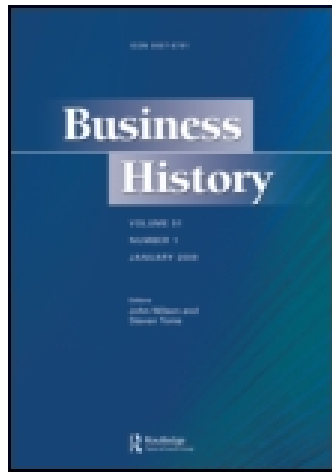


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Global strategies, differing experiences. Electricity companies in two late-industrialising countries: Spain and Argentina, 1890–1950

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The article compares the performance and profitability rates of electric utility firms in Spain and Argentina from the early period of global electrification to the period following World War 2. It aims to analyse the relationship between the investment strategies of international electricity companies and local conditions in two late-industrialising countries, and evaluate its impact on the structure and development of both electric utility systems. The study finds similar long-term trends in profitability as a result of the global strategies of multinational holding companies; nonetheless profitability rates varied greatly from one country to another. Rates were higher in Argentina as foreign firms controlled large systems in most dynamic urban areas. In contrast, the increasing investment of local firms in electric utilities paved the way to a less profitable but more equitable electricity system in Spain.

Keywords: electric utilities; holding companies; global electrification; multinational strategies; profitability; Argentina, Spain

1. Introduction

The relationship between new energy resources and economic growth has become a classical topic in international economic historiography. Carlo Cipolla's initial argument – recently updated by Paolo Malanima – and Wrigley's seminal work have underscored the strategic impact of intensive new energy resource utilisation on Western nations' economic and industrial growth.¹ Nonetheless, it should be noted that the dissemination of new energy production technologies and sustainability of economic growth vary significantly from one region to another, depending on their resources and the timing of industrialisation. In late-industrialising economies, the ties linking energy development, electricity system evolution and economic growth have not been analysed as much. Lacking statistics on electricity before 1925 have restricted studies on this topic in Latin America, although recent research has started to fill this gap, building new data series on energy consumption and comparing energy consumption and economic growth in both Spain and Latin America.²

In order to contribute to the study of this topic from a business history perspective, this article compares electricity companies' investment strategies and profitability in Spain and Argentina, from the time electric systems were put in place to their indigenisation in Spain and nationalisation in Argentina following World War II. Primary sources used to

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calculate electricity companies' economic and financial profitability included the annual reports and balance sheets issued by major domestic and foreign companies operating in both countries.³ Our hypothesis argues that electrification in Spain and Argentina was shaped by both electricity companies' profitability levels and market structures. During the global electric utility building process in Western nations, electrification schemes in late-industrialising countries depended on financial conditions, local resources and regulatory frameworks, as well as electricity multinationals' strategies. As industry regulatory frameworks and electrical market structures have been discussed in a previous study, we will focus on the relation between business investment strategies and host economies.⁴

A comparison between both countries is possible because their energy track records bear production and consumption similarities. Both Spain and Argentina initiated their electrification process in the late nineteenth century; their electricity production and consumption soared after World War I and became relatively stagnant in the 1930s, surging again after World War II. In turn, their key difference lay in Spain's heavy reliance on hydroelectricity and Argentina's predominantly thermoelectric production. Also noteworthy were Spain's greater installed capacity, especially in the 1920s, and Argentina's oddly higher per capita consumption and production levels throughout this period.⁵

Section 2 describes the business features of electric utilities in Argentina and Spain, focusing on multinational companies' internationalisation strategies and local groups' involvement. Section 3 discusses profitability drivers for electric utilities in both nations in order to lay the groundwork for a comparison of electric utilities' economic and financial performance in each country and between both in 1910–50.

