Ecuador, and Haiti. In contrast, Argentina had the most kilometers of railroad per 1,000 inhabitants.

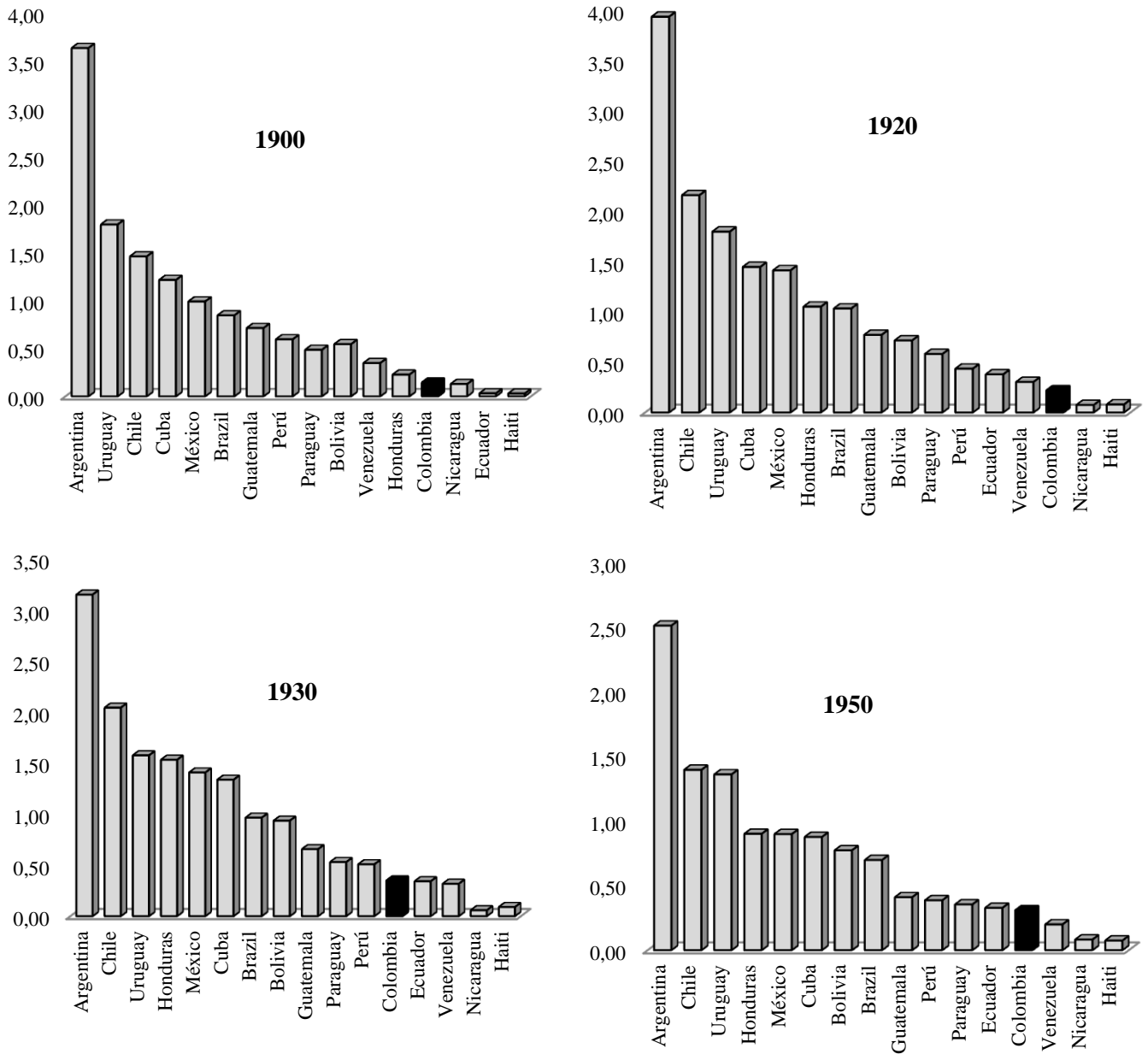
⁸In 1850, Colombia started to build its first line: the Panama Railway. The construction of ten railroads was begun between 1870 and 1900: Antioquia (1874), Barranquilla (1869), Cartagena (1890), Cucuta (1878), La Sabana (1882), Girardot (1881), La Dorada (1884), Norte (1881), Pacifico (1878), Santa Marta (1882).

Map 1 Railroads in Colombia

1905



Graph 4
Latin America: Kilometers of Railroad per 1,000 Inhabitants: 1900-1950
 (Selected countries)



Source: <http://moxlad.fcs.edu.uy/en/databaseaccess.html>

Railroad expansion stopped during the “War of a Thousand Days” (1899-1902). It was only under the government of Rafael Reyes (1905-1910) that the construction of railways resumed, as part of a policy to promote agricultural exports. Major expansions occurred in 1909-1910, mainly in the so-called coffee railroads (Antioquia, La Dorada,

Girardot, Pacifico and Tolima; see Table 4). However, as discussed further on in this paper, the largest expansion and investment in railways occurred in the mid-twenties, as a result of the country's insertion into the world financial markets, the US compensation for Panama and the increase in international coffee prices, which allowed the government to allocate more resources for investment in railways (see Graph 5).

Between 1905 and 1919, freight and passenger transport via Colombian railroads increased continuously (see Graphs 6 and 7), especially on the Barranquilla line and the coffee railroads (see Graphs 8 and 9).⁹ It is noteworthy that the Antioquia railroad had the largest share of passengers transported during the period.

By 1919, Colombia had approximately 1,300 kilometers of rail lines, mostly concentrated in the central and northern regions of the country. Despite the government's policy to encourage railroad construction, the development of the railway system was very slow; less than 700 kilometers were built during this period.¹⁰ As shown in Map 2, the system was not integrated; in fact, most lines were isolated from one another. They were typically short and only connected certain productive regions with the ports or the Magdalena River. They did not link the main cities.

⁹According to Beyer, R. (1947), 71% of the railway lines in 1898 and 80% in 1914 were used to transport coffee.

¹⁰For more details see Pachón, A. and Ramírez, M. T. (2006).

Table 4
Colombian Railroad Tracks (kms.): 1885-1950

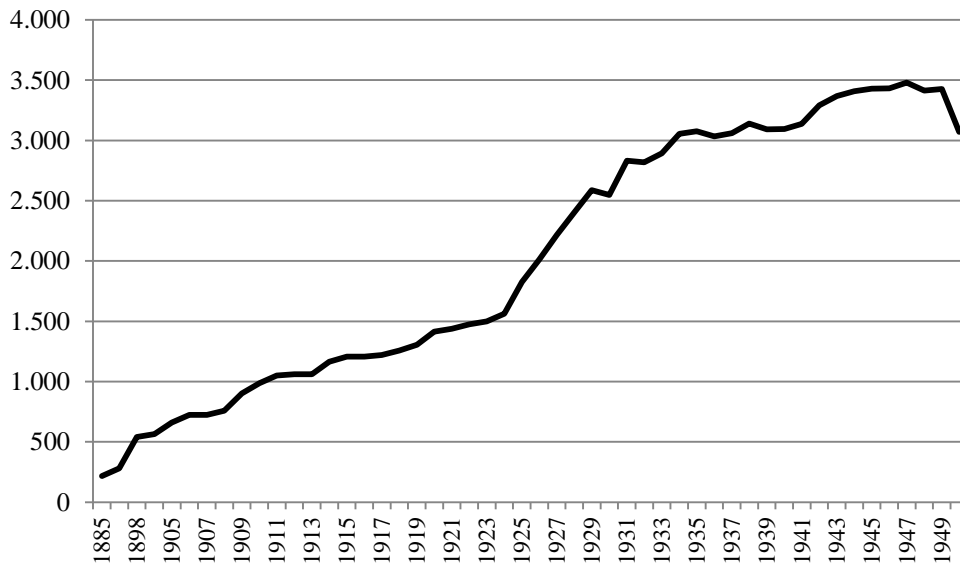
Year	Antioquia	B/quilla	Caldas	C/gena	Norte 1	Norte 2	Cúcuta	Cundin.	Girardot	La Dorada	M/dalena	Nariño	Nordeste	Pacífico	Tolima	Sabana	Sur
1885	38	28					54	40	31	15				38			
1890	48	28					55	40	31	29				52		40	
1905	66	28		105		47	72	40	49	33	67			43	21	40	30
1910	102	28		105	12	62	72	40	132	111	98			94	25	40	30
1911	109	28		105	12	62	72	40	132	111	98			94	25		30
1912	109	28		105	12	62	72	40	132	111	98			94	25		30
1913	188	28		105	20	62	72	40	132	111	98			94	25		30
1914	205	28		105	20	62	72	40	132	111	98			234	25	55	33
1915	205	28		105	20	62	72	40	132	111	128			234	30		33
1916	205	28		105	20	62	72	40	132	111	128			234	30		35
1917	215	28	10	105	20	62	72	40	132	111	128			233	30		35
1918	223	28	10	105	20	62	72	40	132	111	128			233	40		35
1919	223	28	10	105	20	62	72	40	132	111	128			233	65		35
1920	242	28	31	105	20	62	72	55	132	111	159			233	65		35
1921	242	28	39	105	27	62	72	55	132	111	159			269	76		35
1922	242	28	39	105	27	62	72	55	132	111	180			269	94	55	35
1923	242	28	50	105	27	62	72	55	132	111	180			330	84		35
1924	242	28	50	105	29	62	72	55	132	111	180			390	94		35
1925	248	28	64	105	50	104	72	63	132	111	181			480	94		35
1926	248	28	83	105	50	154	72	63	132	111	184		49	548	106		35
1927	259	28	117	105	72	154	92	63	132	111	184	35	58	577	141		37
1928	289	28	117	105	72	172	92	63	132	111	184	50	74	577	141		48
1929	320	28	117	105	90	172	100	75	132	111	184	73	101	577	141		49
1930	320	28	117	105	109	221	100	75	325	111	187	95	117	577	141		49

Colombian Railroad Tracks (kms.): 1885-1950 (Cont.)

Year	Antioquia	B/quilla	Caldas	C/gena	Norte 1	Norte 2	Cúcuta	Cundin.	Girardot	La Dorada	M/dalena	Nariño	Nordeste	Pacífico	Tolima	Sabana	Sur
1931	320	28	119	105	109	246	100	165	326	111	187	97	252	577	199		
1932	320	28	111	105	109	246	100	165	331	111	187	97	252	645			
1933	337	28	111	105	109	256	83	165	331	111	186	97	252	678			
1934	337	28	111	105	109	256	83	211	331	111	189	97	252	678			
1935	337	28	117	105	109	269	83	212	331	111	190	97	252	678			
1936	337	29	117	105	109	269	62	212	331	111	126	97	252	678			
1937	359	29	117	105	109	269	62	215	331	111	126	97	252	678			
1938	359	29	117	105	109	269	62	215	368	111	126	97	253	719			
1939	337	29	117	105	117	269	62	215	368	111	126	107	253	730			
1940	337	29	118	105	117	269	68	215	368	111	193	107	253	730			
1941	337	29	118	105	117	264	68	223	369	111	193	107	253	730			
1942	337	29	118	105	117	264	68	223	398	111	193	112	285	874			
1943	383		125	105	117	254	68	223	398	112	216	114	285	884			
1944	383		125	105	117	254	68	223	398	112	216	114	285	884			
1945	383		125	105	117	254	68	223	398	127	216	114	293	884			
1946	383		125	105	117	254	63	223	399	128	186	114	293	884			
1947	385		125	105	117	254	63	223	399	128	186	114	293	887			
1948	385		125	105	117	254	63	223	399	128	153	114	293	916			
1949	339		125	105	117	254	63	200	399	113	153	111	293	916			

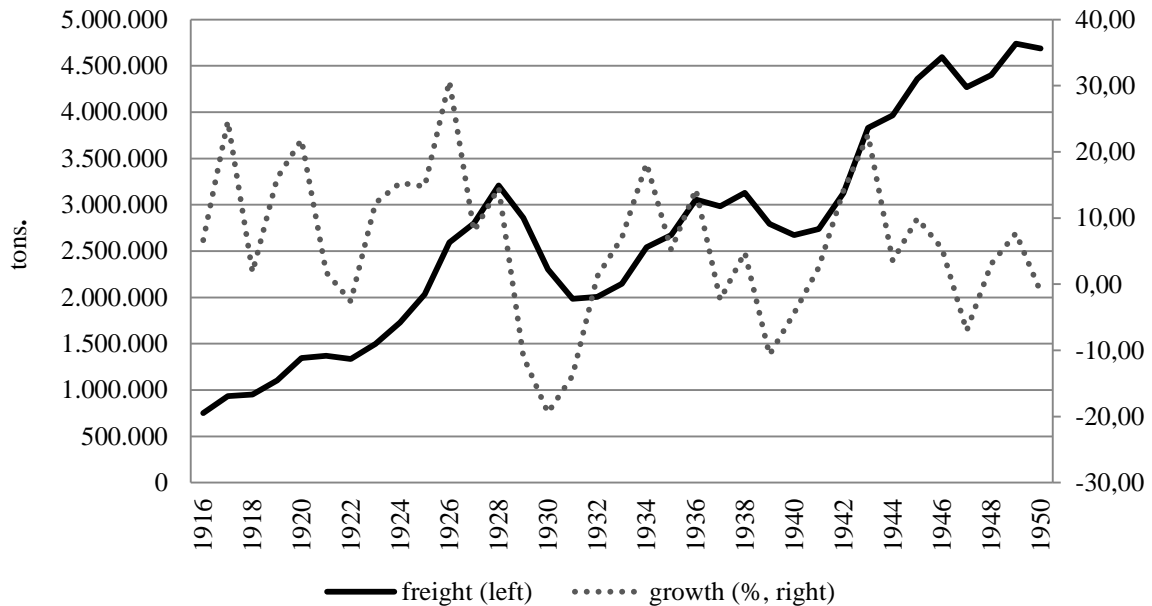
Sources: Anuarios Estadísticos de Colombia and Memorias del Ministro de Obras Públicas de Colombia for several years and the authors' calculations.

Graph 5
Total Railroad Tracks in Colombia (Km.): 1885-1950 (*)



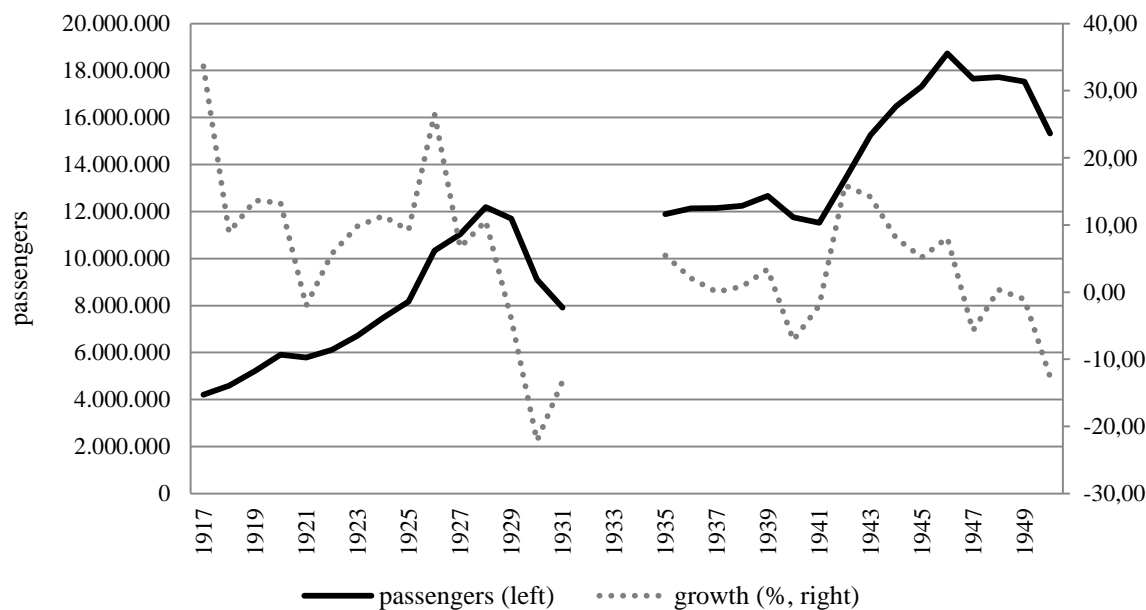
(*) Total Railroad Tracks= National plus departmental, municipal and private railroads.
 Source: Pachón, A. and Ramírez, M.T. (2006).

Graph 6
Colombian Railroads: Freight (tons): 1916-1950



Note: Corresponds to the sum of freight transported by the following railroads: Antioquia, Barranquilla, Caldas, Cartagena, Norte sec 1 and sec 2, Cucuta, Cundinamarca, Girardot, La Dorada, Magdalena, Nariño, Nordeste, Pacifico, Tolima, and Sur.
 Source: Pachón, A. and Ramírez, M.T. (2006).

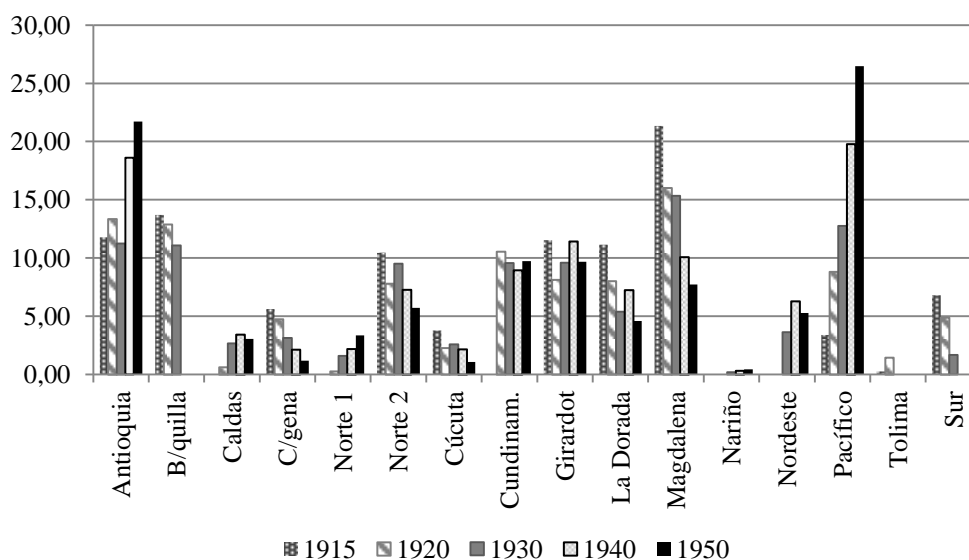
Graph 7
Colombian Railroads: Number of Passengers in 1916-1950



Note: Corresponds to the sum of passengers transported by the following railroads: Antioquia, Barranquilla, Caldas, Cartagena, Norte sec 1 and sec 2, Cucuta, Cundinamarca, Girardot, La Dorada, Magdalena, Nariño, Nordeste, Pacifico, Tolima, and Sur.

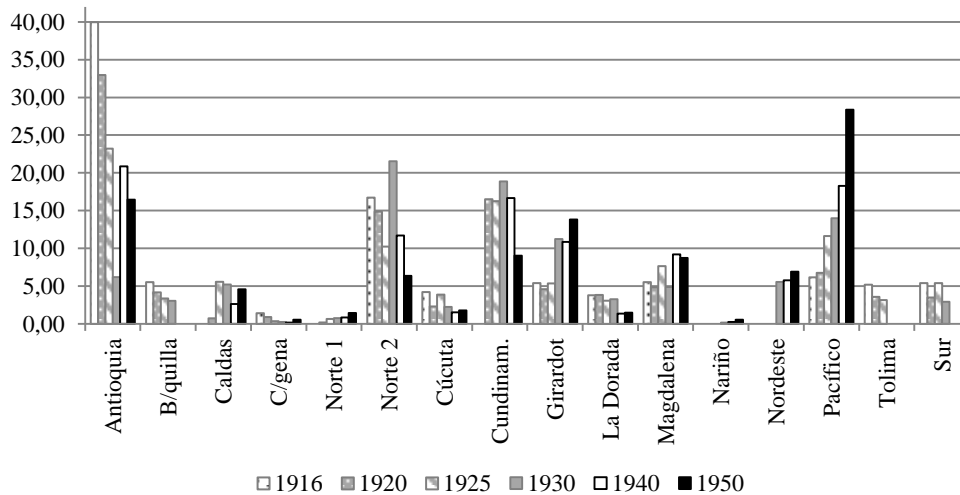
Source: Pachón, A. and Ramírez, M.T. (2006).

Graph 8
Colombian Railroad Freight: 1905-1950
 (Share of each railroad in total freight, %)



Source: Anuario Estadístico de Colombia and Memorias del Ministro de Obras Públicas de Colombia for several years.

Graph 9
Colombian Railroad Passengers: 1916-1950
 (Share of each railroad, %)



Source: Anuario Estadístico de Colombia and Memorias del Ministro de Obras Pública de Colombia, several years.

Within Latin America, the position of Colombia worsened in relative terms. As can be seen in Graph 4, Colombia surpassed only Nicaragua and Haiti in kilometers of railroad per 1,000 inhabitants in 1920. Table 5 also shows Colombia not only had a very low railroad network density, but also an enormous gap in this respect compared to several European and Latin American countries.

Map 2 Railroads in Colombia

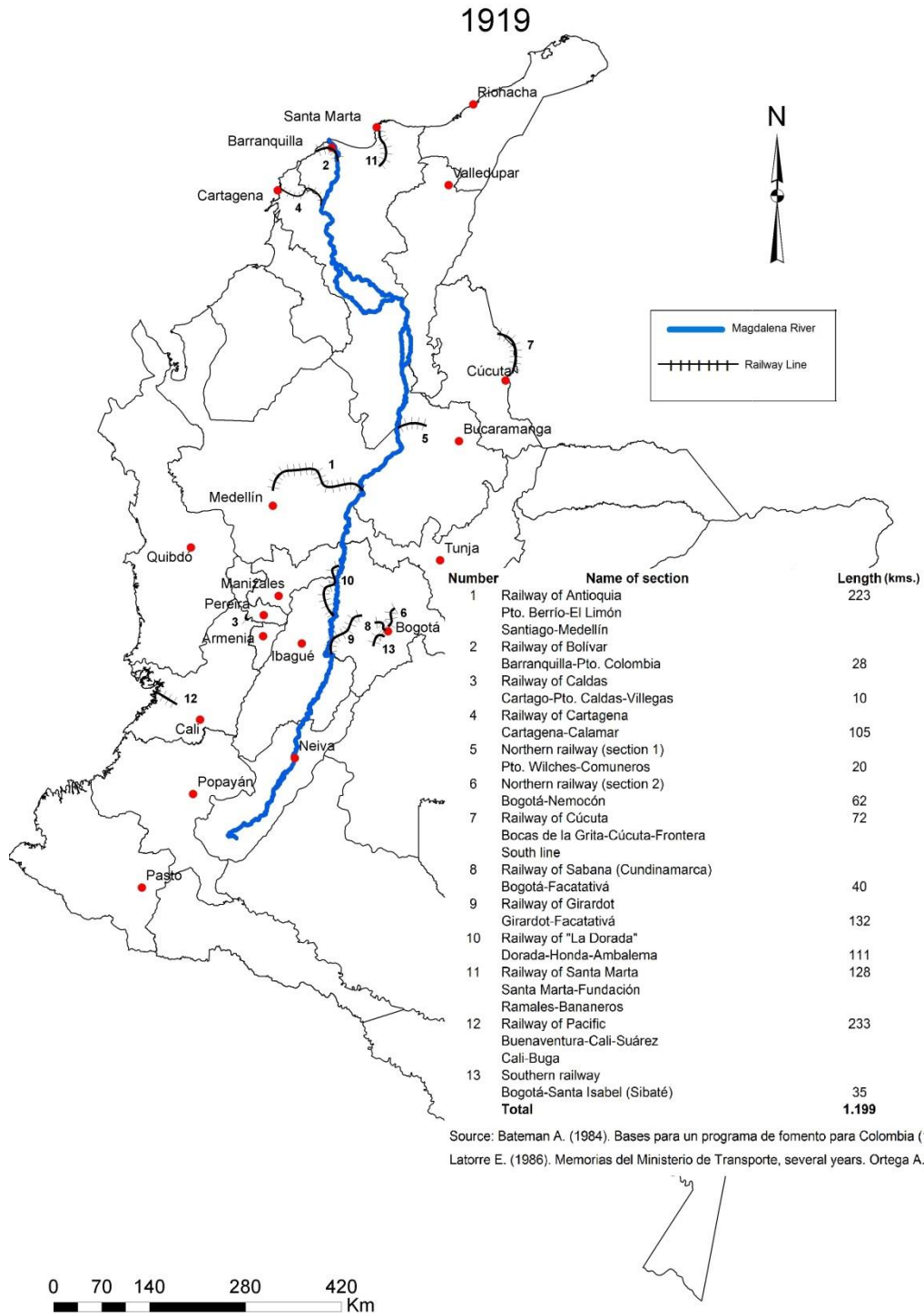


Table 5
Density of the Railway Network
(Km. of railways per 1,000 km² of surface)