This analysis reveals that electric utilities showed an equivalent average profitability in both Spain and Argentina over this period, albeit with significant differences in company and country profitability levels. Foreign electric utilities' higher profitability in Argentina corroborates path dependency, while the concentration of European investments in more dynamic urban markets associated with export trade, compounded by a shortage of both natural and financial resources, consolidated the supremacy of foreign companies in the electricity industry. In contrast, as foreign companies withdrew from this sector in Spain, local groups, with plenty of capital, leveraged water resources to build hydroelectric ventures. As a result, Spain's electric utilities proved less profitable but more equitable in terms of geographic distribution, while Argentina's system remained very profitable and asymmetrical.

2. Electricity companies in Argentina and Spain, an overview (1889–1950)

2.1. German and British electric utilities in the early electrification period

Electricity was introduced in Argentina and Spain a few years after the creation of the first electric utility company, the Edison Electric Illuminating Company of New York in 1880. In 1889, the first British electric companies arrived in both countries, only to be displaced by German and Swiss electric utilities a few years later. The latter seized control of these markets as a result of technological and financial advantages boasted by the Swiss and German electro-technical industries, as their limited domestic markets fuelled companies' expansion to European and Latin American destinations.

As noted by Hausman, Hertner and Wilkins, major electrical manufacturers *Allgemeine Elektrizitäts-Gesellschaft-AEG*, *Siemens & Halske* and *Brown Boveri* partnered with investment banks to create electric holdings based in Switzerland and Belgium.⁶ Their goal was to fund, build and manage tramway and electric networks in

Europe and Latin America to expand their markets for electrical products.⁷ Therefore, three holding companies were created in Switzerland – *Elektrobank* (promoted by AEG), *Indelec* (owned by *Siemens & Halske*) and *Motor* (owned by *Brown Boveri*) – in 1895 and 1896. In 1898, the *Société Financière de Transports et d'Entreprises Industrielles* (SOFINA), associated with the electric utility *Union Elektrizitäts-Gesellschaft* (UEG), was founded in Brussels. Its equity was mostly provided by the German group, supported by some Belgian banks and a small interest owned by the US-based *Thomson-Houston*.⁸

In the early 1900s, the competition among electrical multinationals gave way to cooperation in distributing the peripheral European and Latin American markets. Siemens merged with Schuckert, while AEG acquired UEG. In Latin America, Siemens joined *Deutsch Überseeische Elektrizitäts-Gesellschaft* (DUEG), a company started in 1898 by AEG, *Deutsche Bank* and *Berliner Handels-Gesellschaft* to build and manage electricity networks in South America.⁹ DUEG (CATE, in Spanish) began its expansion with the acquisition of British power stations and the construction of new thermoelectric power plants in Buenos Aires, Montevideo and Santiago de Chile. By 1914, this company accounted for the largest German investment in Latin America.¹⁰

After the acquisition of UEG, the partnership forged by SOFINA and AEG consolidated their control over Argentina's electric networks. In 1910, SOFINA acquired a British company called Rosario Electric Co., creating the *Société d'Électricité de Rosario* (SER). Thus, DUEG (AEG) and SOFINA owned and controlled the electric and tramway networks in Argentina's most populated districts. In 1911, the *Compañía Italo Argentina de Electricidad* (CIAE) joined the market in Buenos Aires. A Swiss holding, *Columbus AG für Elektrische Unternehmungen*, built by (Brown Boveri's) *Motor*, a group of Swiss banks, the Italian manufacturers *Pirelli* and *Franco Tosi*, and *Devoto*, an Argentine business group, held the controlling stock of this new company.¹¹ When World War I broke out, the electricity supply in Argentina's most crowded areas was in the hands of German, Belgian and Swiss holding companies' subsidiaries, while smaller towns were serviced by British companies or Argentine utilities with British interests.