Country	1900 ca.	1920	1930
Colombia	0.51	1.18	2.29
Peru	1.40	1.65	2.24
Ecuador	0.14	2.07	2.35
Brazil	1.80	3.35	3.81
Chile	5.76	10.86	11.82
Argentina	6.03	12.69	13.66
Greece	16.34	18.87	21.09
Spain	26.17	30.94	33.07
Portugal	23.38	35.25	36.75
Average Europe	57.78	64.79	71.51
Italy	55.28	66.69	71.42
France	81.02	99.76	115.73
Germany	95.56	122.77	124.12
United Kingdom	130.85	142.29	142.96

Source: For Europe: Herranz, A (2008) and for Latin America: <http://moxlad.fcs.edu.uy/en/databaseaccess.html> and the authors' calculations.

In all, by the early twenties, Colombia did not have the rail system the country required for its development. G.T. Renner (1927) illustrates this situation quite well by describing a journey from Puerto Colombia, on the Colombian Caribbean coast, to Bogota, the nation's capital:

“From New York one may reach Puerto Colombia by steamer in five or six days. From Puerto Colombia, the route is over seventeen miles of a meter gauge railway to Barranquilla....The railway from Puerto Colombia to Barranquilla serves to carry freight and passengers around the sand choked delta of the Magdalena. At Barranquilla a change is made from railway to a stern-wheel steamboat of the Mississippi River type. For the first 60 miles the channel is deep and wide, but the following 500 miles is through a bewildering sequence of sand bars, braided channels, sunken tree trunks, and swamps. Day after day the little boat, carefully screened from the mosquitoes, plows its way through unending jungle, oppressive heat and humidity, stopping at intervals to take on wood for fuel. At Dorada, freight and passengers are transferred to a narrow gauge railway and carried 70 miles around an impassable rapid, thence onto another smaller steamboat and 50 miles upstream to Girardot, the head of navigation for ordinary boats. The river at Girardot is 600 feet above the sea and it has taken nine or ten days to make the ascent. Eight thousand feet above on the plateau is Bogotá, reached by means of a tortuous railway some 80 miles long.” (p. 262)

4. “The Dance of Millions” and Investment in Railroads: 1920-1929

As has been mentioned, development of the railroad system in Colombia was very limited during the early years of the twentieth century. However, roughly about 1,250 kilometers of new railway lines were constructed in the twenties (see Graph 5). During that same period, especially after 1925, an unprecedented amount of foreign capital arrived in the country. As argued by J. J. Echavarría (1982), several external and internal factors allowed for an important increase in foreign loans. In the first place, the Latin American countries became attractive to foreign investors. In the case of Colombia, the institutional reforms proposed by the Kemmerer Mission and the expansion of export and production capacity, especially in the coffee sector, made the country more attractive.

The total external debt in Colombia increased considerably between 1924 and 1929, representing about 10% of GDP during that period, on average (see Table 6).¹¹ These funds were used mainly to build much needed public infrastructure, especially railroads. In fact, the amount invested in railroad construction up to 1929 represented 45% of foreign loans.¹² Regarding the US compensation for Panama, an important share of it was used to complete the construction of existing railroads, such as the Pacifico Line, the Norte Railway (sec. 1 and 2), and the Tolima Railroad, which had been started in the late nineteenth and early twentieth century (see Table 7).

¹¹ See Echavarría, J.J. (1982) on the evolution of Colombia’s external debt during this period.

¹² Before the twenties, railroads were built primarily through the concession system; therefore, the ratio of external debt to investment in railways prior to 1924 is above 100%.

Table 6
Foreign Debt and Railroad Investment in Colombia: 1924-1933

Year	Total Foreign Debt Balance at Year End ^{1/} (Millions USD)	Railroad Investment Stock ^{2/} (Millions USD)	Ratio of Railroads Investment To Total Foreign Debt Balance (%)	Ratio of Total Foreign Debt Balance To GDP (%)	Ratio of Railroad Investment to GDP (%)
1924	28.51	47.05	165.06	3.41	5.63
1925*	30.37	56.76	186.87	3.10	5.80
1926*	67.53	74.57	110.44	5.56	6.14
1927	141.03	90.00	63.82	10.97	7.00
1928	235.21	108.32	46.05	15.34	7.07
1929	257.41	114.09	44.32	17.85	7.91
1930	255.33	116.07	45.46	22.46	10.21
1931	254.09	121.78	47.93	28.18	13.50
1932	255.98	129.86	50.73	31.19	15.82

Source: Junguito, R. and Rincón, H. (2007), and Echavarría, J. J. (1982) and Annals of Engineering (1934).

Note: 1/ Total foreign debt includes: central government debt, municipal debt, departmental debt, private banks, and Banco Agrícola Hipotecario; 2/ Railroad investments include investment in all the lines. Information taken from the Annals of Engineering (1934). *The US compensation was included as part of the investment in railroads. That is why the ratio of railroad investment to total foreign debt is more than 100% in 1924, 1925 and 1926.

During this period investment in railroads increased by 20% per year, on average, and represented about 7% of GDP (see Table 6). The amount of railroad tracks increased from 1,500 kilometers in 1923 to almost 2,600 kilometers in 1929 (see Graph 5). The most growth in railway extension took place between 1925 and 1928. The Pacific, Norte sections 1 and 2, and the Tolima railroads experienced the largest growth in kilometers and investment (see Map 3 and Table 8). Those years also saw an expansion in freight and passengers transported by railroads, which grew at a rate close to 30%. However, despite this increase in railroad extension, railways, Colombia continued to lag by international comparison. In 1930, railroad density was still very limited and the number of kilometers of railway per inhabitant remained one of the lowest in Latin America (see Table 5 and Graph 4).

Table 7
Investment in Railroads from the US Compensation for Panama
(Distribution, %)

Name of the railroad	Millions of pesos	Share in investment (%)
Norte Sec. 2	2.972	18.3
Norte Sec. 1	2.531	15.6
Tolima-Huila-Caqueta	2.336	14.4
Pacifico	2.298	14.2
Subv. from Medellín to Río Cauca railroad	1.200	7.4
Cable Cucuta-Rio Magdalena	0.951	5.9
Del Carare	0.831	5.1
Subv. to Caldas railroad	0.800	4.9
Troncal Occidente	0.550	3.4
Nariño	0.439	2.7
Nacederos-Armenia	0.295	1.8
Central de Bolivar	0.278	1.7
Subv. to Cundinamarca Railroad	0.223	1.4
Sur	0.166	1.0
Puente de Girardot	0.152	0.9
Subv. to Santander-Timba Railroad	0.058	0.4
Cable de Manizales	0.050	0.3
Subv. to Ambalema-Ibagué Railroad	0.050	0.3
Ibague-Armenia	0.030	0.2
Total Railroads	16.209	100.0
Others	9.042	
Total US Compensation	25.251	
Investment in Railroads/ US Compensation (%)	64.19	

Source: Pachón, A. and Ramírez, M.T (2006).

Map 3 Railroads in Colombia

1925

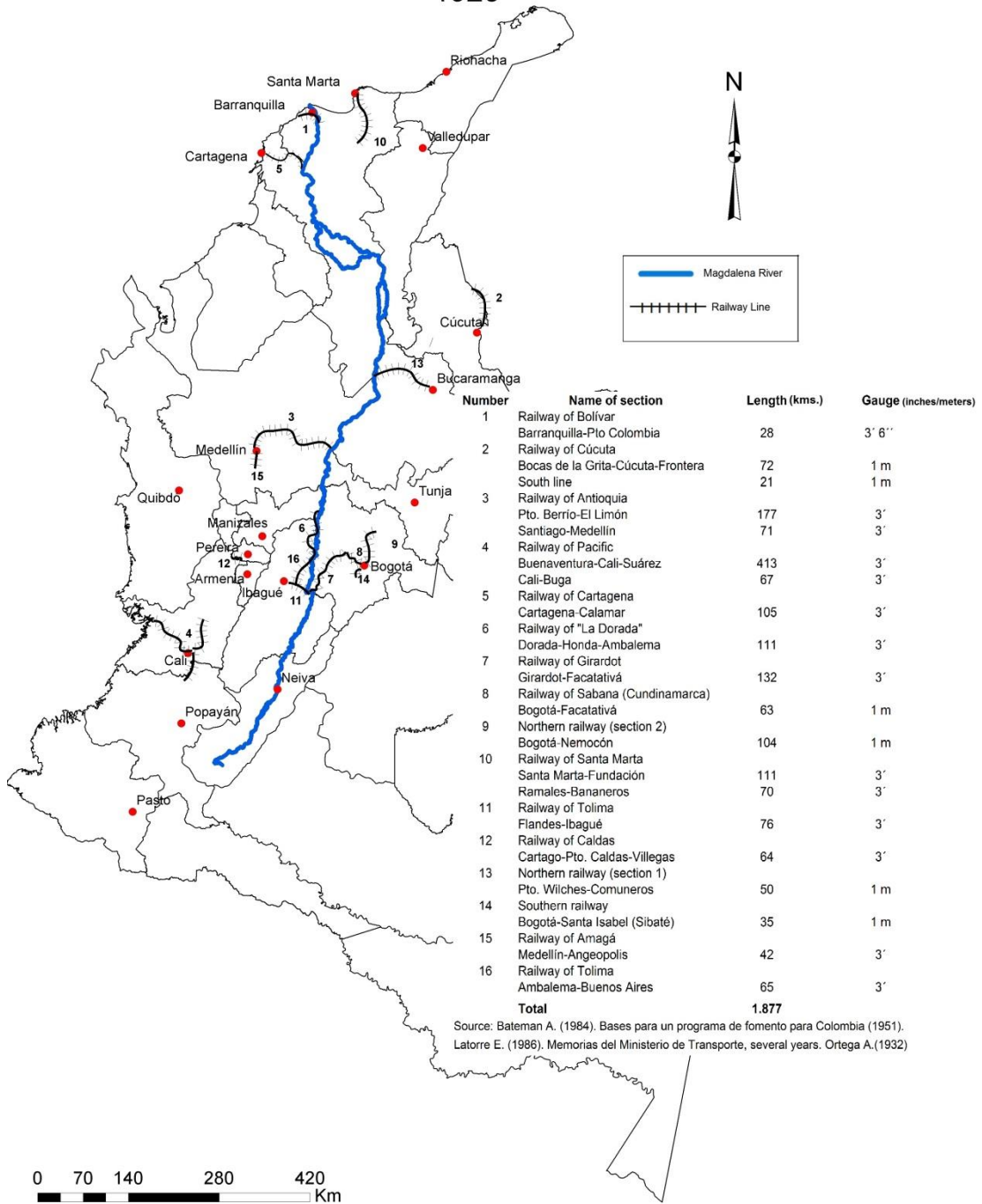


Table 8a
Investment per Railroad: 1924-1933
(Stock, millions of USD)

Railroads	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Cundinamarca	1.01	1.24	1.32	1.33	1.33	2.02	3.28	4.54	6.66	7.90
Girardot	7.72	7.91	8.58	9.12	10.97	11.40	11.42	11.42	11.58	13.74
Nordeste		0.31	0.49	0.68	1.19	1.69	1.86	4.55	4.61	5.47
Cúcuta			0.19	0.97	1.66	1.94	1.98	1.98	2.01	2.39
Pacífico	24.93	28.81	34.08	37.65	44.42	44.93	45.00	46.62	51.55	62.49
Caldas	0.74	0.75	1.30	1.31	1.31	1.32	1.32	1.32	1.34	1.59
Antioquia	2.16	2.17	4.47	4.50	6.13	6.71	6.91	7.03	7.13	8.91
Cartagena	0.72	0.72	0.72	0.73	0.73	0.73	0.73	0.73	0.75	0.88
Nariño	0.03	0.32	0.92	1.81	2.66	3.21	3.39	3.39	3.44	4.08
La Dorada	1.11	1.12	1.12	1.13	1.13	1.14	1.14	1.14	1.16	1.38
Norte Sec. 1	3.01	5.40	9.06	11.89	12.62	12.76	12.78	12.78	12.97	15.37
Norte Sec. 2			0.86	2.67	5.26	6.33	6.34	6.34	6.43	7.63
Tolima	4.29	4.96	6.04	7.07	7.06	7.14	7.15	7.15	7.25	8.60
Sur	1.34	3.03	5.40	9.13	11.87	12.76	12.78	12.78	12.97	15.37
Total	47.05	56.76	74.57	90.00	108.32	114.09	116.07	121.78	129.86	155.79

Sources: Anuario Estadístico de Colombia and Memorias del Ministro de Obras Públicas de Colombia for several years and *El Tiempo*, August 14, 1930.