Similarly, German companies invested in Spanish electric networks in the late nineteenth century. With the *Banco Hispano-Alemán* as an intermediary, AEG invested in building electric utilities in Madrid (1889), Seville (1894) and Bilbao (1895).¹² In Barcelona, AEG acquired the British tram companies to create the *Compañía General de Tranvías de Barcelona a Sans*. To fund the tramway electrification, AEG partnered with SOFINA. In 1896, *Schuckert* started operating in Bilbao with *Ahlemeyer Cía Anónima*, and Siemens purchased a plant in Malaga.¹³

Despite these investments, by 1914 foreign companies were not as dominant in Spain's electric industry as they were in Argentina. In fact, AEG forwent some of its earlier investments in Spain (*Madriileña*, 1905) or reduced its interest (*Vizcaína*) and only retained control over *Sevillana*. In 1912, AEG and its partners sold most of their *Barcelonesa* stock to F.S. Pearson. This Canadian group founded a company called *Barcelona Traction, Light & Power* and promoted a new project based on hydroelectric power plants and the construction of a regional network. The initial project failed, and the company was transferred to SOFINA in 1913.¹⁴

German groups' expansion in Spain was hindered by two major hurdles. First, the German group had built competitive advantages in high-voltage electric output from thermal power stations, but Spain's geography favoured the use of hydraulic energy, whose demand, as a result of industrial districts' development, aided the engagement of both the smallest and largest electricity networks. By 1901, Spain boasted over 850 plants – many of them stand-alone – that used a mix of hydro-mechanical energy, with grain and

wood mills working by day and electric lighting supply by night.¹⁵ Water power also proved fruitful to build large electricity systems as shown by The Barcelona Traction's management of the Pyrenees' waterfalls, in Catalonia.

Second, Spanish investment consortia invested heavily in the country's electric network development. Starting in 1901, Banco de Vizcaya, a Basque industrial bank, funded the creation of *Hidroeléctrica Ibérica (HI)*, the regional hub servicing the thriving Basque industrial market; *Hidroeléctrica Española (HE)* to supply Madrid and Levante (1907), and Cantabria's *Hidroeléctrica del Viesgo* (1916). This bank fuelled the development of financial markets in this region: its shareholders were manufacturers that sought to control the supply of electrical energy to their industries.¹⁶ Spanish banks promoted other electric companies; for example, Banco Urquijo invested in *Unión Eléctrica Madrileña* and *Hidroeléctrica del Cantábrico*. By 1918, Banco de Vizcaya finally created the *Grupo Hidroeléctrico* (including its companies and those of Banco Urquijo). This group monopolised the markets in Spain's hinterlands, the Cantabrian front and Levante region, except Catalonia; it also operated in Andalucía with *Mengemor* and moved into *Sevillana* during World War I.¹⁷ Only the Saltos del Duero project, promoted in 1927 by *Banco de Bilbao*, the other Basque industrial bank, would briefly challenge *Grupo Hidroeléctrico's* leadership in these markets.

2.2. Holding companies' and business groups' reorganisation during the inter war period

Germany's World War I defeat undermined AEG's financial strength and reduced its influence in SOFINA, which incorporated Belgian, American, British and French capital. Eventually, AEG sold its stock in South American companies, and SOFINA took over DUEG companies' management. With Dannie Heineman at the helm, SOFINA created a new company to transfer DUEG's assets in Latin America: *Compañía Hispanoamericana de Electricidad (CHADE)*, based in Barcelona first and in Madrid later. The decision to base the company in Spain was driven by the fact that Spain had remained neutral during the war, had a stable currency and enjoyed a cultural affinity with Argentina. CHADE received Spanish funds, but Spain maintained a minority interest in the company. In Spain, *Elektrobank* decided to replace German representatives with Swiss members at *Sevillana's* Board during the war. At the same time, the Vizcaya group acquired *Electra del Lima*.¹⁸

Both in Argentina and Spain, electric companies' investment intensified over the 1920s. In Argentina, the increase of nominal capital incorporated by all three companies operating in the largest cities proved remarkable: from Ar\$ 70 million to Ar\$ 236 million – a cumulative yearly 11.83% in 11 years. This increase was used to incorporate technology for installed capacity expansion, production growth, cost reductions through fuel savings, and network expansion to service new customers. In turn, Spanish electric utilities' equity rose at a 12.26% cumulative annual rate from 1917 to 1925. This investment focused on hydroelectric production rather than connection network deployment, as only the Catalanian and Basque markets were integrated in the late 1920s. Foreign capital continued to concentrate in the thriving Catalanian market (*Barcelona Traction*) as well as in Andalucía (*Sevillana*), while domestic companies largely serviced the rest of Spain. By 1925, foreign electric utilities' core assets – disbursed funds plus outstanding liabilities – accounted for 29.53% of total industry investments in Spain, although their actual weight was lower.¹⁹ The Spain-based equity of electric utilities operating abroad – including

CHADE and companies operating in Portugal and Morocco – added up to 12.59% of all core assets owned by public electric utilities quoting on Spain's stock market.²⁰

Funding needs had grown after the war, as electric utilities embarked on distribution network and large hydraulic dam construction efforts. The United States led this new investment wave in the global electricity market, raising its portfolio investments in European and Canadian holding companies as well as increasing direct investments by acquiring companies in Latin America and Eastern countries.²¹

A leading force in the US expansion was *American & Foreign Power*, a holding company founded in 1923 to operate in Latin America. In 1928–30, *American & Foreign Power* acquired the electric and tram companies that operated in Argentina's hinterlands, except for SOFINA's subsidiaries and the companies controlled by the Italian–Swiss group headed by CIAE. In 1930, *Foreign Power* reorganised its holdings into five large operating companies: *Compañía de Electricidad del Norte Argentino*, *Compañía de Electricidad del Sur Argentino*, *Compañía de Electricidad del Este Argentino*, *Compañía Central Argentina de Electricidad* and *Compañía de Electricidad de los Andes*.²² Subsequently, international holding companies' subsidiaries dominated Argentina's market, as shown in Table 1.

German companies' displacement, SOFINA's consolidation, and increased US interests also shaped Spain's electric industry in the 1920s. *Grupo Hidroeléctrico* and, particularly, Banco de Vizcaya joined *General Electric's* strategic pursuits, with collaborations in the electro-technical industry.²³ In 1928, the American *United Electric Securities* group contributed 25% of the equity for Saltos del Duero, a new group operating in the Spanish hinterlands.²⁴ In turn, *Elektrobank* bought an interest in *Saltos del Alberche*. In Valencia, *Electrobel* transferred *Riegos de Levante* to a SOFINA subsidiary, whose parent company also controlled Barcelona Traction. In Catalonia, Columbus' *Cooperativa de Fluido Eléctrico* seized control over *Catalana* in 1927, while the Swiss remained in *Sevillana*. Even after the 1929 crash, international investments in electricity climbed, as the stock value collapse was viewed as an opportunity to purchase. Starting in 1930, however, *Elektrobank* got rid of its *Alberche* stock, transferring its shares to Toronto's *Iberian Electric*, while *Riegos de Levante* gave away 40% of its stock to local distributors. According to Broder, this investment wave proved unprofitable in a setting characterised by low fees, ongoing peseta depreciation and political uncertainty.²⁵

As shown in Table 2, Spanish electric utilities' grouping became quite evident in 1935, although, on occasion, firms just shared a vague corporate strategy. While over 20 free-standing electric clusters could be detected, 71% of all Spanish electric utilities' core

Table 1. Holding companies controlling Argentina's electric market in 1919–35.

Holding	Home-country of the investment	Number of subsidiaries	Installed Capacity %	Production %
SOFINA	Belgium, France, Germany, US	5	50	53
American & Foreign Power	US	10	13	9
Columbus/Motor Columbus/SSAE	Switzerland, Italy and Argentina	6	12	12
Other companies			25	26
Total			100	100

Source: *Revista Electrotécnica* (1933), 442–500.

Table 2. Spanish electric utilities' grouping in 1935.