Table 8b
Investment per Railroad: 1924-1933
(% of total investment)

Railroads	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933
Cundinamarca	2.14	2.19	1.78	1.48	1.23	1.77	2.82	3.73	5.13	5.07
Girardot	16.41	13.94	11.51	10.13	10.12	9.99	9.84	9.38	8.92	8.82
Nordeste		0.55	0.65	0.75	1.09	1.48	1.60	3.73	3.55	3.51
Cúcuta			0.26	1.07	1.53	1.70	1.71	1.63	1.55	1.53
Pacífico	52.98	50.76	45.70	41.83	41.01	39.38	38.77	38.28	39.70	40.11
Caldas	1.58	1.32	1.74	1.45	1.21	1.16	1.14	1.09	1.03	1.02
Antioquia	4.58	3.83	5.99	5.00	5.66	5.88	5.95	5.77	5.49	5.72
Cartagena	1.52	1.27	0.97	0.81	0.67	0.64	0.63	0.60	0.57	0.57
Nariño	0.07	0.56	1.24	2.01	2.46	2.82	2.92	2.78	2.65	2.62
La Dorada	2.37	1.98	1.51	1.26	1.04	1.00	0.99	0.94	0.89	0.88
Norte Sec. 1	6.39	9.51	12.15	13.22	11.65	11.18	11.01	10.49	9.98	9.87
Norte Sec. 2			1.16	2.97	4.86	5.55	5.46	5.21	4.95	4.90
Tolima	9.11	8.75	8.10	7.86	6.51	6.25	6.16	5.87	5.58	5.52
Sur	2.85	5.34	7.24	10.14	10.96	11.18	11.01	10.49	9.98	9.87
Total	100	100	100	100	100	100	100	100	100	100

Sources: Anuario Estadístico de Colombia and Memorias del Ministro de Obras Públicas de Colombia for several years and *El Tiempo*, August 14, 1930, and authors' elaboration.

With the Great Depression, foreign loans stagnated and the large inflows of capital for infrastructure ended. By 1933, most of the Latin American countries had incurred in

debt moratorium. As argued by M. Avella (2003), the moratorium on foreign debt in Colombia was a lengthy process that lasted from 1931 to 1935. Payments on the national debt (installments and interest) were suspended in January 1935 and resumed in 1940, first under an interim agreement and then permanently. An important benefit of the renegotiation was the reduction in the interest rate. For example, the interest rate on the 1927 and 1928 domestic loan was reduced from 6% to 3%.¹³

The international financial crisis not only halted foreign loans, but also expansion of the railway system. It also had a highly negative effect on the amount of freight and passengers mobilized by the Colombian railways, which dropped by nearly 20% in 1930. In general, railway revenue began to decline in the early 1930s. The most affected were the so called coffee railroads: Antioquia, Pacifico, La Dorada, and Caldas (see Graphs 10 and 11). Railroad development also was reduced to a minimum by a change in government policy. Less than 700 kilometers of railways were built between 1930 and 1950.¹⁴ After 1930, the investments in infrastructure were assigned mostly to highway construction. In fact, railroad investment as a portion of total investment in land transport infrastructure decreased from 60% in 1930 to 20% in 1950 (see Table 9). At the beginning of the forties, the reduction in international trade and the introduction of import restrictions caused by World War II led to fiscal constraints and low economic growth, which affected public investment in infrastructure. Import restrictions in particular resulted in substantially fewer imports of transportation equipment; especially transport materials for railways (see Graph 12).

¹³ See Avella, M. (2003) for a complete analysis on the process of moratorium on the Colombian external debt between 1931 and 1935.

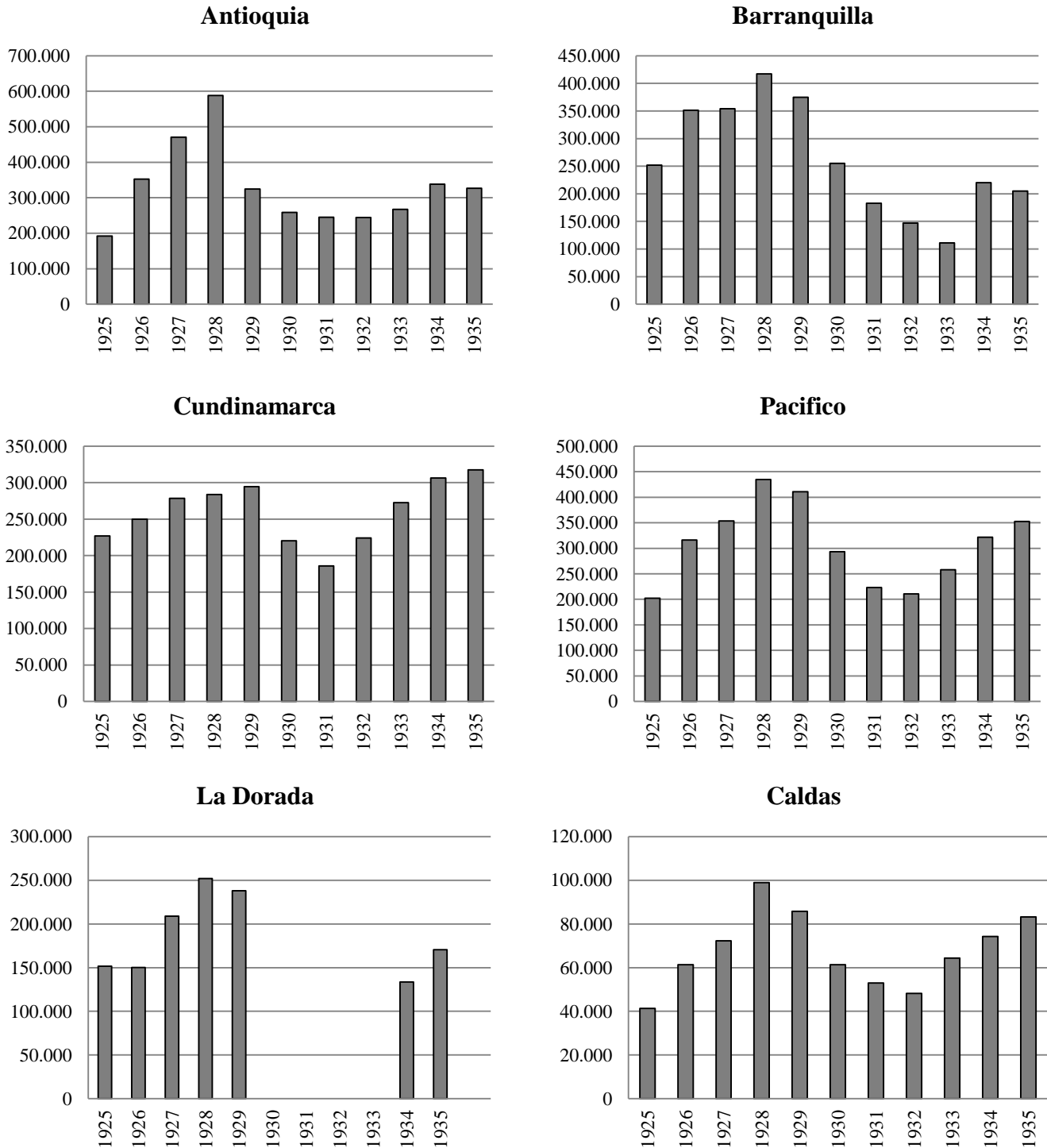
¹⁴ See Pachón; A. and Ramírez; M.T. (2006) for more details on infrastructure policies during the 1930s.

Table 9
Public Investment in Land Transportation: Investment in Railroads and Highways
(Millions of 1950 pesos)

Year	Investment in Railroads	Investment in Highways	Total Investment	Highways/Total (%)	Railroads/Total (%)
1925	60.6	38.1	98.7	38.60	61.40
1926	96.6	57.4	154.0	37.27	62.73
1927	92.7	70.3	163.0	43.13	56.87
1928	114.4	77.5	191.9	40.39	59.61
1929	70.6	70.0	140.6	49.79	50.21
1930	52.6	38.5	91.1	42.26	57.74
1931	35.6	37.7	73.3	51.43	48.57
1932	4.7	37.3	42.0	88.81	11.19
1933	4.5	50.7	55.2	91.85	8.15
1934	4.0	38.3	42.3	90.54	9.46
1935	7.7	45.4	53.1	85.50	14.50
1936	4.9	60.0	64.9	92.45	7.55
1937	7.9	67.3	75.2	89.49	10.51
1938	13.1	67.8	80.9	83.81	16.19
1939	28.8	80.0	108.8	73.53	26.47
1940	41.3	80.6	121.9	66.12	33.88
1941	22.6	73.7	96.3	76.53	23.47
1942	26.8	65.2	92.0	70.87	29.13
1943	34.4	69.9	104.3	67.02	32.98
1944	27.6	68.2	95.8	71.19	28.81
1945	34.0	56.4	90.4	62.39	37.61
1946	26.4	55.0	81.4	67.57	32.43
1947	31.0	75.8	106.8	70.97	29.03
1948	21.3	79.1	100.4	78.78	21.22
1949	17.3	52.6	69.9	75.25	24.75
1950	14.4	56.8	71.2	79.78	20.22

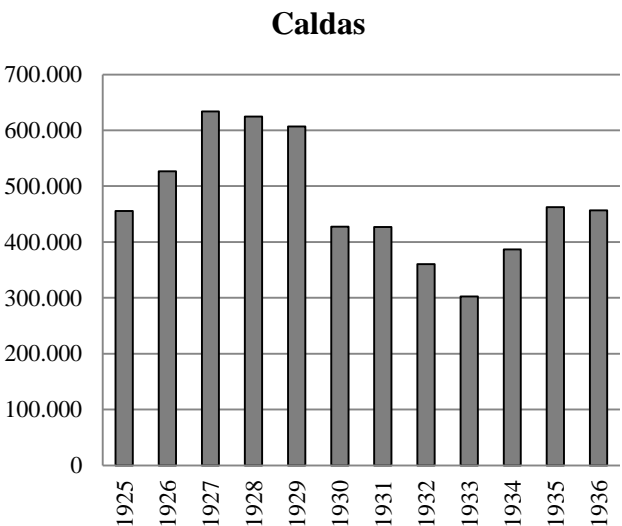
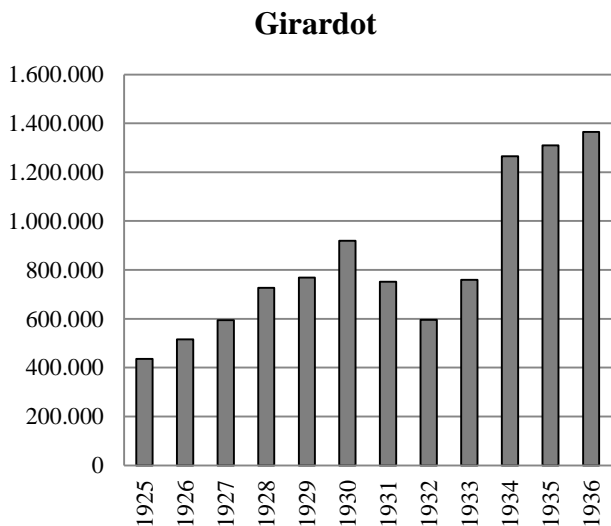
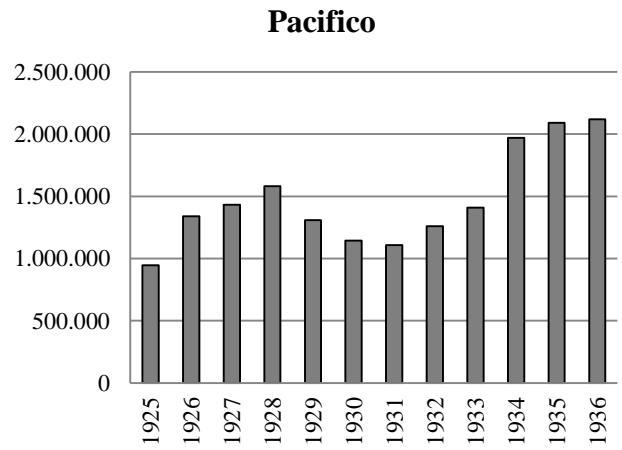
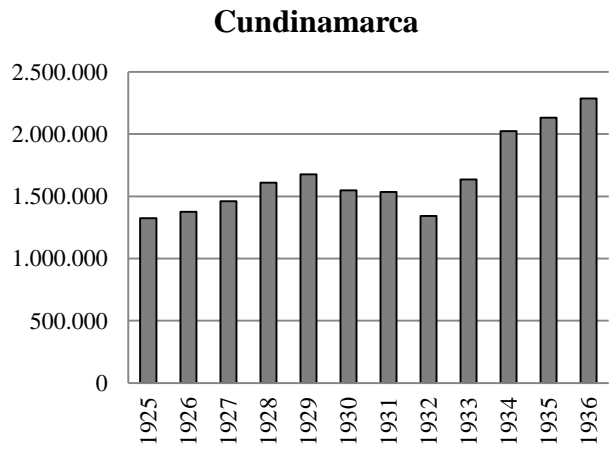
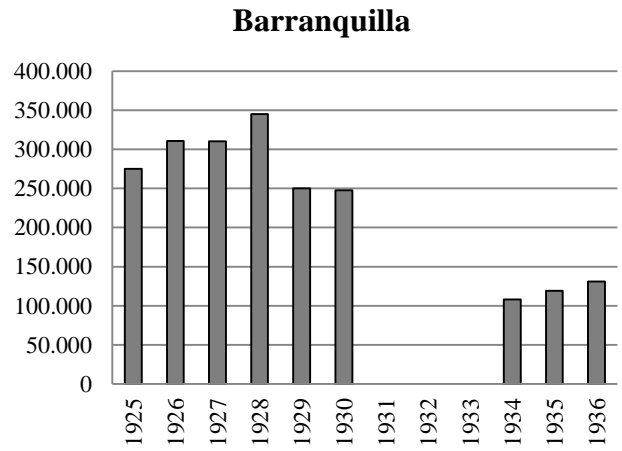
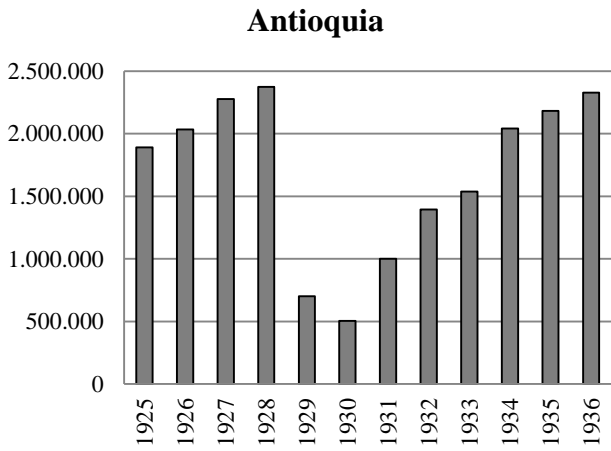
Source: Pachón, A. and Ramírez, M.T. (2006).

Graph 10
Selected Railroads: Freight (tons), 1925-1935



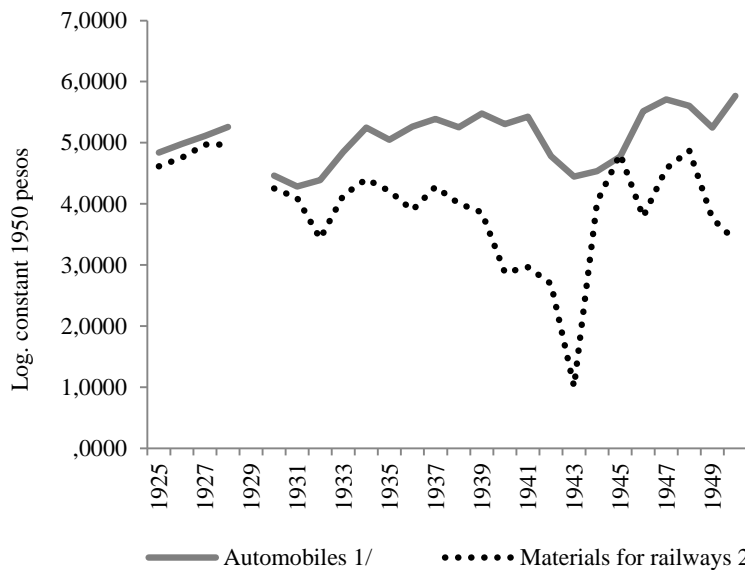
Sources: Anuario Estadístico de Colombia, and Memorias del Ministro de Obras Públicas de Colombia for several years.

Graph 11
Selected Railroads: Number of Passengers, 1925-1936



Sources: Anuario Estadístico de Colombia, and Memorias del Ministro de Obras Públicas de Colombia for several years.

Graph 12
Imports of Transport Equipment (in logs.)



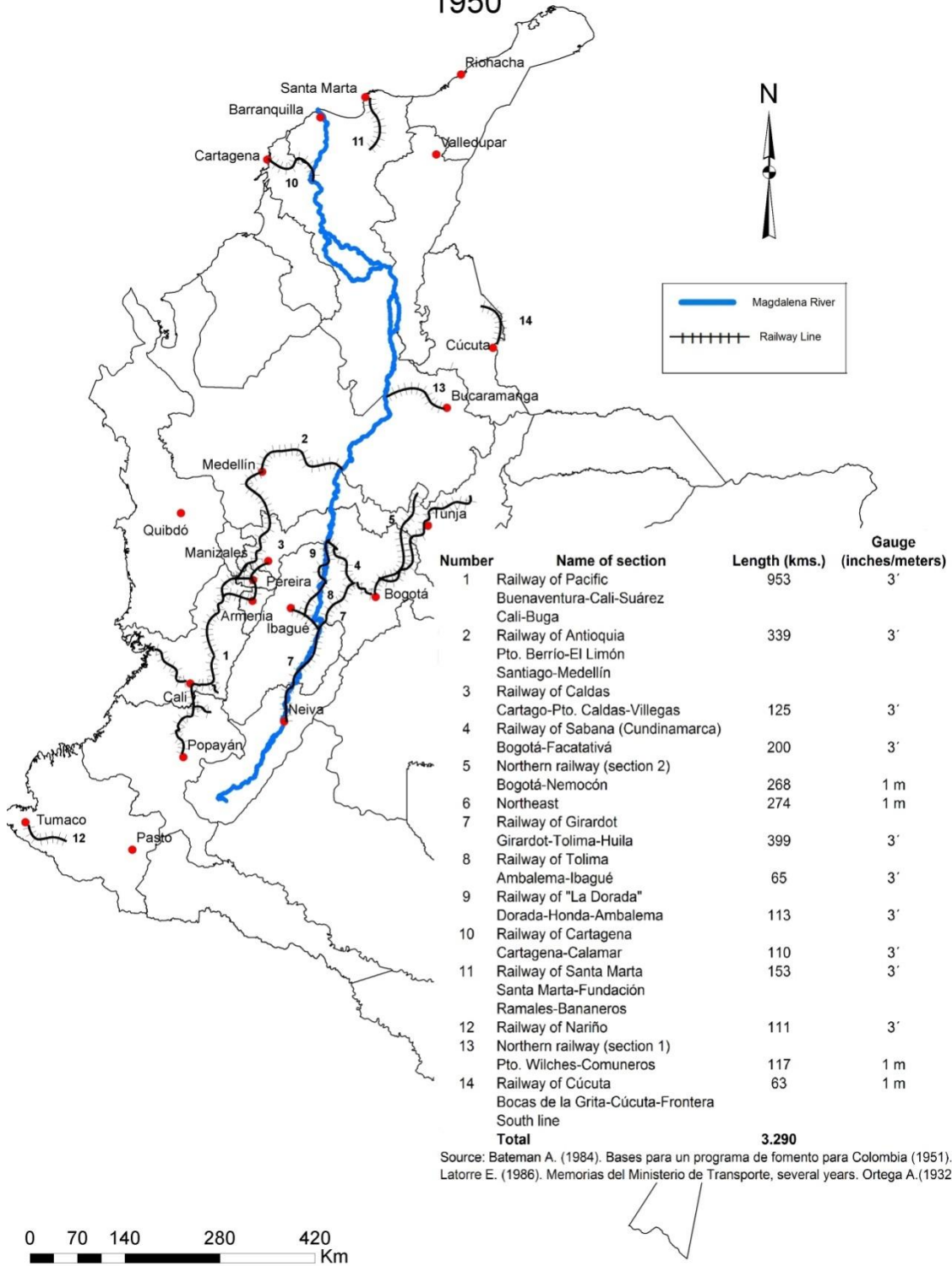
Note: Import statistics had to be adapted in 1932 to the new nomenclature adopted in Legislative Act 62 of 1931. 1/ For 1932 to 1934, it is the sum of cargo cars, buses with pneumatic tires, other cars, buses, and trucks with solid rubber tires. For 1935-1950, it is the sum of cars, buses, and trucks.
2 / Transport materials are the sum of carts and wagons for railways and tramways, and locomotives and their accessories. Source: Anuario de Comercio Exterior, several years and the authors' calculations.

Map 4 shows the railroad lines that had been constructed by 1950. The railroads were located in three main regions: the coffee region, the Bogota-Cundinamarca zone, and the Valle del Cauca region. Unlike the early constructions, the expansion in the twenties was intended to interconnect cities and their surrounding areas. However, by 1950, the country still lacked the transportation infrastructure required for its economic development, and the density of the railway and road network was still very low. In 1949, a World Bank mission headed by the economist Lauchlin Currie arrived in Colombia to a program to promote the country's development. With respect to the state of overland transportation, the Mission concluded: "...the various systems of transportation in Colombia are not currently able to meet, separately or together, in adequate conditions the growing needs of the country at a reasonable price."¹⁵ Thus, the

¹⁵BIRF (1950) p. 119.

Mission singled out improvement in transportation infrastructure as a priority for Colombia in the immediate future.

Map 4
Railroads in Colombia
1950



5. Rates of Return on Colombian Railroads: 1924-1950

In the 1920s and early 1930s there were several influential people in Colombia who thought a large part of the investment in railroads in the twenties was wasted.¹⁶ Moreover, authors such as Alfredo Ortega (1932) and Donald Barnhart (1956) argued that, after spending such large amounts of resources, the country still was isolated and disconnected. Mainly, they blamed this on a lack of planning and an inability to manage those resources, in most cases because of political pressures, but also due to a limited technical capacity to carry out the constructions.