Group	Societies	Basic resources (%)
Banco Hispano-Colonial	4	9.46
Grupo Hidroeléctrico	46	32.69
Grupo Hidroeléctrico + Banco Bilbao	8	5.16
Grupo Hidroeléctrico + <i>Electrobank</i>	1	0.09
<i>Barcelona Traction</i>	17	25.06
Total	76	72.45

Source: Anuario Financiero y de Sociedades Anónimas de España, 1935.

assets were held by five groups – some with interlocked boards.²⁶ Only a quarter of this universe featured foreign ownership or control, although their aggregated output accounted for less than 33% of the total production in 1935.²⁷ This trend grew stronger after the Spanish Civil War in 1939: the only direct investments that persisted in electric industry were *Barcelona Traction* in Catalonia, *Sevillana* and *Fuerzas Motrices del Valle Lecrín* in Andalucía.

At that time, 75% of Argentina's electric market was controlled by subsidiaries owned by three foreign holdings, showing significant economic concentration, while Spain's market was remarkably less oligopolistic and its controlling groups were mostly Spanish.²⁸

Investments in Argentina's electric system were very limited in the 1930s. *American & Foreign Power's* financial conditions prevented the execution of its investment programme to update electric installations in Argentine provinces. As a result, numerous conflicts with users arose, triggering State interventions in Córdoba and Tucumán. This process eventually led to the expropriation of *American & Foreign Power's* companies, driven by the military government that took over in 1943. SOFINA's companies continued to operate, but they stopped investing in the local system as of World War II. Insufficient supply and a difficulty to import fuel and supplies at a time of industrial growth caused an energy deficit during the war. To remedy this shortage, in 1943–48, the Argentine government pursued a number of strategies that varied from one controlling holding to the next. Several American companies were expropriated, while SOFINA's subsidiaries and *Compañía Ítalo-Argentina de Electricidad* received subsidies and loans to afford wage increases and to guarantee minimal returns on investments.²⁹ The government also started to build two thermoelectric plants to supplement foreign companies' output in the Pampean market, while installing hydroelectric power plants to supply electricity to less populated areas.

After the Civil War, the breakdown of the Spanish economy and insufficient energy supply induced the reorganisation of electricity markets and firms. Electricity demand grew and so did equipment investments until 1943, when State intervention and the shortage of foreign exchange began to curtail supply. During the 1940s, as technological regression and decreasing productivity hit the economy at large,³⁰ the lack of capital hampered the essential investments to expand the generating capacity with the construction of huge reservoirs. As a result, energy restrictions and electricity cuts had a negative impact on industry, hitting electricity companies severely until the early 1950s. Against the backdrop of high inflation rates, frozen electricity prices benefited the largest integrated companies rather than electricity retailers, whose profit rates declined.³¹

Moreover, Spanish electric utilities feared asset seizures after peace was re-established and, in 1944, they rallied around *Unidad Eléctrica Española S.A. (UNESA)*, a self-regulating agency meant to avoid greater public intervention, while foreign utilities faced

a gloomier fate.³² Spain's electric markets shrank to six: four integrated markets while two remained still competitive. Catalonia's market, serviced by *Barcelona Traction* and *Fluido Eléctrico*; the eastern-central market, supplied by *Hidroeléctrica Española*, *Unión Eléctrica Madrileña*, and two smaller companies – *Riegos de Levante* and *Lute*; Aragón's market, with *Eléctricas Reunidas de Zaragoza* (ERZ) and *Energía e Industrias Aragonesas SA* (EIASA) as electricity providers, and the Basque-Castellan market, served by *Iberduero*.³³ After several mergers and acquisitions, these four markets were more integrated, while the north-western market, serviced by *Sociedad Gallega*, *Hidroeléctrica del Cantábrico*, *Viesgo* and *Langreo*, and the Andalucía market, with *Sevillana*, *Mengemor*, *Lecrín* and *Chorro* as suppliers, remained competitive.