Richard Hartwig (1983), who claims three fourths of the investment in infrastructure was a total loss, offers an illustrative example.¹⁷ Based on Barnhart, Hartwig refers to a report by Enrique Velez,¹⁸ who supposedly claimed three fourths of the total investment was lost. However, the Velez report, published in the newspaper *El Tiempo* on August 14, 1930, makes no such assertion; it merely shows statistics on public investment in infrastructure in the 1920s. It is in an unsigned comment on the Velez report entitled “Como se evaporan los millones” (“*How Millions Evaporate*”), published in the same newspaper the day before the report appeared, where wild estimates are made concerning the amount of resources wasted. However, the highest estimate of losses comes to 100 million pesos out of a total 213 invested, which is 47% and not 75%, as Barnhart argues Velez had estimated. This sort of careless use of information has contributed in the past to the sense of failure concerning the enormous effort made in the 1920s to improve Colombia’s transportation network.

¹⁶ See, for instance, *Annals of Engineering* (1929, 1934) from the Colombia Society of Engineering and *Memorias del Ministro de Obras Públicas* (1929, 1930, 1931).

¹⁷ See Richard E. Hartwig, (1983), p. 98-99.

¹⁸ Enrique Velez was a public works fiscal inspector.

However, none of those studies estimated the profitability of the investments. One exception was William P. McGreevey¹⁹ (1975), who estimated total aggregate railroad effectiveness by calculating the private internal rate of return on the investment, the cost-benefit ratio, and the internal rate of return on capital for 1924 and for the average in 1936-1949. McGreevey found that earlier railway investments (mainly in the so-called coffee railroads) were more profitable than the investments made in the twenties.

In this section, we estimate the yearly rates of returns (RR) during 1924-1950 on railroads built or extended in the 1920's. The main objective is to determine if the investments in railways during the 1920s, financed largely with foreign loans, were profitable. One of the main contributions of this paper is the calculation of the annual rates of return by railroad lines, for both freight and passengers. Our calculations also consider the fact that, as a result of the Great Depression and the suspension of payments on foreign debt, Colombia ended up paying only a portion of the loans obtained in the 1920's. To make these calculations, we construct a detailed data set of

¹⁹William Paul McGreevey published the results of his MIT dissertation in Spanish in 1975. A seminar was organized that year in Bogota at which several leading Colombian historians, as well as foreign scholars specializing in Colombia, criticized McGreevey's book in very harsh terms. The most formidable rebuttal of McGreevey's book came from US historian Frank Safford (see Safford, 1975). The main thrust of Safford's comment was that McGreevey incurred in numerous factual errors, assumptions that were hard to sustain, and errors of logic. In general, it can be said that Safford's devastating critique was valid. However, in one chapter in particular, we believe Safford was simplistic in his observations and unduly unfair with McGreevey's results. We refer to the chapter on railroads, where the author estimates the rate of social saving and the rate of return on railroads in the period 1922-1957. His conclusion is that railroads were a good investment for Colombia, and the rate of social savings was comparable to the results obtained by Robert Fogel for US railroads in the nineteenth century. McGreevey's results were corroborated by Ramírez, M.T. (2001), as well the results of this paper. Safford dismissed McGreevey's chapter on railroads by stating the author had demonstrated something unnecessary; namely, that those railroads represented an economic advantage over horseshoe roads. However, McGreevey did much more than that. His methodology was the one popularized by Robert Fogel's classic work on railroads in the US and he applied it with rigor to obtain a result that had been much disputed in Colombia; namely, that the railroads built in the 1920s were profitable.

yearly investment, income, expenditures, number of passengers, tons of freight, and railroad tracks for fourteen Colombian railroads during the period under analysis.

The rates of return were measured as the ratio of net earnings (income minus expenditure) to cumulative investment for each year. This measure has the advantage in that it offers profit figures on an annual basis. We propose two scenarios. In the first (RR1), we assume no major investments in railroads were made after 1933. In the second scenario (RR2), we assume the investment depreciates at an annual rate of 5% after 1933. Moreover, since railroad investments were financed with foreign loans and because of the debt moratorium, we reduce the investment in railroads by 15%. Colombia stopped servicing its foreign debt because of several decisions taken in the period from 1931 to 1935.²⁰ In the 1940s, it was renegotiated and, as a result, the country benefited from a substantial reduction in its outstanding debt and in the rate of interest it ultimately paid when repayment was resumed. Erika Jorgensen and Jeffrey Sachs (1988) estimate that, at present net values, Colombia ended up paying 15% less of the foreign debt it acquired in the 1920s.²¹ For this reason, to calculate rates of return on railroad investment, one must subtract the percentage of foreign loans that were never paid.

Table 10 shows the rates of return during 1924-1950, as calculated for both scenarios. A comparison of the two suggests the rates of return are slightly higher when the debt moratorium is pondered in the calculation. In general, the railroads clearly were profitable during the period 1924-1943, with the rates of return being higher during the twenties. After 1943, most of the railroads posted losses. Their rates of return are

²⁰Avella, M. (2007).

²¹Jorgensen, E. and Sachs, J. (1989), Ch. 3.

consistently negative; mainly they had to deal with competition from parallel roads and the negative effects of World War II on the Colombian economy. As mentioned, infrastructure policy shifted to a focus on highway construction as of the early 1930s; this is where the major investments were made. Many new roads were built parallel to the railways and successfully competed with them for freight and passenger traffic, since highway transportation was faster and more flexible (see Graph 13). In addition, the highways were more profitable, because they were privately operated. Consequently, many railroads went bankrupt. In fact, all the railroads saw their revenue drop as of the late thirties, due to an important reduction in freight and passenger rates brought on by the government's regulation of railway fares (see Graph 14 and 15).²²

It is difficult to make international comparison, since the methodologies, definitions, and the years of estimations differ from country to country. However, we can infer from Table 11 that Colombian railroads in the 1920s were generally as profitable as most European railroads in the nineteenth century. However, North American railroads in the mid-nineteenth century and the San Paulo railway in Brazil, at the beginning of the twentieth century, were more profitable than the Colombian railways.

²² See Pachón, A. and Ramírez, M.T. (2006) for more details on highways and the railroad tariff policy.

Table 10
Colombian Railroads: Rate of Return (RR)*

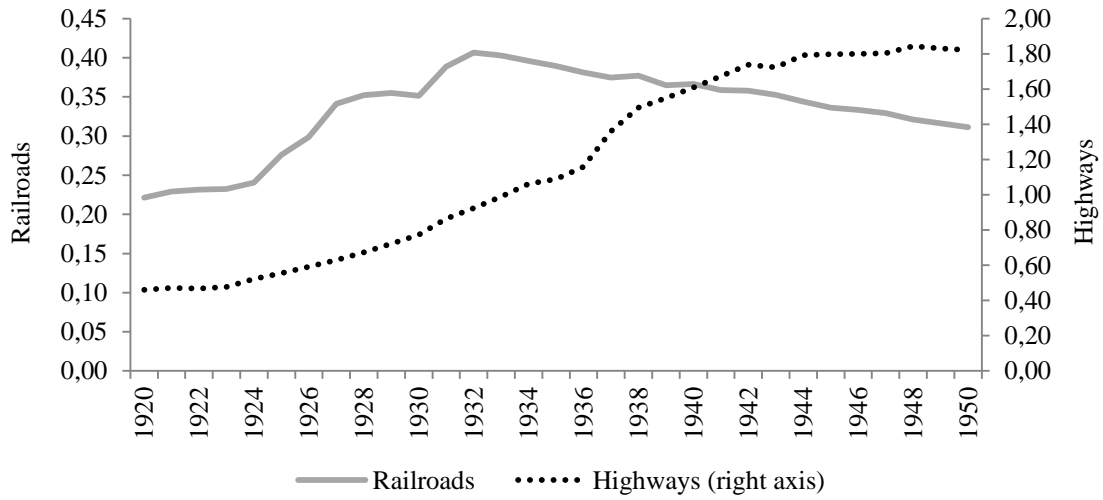
Year	RR 1	RR 2
1924	8.8%	10.3%
1925	7.9%	9.3%
1926	7.2%	8.4%
1927	4.7%	5.5%
1928	4.2%	5.0%
1929	4.8%	5.7%
1930	3.9%	4.6%
1931	3.5%	3.5%
1932	3.2%	3.2%
1933	3.2%	3.2%
1934	2.8%	3.0%
1935	3.0%	3.3%
1936	3.1%	3.7%
1937	3.6%	4.5%
1938	2.8%	3.7%
1939	2.0%	2.8%
1940	1.5%	2.2%
1941	1.6%	2.4%
1942	4.0%	6.3%
1943	6.1%	10.1%
1944	-0.8%	-1.5%
1945	-3.1%	-5.6%
1946	-9.1%	-17.7%
1947	-11.6%	-23.8%
1948	-12.9%	-27.8%
1949	-9.9%	-22.5%
1950	-12.0%	-28.7%
Avg. 1924-1949	1.34%	0.05%
Avg. 1924-1943	4.11%	5.00%

Note: $RR = (\text{Income} - \text{Expenditure}) / \text{Cumulative Investment}$. * Includes the following railways: Cundinamarca, Girardot, Pacifico, Caldas, Antioquia, Nordeste, Cúcuta, Cartagena, Nariño, La Dorada, Norte Sec. 1, Norte Sec. 2, Sur, and Tolima. RR1: It is assumed there was no investment after 1933.

RR2: It is assumed the investment depreciates at a rate of 5% annually after 1933. Additionally, since railroad investment was financed with foreign loans and because of the debt moratorium in 1930, we reduce the investment in railroads by 15%, inasmuch as only 85% of the debt was eventually repaid.

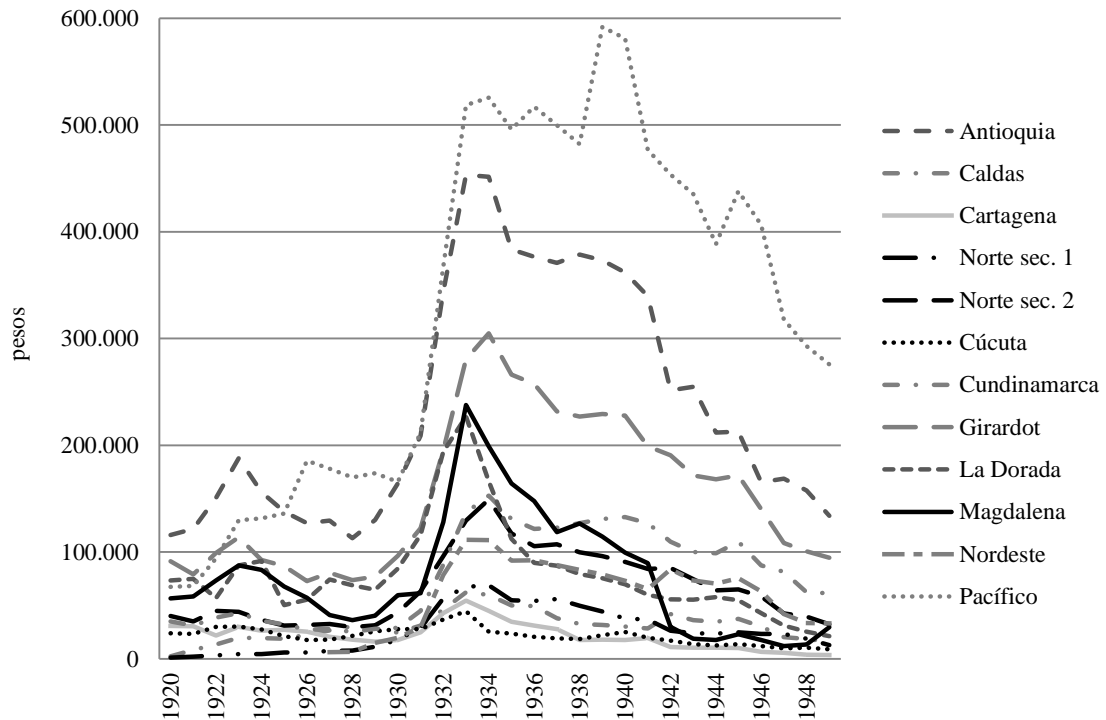
Sources: Anuario General de Estadística de Colombia, several years, and the authors' calculations.

Graph 13
Railroads per Capita vs. Highways per Capita in Colombia: 1920-1950



Source: Pachón, A. and Ramírez, M. T. (2006).

Graph 14
Colombian Railroads: Total Revenue (Constant 1950 Pesos)



Sources: Memorias del Ministerio de Obras Públicas de Colombia, several years.

Table 11
Private Rate of Return on European Railroads (1871-1913)
(Percentage)

Country	1871/1875	1881/1885	1891/1895	1901/1905	1911/1913
Germany	5.49	4.52	4.9	5.64	5.98
Austria	3.59	3.26	3.83	3.1	3.25
Belgium		3.96	4.66	3.88	1.24
Spain				4.36	5.93
Spain (only North)	4.19	5.04	4.53	5.52	6.53
France	4.76	4.33	3.6	4.06	3.68
Holland			0.64	1.03	1.43
Hungary				3.72	
Italy		1.98	1.66	1.52	1.34
Norway	2.6	1.63	1.7	1.59	2.17
United Kingdom	4.57	4.22	3.8	3.39	3.61
Sweden	4.57	3.62	3.52	3.8	3.82
Switzerland	3.45	3.26	3.59	3.87	4.41

Source: Herranz Loncán, A. (2008).

Table 11 b
Rates of Return on Brazilian Railroads: the Central and San Paulo Railroads

Year	Central do Brazil		San Paulo Railway	
	Aided Rate	Unaided Rate	Aided Rate	Unaided Rate
1900	1.42%	1.42%	10.48%	10.48%
1901	3.04%	3.04%	10.60%	10.60%
1902	1.98%	1.98%	9.48%	9.48%
1903	2.41%	2.41%	8.22%	8.22%
1904	0.20%	0.20%	9.44%	9.44%
1905	0.42%	0.42%	10.58%	10.58%
1906	0.27%	0.27%	14.66%	14.66%
1907	0.27%	0.27%	10.09%	10.09%
1908	-1.07%	-1.07%	9.41%	9.41%
1909	-0.01%	-0.01%	13.19%	13.19%
1910	-3.67%	3.67%	10.76%	10.76%
1911	-4.49%	-4.49%	11.33%	11.33%
1912	-3.94%	-3.94%	11.88%	11.88%
1913	-1.92%	-1.92%	11.76%	11.76%

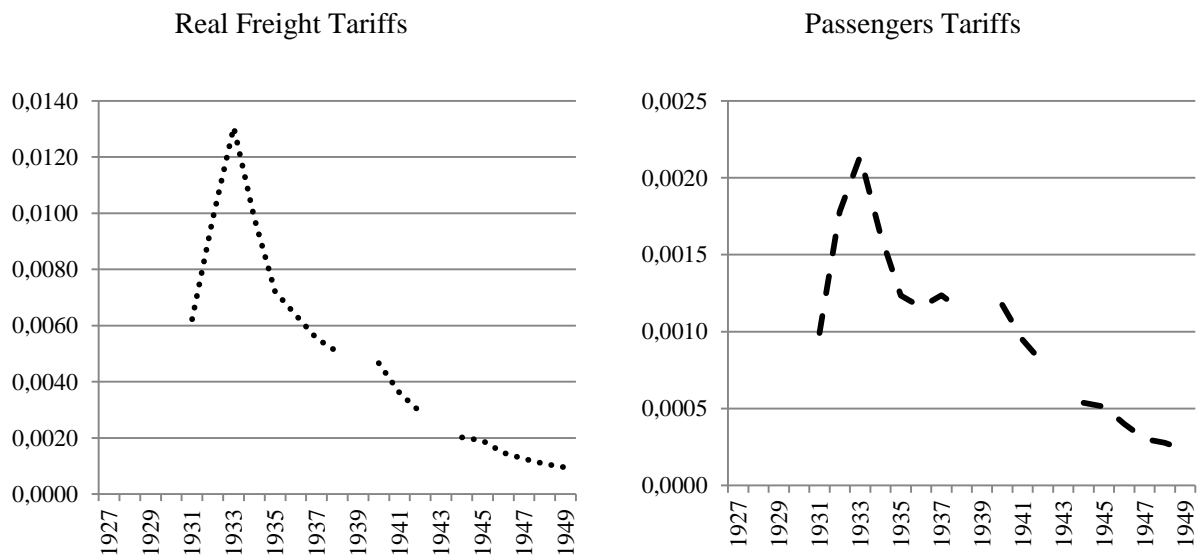
Source: Summerhill, W. (1995).

Table 11c
Rate of Return on USA Railroads: Selected Railroads

	1852	1853	1854	1855
Michigan Southern	4.6	9.6	6.3	7.5
Michigan Central	7.4	6.6	7.2	8.2
Terre Haute and Richmond	5.4	7.9	10.6	12.2
Cleveland, Columbus & Cincinnati	13.2	-	12.6	15.9

Source: Fishlow, A. (1965).

Graph 15
Real Railroad Tariffs in Constant 1950 Pesos

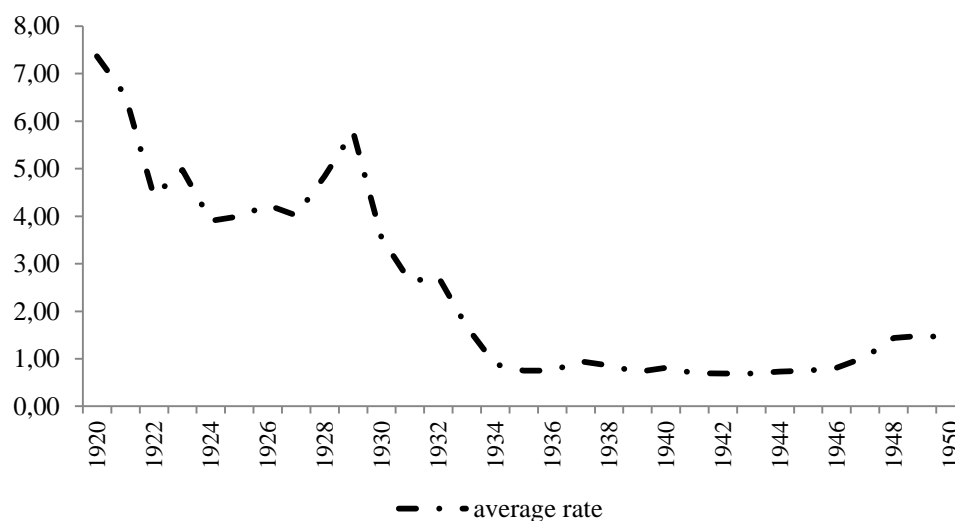


Source: Pachón, A. and Ramírez, M.T. (2006).

In addition, to infer how profitable the Colombian railways were it is necessary to compare rates of return to an appropriate investment alternative. Although it is difficult to find the right alternative, one option is to compare the rates of return to the opportunity cost of capital. For example, by comparing the rates of return on Colombian railways to, U.S. commercial paper rates in New York City, we can conclude the investments in Colombian railroads were profitable up to 1940 (see Graph 16).

We also estimate the rates of return on the individual railways for which we have complete information on output, expenditure, and investment. In Colombia, the railroad companies showed mixed results in terms of profitability. We found the most profitable railroads were Antioquia, Cucuta, Cundinamarca, Girardot, La Dorada, and Pacifico, which had abundant freight, mainly because they transported coffee. On the other hand, most of the railroads that received a significant share of the US compensation were not profitable, i.e. Nariño, Norte sec. 1 and sec.2, and Nordeste (see Table 12). For instance, the rates of return on Norte sec. 2 and the Nordeste railroads fell dramatically, since these lines had to compete with the *Carretera Central del Norte*, which was completed in 1934.

Graph 16
U.S. Commercial Paper Rates, New York City (%)



Source: <http://www.nber.org/databases/macroeconomic/chapter13.html>.

In general, the coefficient of exploitation of Colombian railroads was below one until the late thirties. However, most railroads ceased to be profitable as of the early forties, when their expenditures often exceeded their income (see Table 13). Most of the

railways went bankrupt as a result. In the fifties, the central government had to intervene in the railway system, nationalizing most lines.

We also estimated the rates of return on both freight and passenger transportation. As shown in Table 14, shipping freight was far more profitable than passenger transportation up to 1943, because the railroads generally specialized in cargo. However, as of 1944, the magnitude of the decline in the rate of return on freight was much larger than that of the passenger rate, since the drop in freight rates was more pronounced (see Graph 15).

Table 15 compares our estimated rate for Colombia to the ratio of net operating revenues to nominal GDP for a sample of countries, as calculated by Herranz, A. (2013). The ratio was significantly lower in Colombia compared to England, Argentina and Mexico. Yet, the Colombian ratio was close to that of Spain, Brazil, and Uruguay.

Table 12
Colombian Railroads: Rate of Return (RR), 1924-1950

Year	Antioquia	Caldas	Cartagena	Norte 1	Norte2	Cúcuta	C/marca	Girardot	La Dorada	Nariño	Nordeste	Pacífico	Tolima	Sur
1924	69.39%	21.42%	6.65%	-1.11%	43.17%	109.31%	15.12%	10.82%	48.38%			3.87%	1.54%	4.30%
1925	78.19%	16.58%	16.93%	-0.91%	29.01%	98.92%	8.53%	13.77%	22.72%			4.61%	0.93%	1.82%
1926	39.92%	19.93%	21.31%	-0.91%	35.31%	97.16%	19.81%	12.59%	38.85%			5.03%	0.39%	0.88%
1927	44.55%	-9.39%	11.76%	-1.89%	6.09%	22.49%	19.67%	13.64%	73.42%		-31.63%	1.13%	0.27%	0.21%
1928	33.64%	23.75%	14.37%	-1.09%	4.78%	26.64%	21.97%	11.48%	77.19%	-5.70%	3.07%	-0.49%	0.59%	0.33%
1929	37.87%	17.75%	9.50%	-0.67%	4.18%	25.38%	16.03%	9.30%	55.89%	-3.90%	11.60%	1.01%	2.86%	0.31%
1930	31.95%	6.21%	-0.38%	-0.02%	0.04%	10.94%	2.79%	2.98%	44.58%	-2.90%	5.17%	2.09%		
1931	23.99%	5.54%	-2.22%	0.78%	1.22%	3.89%	5.09%	4.16%	43.53%	-1.30%	0.45%	2.22%		
1932	19.53%	4.63%	-3.90%	1.47%	1.48%	1.70%	0.40%	4.97%	41.22%	-0.85%	3.64%	2.17%		
1933	19.39%	4.23%	-5.43%	-0.08%	1.71%	2.32%	1.85%	5.20%	38.81%	-1.76%	3.59%	2.41%		
1934	21.85%	5.74%	-7.21%	-1.14%	1.15%	-0.61%	1.15%	2.86%	38.27%	-6.59%	5.82%	2.41%		
1935	18.37%	7.81%	-9.03%	-0.56%	-1.07%	0.52%	1.33%	4.44%	37.59%	-5.78%	6.37%	3.47%		
1936	24.43%	12.20%	-10.91%	-0.28%	-0.12%	0.16%	0.66%	5.37%	36.78%	-3.19%	7.63%	2.84%		
1937	20.72%	5.10%	-12.85%	0.11%	-0.74%	0.40%	0.44%	5.39%	45.34%	-4.34%	7.68%	5.33%		
1938	33.03%	-0.92%	-29.70%	-0.99%	-1.41%	-1.01%	-0.60%	4.70%	45.67%	-8.99%	7.06%	2.93%		
1939	29.16%	-3.75%	-32.26%	-1.88%	-4.36%	0.60%	-5.36%	3.23%	35.76%	-8.94%	1.67%	3.46%		
1940	24.76%	-6.87%	-35.75%	-2.29%	-4.45%	2.37%	-6.21%	3.77%	24.67%	-9.45%	-6.61%	3.65%		
1941	31.42%	-4.35%	-28.30%	-3.08%	-3.61%	-0.21%	-1.68%	3.40%	22.09%	-10.46%	-6.55%	3.01%		
1942	14.06%	17.20%	-52.58%	-2.14%	4.63%	1.90%	7.58%	13.14%	36.61%	-11.61%	11.75%	8.41%		
1943	63.53%	23.92%	-62.38%	-2.08%	0.53%	4.03%	8.94%	16.68%	68.39%	-14.56%	7.41%	9.87%		
1944	35.45%	12.01%	-59.91%	-2.26%	-149.79%	2.92%	4.28%	15.78%	105.11%	-17.91%	11.82%	3.88%		
1945	14.46%	21.02%	-92.27%	-3.31%	-215.62%	5.10%	17.10%	16.06%	95.51%	-27.02%	0.73%	4.78%		
1946	-67.93%	-16.68%	-151.05%	-4.50%	-280.62%	3.01%	1.40%	4.79%	130.81%	-44.04%	-17.01%	2.80%		
1947	37.49%	-47.54%	-208.86%	-2.72%	-338.15%	5.08%	-2.83%	-5.75%	83.40%	-76.40%	-55.68%	-11.29%		
1948	41.69%	-97.91%	-248.21%	-3.99%	-374.37%	8.35%	-15.53%	-3.96%	27.59%	-82.87%	-72.16%	-11.27%		
1949	6.34%	-77.56%	-243.68%	-11.83%	-456.76%	-1.54%	6.80%	3.79%	23.71%	-109.03%	-74.43%	15.08%		
1950	87.10%	199.51%	-344.08%	-10.00%	-650.16%	-10.47%	-19.55%	0.00%	-74.73%	-133.03%	0.00%	7.33%		