By 1947, the only foreign companies were those servicing Catalonia and *Sevillana*. In order to guarantee Spain's international loans, the government chose to rescue them, resorting to an invisible nationalisation for *Sevillana* and a long international legal proceeding in the case of *Canadiense*.³⁴ The assets owned by *Sevillana* and *Barcelona Traction* became the cornerstones of Spain's fledgling public electric sector, which was to remain small and affiliated to the INI (*Instituto Nacional de Industria*)

3. Electric utilities' profitability in Spain and Argentina, 1910–50

3.1. *Electric utilities' profitability drivers*

A comparison between Argentine and Spanish electric utilities reveals a number of interesting long-standing facts. First, both markets successively appealed to the same investors – coming from the United Kingdom, Germany, Belgium, Switzerland, and the United States – in equivalent waves, unfolding in the 1890s, 1910–12 and the 1920s. Foreign investments focused on similar markets – urban areas with highly diversified economies – while domestic capitals zeroed in on marginal areas until 1900. Starting in the 1900s, electrification in Argentina and Spain took a diverging path: while both nations moved forward unhindered, Spanish electrification relied more heavily on domestic investments, while foreign direct investments prevailed in Argentina.

Electrical multinationals, associated with holding companies and investment banks, headed for similar peripheral markets on account of their technological and financial advantages during the favourable periods enjoyed by both economies in 1880–1930. Additionally, these companies' swift expansion in Spain and Argentina shows the weakness of institutional hurdles encountered by foreign electric utilities during the first globalisation period.

Nonetheless, in order to analyse the differences between electric utilities in Argentina and Spain since 1901, it is necessary to take a look at host economies' institutional, financial and monetary conditions affecting companies' internationalisation efforts.

Institutionally, the regulatory frameworks that determined market entry strategies and rate policies differed in nature: in Argentina, municipal regulation persisted until the end of World War II, while in Spain public electric industry regulation began in 1920. Despite this difference, in practice, neither tariff scheme curtailed profit-seeking and exporting practices. Spain and Argentina differed more in the access to markets and hydraulic resources. In Spain, access to markets remained free at all times, while hydraulic resource ownership was restricted to domestic companies in 1917, but most waterfalls had already been allocated. City administrations rarely intervened or seized assets, promoting vertically integrated companies. In turn, Argentine cities' concession system tended to strengthen thermoelectric market's compartmentalisation, with dissimilar conditions and rate policies driving dissimilar profitability levels.³⁵ Financial profitability tends to vary

Table 3. Thermal and hydraulic power shares in Argentina and Spain (%).

Date	Argentina		España	
	Thermoelectric	Hydroelectric	Thermoelectric	Hydroelectric
1900			64.82	35.18
1910			31.22	68.78
1920			22.97	77.03
1930	96.44	3.56	25.40	74.60
1940	96.23	3.77	22.73	77.27
1950	96.81	3.19	27.36	72.64

Sources: For Spain I. Bartolomé, "La industria eléctrica española antes de la guerra civil: reconstrucción cuantitativa," *Revista de Historia Industrial*, 1999, n. 15. Instituto Nacional de Estadística, *Anuario Estadístico de España*. For Argentina: CEPAL, *La energía en América Latina*.

according to energy costs, market size and nature, and exchange rates when companies are foreign. Comparative studies on electric utilities' profitability levels over time are scarce, but Hausman and Neufeld's analysis on a group of American companies has established that relevant cost differences derived from their scale – the size of their electric power plants and grid interconnection.³⁶ On a secondary note, the use of water or coal had an impact on profitability, as fuel cost savings were offset by increased fixed costs. In addition, a diversified demand had a more favourable effect on profitability than high utilisation. While steadier, industrial and tramway supply could not be subject to the same high fees as low-tension supply. Finally, a company's location in a city with high, diversified demand weighed more heavily than its management strategies.