Note: It is assumed the investment depreciates at a rate of 5% annually after 1933.

Additionally, since railroad investment was financed with foreign loans and because of the debt moratorium in 1930, we reduce the investment in railroads by 15%, as only 85% of the debt was repaid. Sources: Anuario General de Estadística de Colombia, and Memorias del Ministerio de Obras Públicas, several years and the authors' calculation.

Table 13
Colombian Railroads: Coefficient of Exploitation, 1920-1950
(Ratio between Expenditure and Income)

Year	Antioquia	B/quilla	Caldas	C/gena	Norte 1	Norte 2	Cúcuta	C/marca	Girardot	Dorada	Magdalena	Nariño	Nordeste	Pacífico	Tolima	Sur	Total
1920	0.50	0.86	0.97	0.00	0.00	0.00	0.00	0.64	0.78	0.62	1.00			1.02	0.87	0.81	0.63
1921	0.42	0.94	0.67	0.91	1.60	0.44	0.78	0.79	0.66	0.52	0.99			0.91	0.87	0.66	0.69
1922	0.49	0.91	0.60	1.14	0.94	0.48	0.79	0.80	0.57	0.69	1.05			0.75	0.91	0.87	0.71
1923	0.42	0.75	0.60	0.87	0.95	0.46	0.56	0.70	0.58	0.48	1.28			0.69	0.79	0.85	0.65
1924	0.42	0.96	0.51	0.89	1.46	0.39	0.55	0.74	0.46	0.65	1.36			0.56	0.77	0.73	0.66
1925	0.45	0.90	0.71	0.80	1.37	0.64	0.61	0.85	0.44	0.78	1.27			0.57	0.86	0.77	0.68
1926	0.50	0.88	0.58	0.78	1.49	0.66	0.63	0.66	0.47	0.72	1.23			0.67	0.95	0.79	0.69
1927	0.53	0.69	1.14	0.88	1.91	0.85	0.63	0.72	0.53	0.66	1.37		1.28	0.93	0.97	0.92	0.80
1928	0.56	0.71	0.75	0.86	1.43	0.79	0.50	0.72	0.59	0.69	1.23	4.82	0.92	1.03	0.94	0.87	0.80
1929	0.49	0.88	0.79	0.89	1.19	0.78	0.50	0.70	0.64	0.74	1.26	3.03	0.76	0.93	0.65	0.87	0.78
1930	0.38	0.95	0.85	1.01	1.01	1.00	0.64	0.86	0.84	0.72	1.29	2.19	0.84	0.74			0.77
1931	0.44	0.97	0.84	1.04	0.76	0.91	0.81	0.64	0.73	0.70	2.22	1.37	0.96	0.66			0.78
1932	0.47	0.98	0.83	1.08	0.56	0.87	0.88	0.96	0.62	0.68	1.52	1.27	0.75	0.60			0.74
1933	0.45	0.97	0.84	1.11	1.03	0.85	0.82	0.85	0.63	0.66	1.13	1.48	0.77	0.58			0.72
1934	0.51	0.89	0.83	1.15	1.29	0.93	1.06	0.93	0.85	0.64	1.15	2.74	0.71	0.67			0.79
1935	0.65	0.87	0.79	1.18	1.13	1.06	0.96	0.93	0.81	0.62	1.08	2.30	0.72	0.64			0.79
1936	0.59	0.74	0.72	1.21	1.06	1.01	0.99	0.97	0.80	0.60	0.87	1.51	0.71	0.76			0.78
1937	0.70	0.94	0.87	1.25	0.98	1.03	0.97	0.98	0.81	0.57	1.14	1.60	0.74	0.60			0.78
1938	0.59	1.09	1.02	1.77	1.16	1.06	1.07	1.02	0.85	0.59	0.97	2.05	0.78	0.80			0.84
1939	0.64	1.37	1.10	1.82	1.34	1.18	0.97	1.17	0.90	0.66	0.00	2.14	0.95	0.81			0.90
1940	0.69	3.28	1.18	1.90	1.47	1.19	0.89	1.19	0.89	0.76	1.33	2.35	1.22	0.80			0.93
1941	0.66		1.10	1.53	1.54	1.14	1.01	1.04	0.90	0.79	1.22	2.56	1.20	0.84			0.91
1942	0.85		0.80	2.29	1.38	0.87	0.92	0.83	0.71	0.73	2.41	2.84	0.79	0.65			0.82
1943	0.53		0.78	2.14	1.28	0.99	0.85	0.85	0.72	0.64	2.25	2.93	0.90	0.70			0.76
1944	0.75		0.91	1.85	1.25	3.98	0.91	0.94	0.78	0.58	2.04	3.01	0.86	0.90			1.05
1945	0.92		0.88	2.09	1.28	4.43	0.88	0.83	0.83	0.67	1.11	3.52	0.99	0.91			1.10
1946	1.36		1.09	3.02	1.29	4.61	0.94	0.99	0.95	0.59	1.00	4.88	1.13	0.96			1.25
1947	0.85		1.27	3.45	1.13	5.44	0.91	1.02	1.05	0.73	1.04	5.31	1.47	1.16			1.31
1948	0.86		1.49	4.30	1.19	5.17	0.89	1.11	1.03	0.91	2.21	4.35	1.61	1.14			1.34
1949	0.98		1.33	3.64	1.62	5.67	1.02	0.96	0.98	0.93	0.96	5.05	1.47	0.85			1.20
1950	0.81		0.00		1.35		1.11	1.11		1.18	0.81	5.20		0.93			1.28

Sources: Anuarios Estadísticos de Colombia, and Ministerio de Obras Públicas de Colombia, several years.

Table 14
Rate of Return (RR) on Freight and Passengers: Colombian Railroads during 1924-1950

Year	RR Freight	RR Passengers	Total
1924	7.7%	2.9%	10.6%
1925	6.9%	2.6%	9.5%
1926	6.4%	2.3%	8.6%
1927	4.2%	1.5%	5.7%
1928	3.7%	1.4%	5.1%
1929	4.3%	1.5%	5.8%
1930	3.0%	0.9%	3.9%
1931	2.7%	0.9%	3.5%
1932	2.4%	0.8%	3.2%
1933	2.4%	0.8%	3.2%
1934	2.2%	0.8%	3.0%
1935	2.5%	0.9%	3.3%
1936	2.7%	0.9%	3.7%
1937	3.3%	1.1%	4.5%
1938	2.8%	0.9%	3.7%
1939	2.1%	0.6%	2.8%
1940	1.6%	0.5%	2.2%
1941	1.8%	0.6%	2.4%
1942	4.6%	1.7%	6.3%
1943	7.5%	2.6%	10.1%
1944	-1.1%	-0.4%	-1.5%
1945	-4.1%	-1.5%	-5.6%
1946	-13.0%	-4.7%	-17.7%
1947	-17.9%	-5.9%	-23.8%
1948	-21.2%	-6.6%	-27.8%
1949	-17.4%	-5.1%	-22.5%
1950	-24.8%	-4.0%	-28.7%

Note: It is assumed the investment depreciates at a rate of 5% annually after 1933. Additionally, since railroad investment was financed with foreign loans and because of the debt moratorium in 1930, we reduce the investment in railroads by 15%, as only 85% of the debt was repaid. The estimation includes the following railroads: Cundinamarca, Girardot, Pacifico, Caldas, Antioquia, Nordeste, Cúcuta, and Cartagena.

Sources: Anuario General de Estadística de Colombia and Memorias del Ministro de Obras Públicas de Colombia, several years and the authors' calculations.

Table 15
Average Ratio of Net Railway Revenue to Nominal GDP

Country	Railway profit share in national income (Net Railway Revenue/GDP, %)
England (1850-1910)	2.52
Argentina (1865-1913)	1.81
Mexico (1873-1910)	0.91
Spain (1850-1912)	0.86
Brazil (1864-1913)	0.81
Uruguay (1874-1913)	0.71
Colombia (1920-1930)	0.46
Colombia (1920-1943)	0.35

Note: Net Railway Revenue= Income-Expenditures.

Sources: For England and Spain: Table 3 from Herranz-Locán, A. (2013); for Argentina, Mexico, Brazil, and Uruguay: Table 5 from Herranz-Locán, A. (2013); for Colombia: authors' calculations.

Finally, we calculated the internal rate of return (IRR) for the period 1914-1943 as another measure of railroad profitability. The IRR is the level of profitability for which the present value of the railroad is zero. We selected this period so as to take into account all previous investments made in certain railroads, such as the Antioquia, Cartagena, and Girardot lines. After 1943, almost all the railroads registered negative net income. Table 16 shows the estimated internal rate of return (IRR) on the individual railroads for which we have comprehensive information. In general, the investments in railroads were profitable, especially for the so-called coffee railroads, where large investments had already been made before the twenties.

Table 16
Internal Rate of Return (IRR) on Selected Railroads: 1914-1943

Antioquia	Caldas	Cartagena	Norte Sec 1	Norte Sec 2	Girardot	La Dorada	Nordeste	Pacifico	Sur	Total
33%	4%	25%	125%	10%	4%	33%	-14%	-4%	29%	2.0%

Note: It is assumed the investment depreciates at a rate of 5% annually after 1933. Additionally, since railroad investment was financed with foreign loans and because of the debt moratorium in 1930, we reduce the investment in railroads by 15%, as only 85% of the debt was repaid.

Source: Anuario General de Estadística de Colombia, Memorias del Ministerio de Obras Públicas, several years and the authors' calculations.

6. Conclusions

In this paper, we show the large investment in railroads in Colombia during the twenties was profitable. This contrasts with the many criticisms voiced in the late 1920s and early 1930s by leading Colombian politicians, journalists and even engineers concerning the efficiency with which the resources from foreign loans and the Panama compensation were invested in transport infrastructure during the 1920s. In the case of the railroads, which accounted for 45% of those investments, the rates of return were positive until 1943. Thus, the mistake was not to have built the railways, but perhaps to have kept them in operation after 1943, when many lines ceased to be profitable. These results cast a shadow of doubt on the extent of the resources that were wasted, stolen, or poorly managed during the construction of railroads in the 1920s. If some of the more exaggerated claims had been correct – for example, that only one fourth of the resources were actually invested – then Colombian railroads in that period would have been among the most profitable in the world. Accordingly, it is clear those claims of extremely wasteful investments are exaggerated.

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