In this case, powerhouse size proves to be a complex metric, as it would be necessary to compare thermal and hydraulic machines, with no scale compatibility. Grid interconnection should also be ruled out, as there was no national grid in either Argentina or Spain during the analysed period.³⁷ Climate and energy resources would not make any relevant difference between both the countries, except in the case of water resources in Spain. Argentina and Spain have a moderate climate, with slight differences in energy consumption levels. Coal and gas were scarce in both economies.³⁸ Thus, it is best to first explore the preference for thermal (Argentina) or hydraulic (Spain) power generation (Table 3).

Emil Rathenau, AEG head until his death in 1915, questioned the argument that hydroelectricity could compete with thermal electricity – no matter how expensive coal became – because hydroelectric plants' fixed costs would undermine profitability.³⁹ Following his rationale, Spain's hydroelectric boom in 1905–20 would coincide with AEG's departure from Madrid, before it left Barcelona. Similarly, AEG's stay in Seville would be justified, as thermal exclusivity in that market was maintained until 1917. Yet Rathenau did not take into account the war conditions that drove fuel prices up dramatically or the beneficial effects of hydroelectric plants' increasing scale performance. Both factors, argued in the inter-war years to favour water usage, help to explain the early financial profitability of some Spanish electric utilities.⁴⁰ As shown in Figure 1, *Barcelonesa* and *Sevillana* (AEG) used coal to obtain very diverse returns on equity, with a spread of 5% to 7% until 1911. During World War I, water saved Spain's economy from energy restrictions and rewarded *HI*'s hydroelectricity investors with return rates that resembled those of *Barcelonesa* before the war. AEG's early withdrawal may have been prompted by its lack of knowledge about the hydroelectricity business rather than as a result of the profitability spread between coal and water. Indeed, the opposite

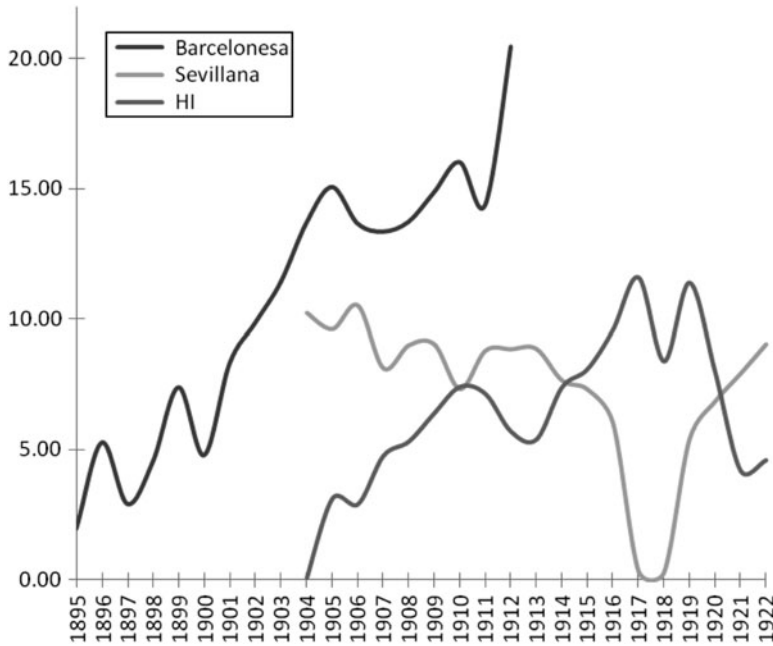


Figure 1. Electric utilities' financial profitability in Spain, 1895–1922. Source: Anuario Financiero y de Sociedades Anónimas de España, 1917. Alcaide Inchausti, *Compañía Sevillana de Electricidad*; Hidroeléctrica Ibérica, *Memorias Anuales* (1905–22).

hypothesis seems more likely: AEG may not have been able to fully pursue its investment recovery strategy with *Sevillana* because the company did not attract alternative buyers.⁴¹

Hydroelectric costs outdid thermal costs only in two scenarios: with exceptional hydrographical endowment or with extraordinarily high coal prices. According to Rathenau's rationale and except in the most generous natural locations, like the Norwegian and Alpine natural collection ponds, hydroelectric investments' profitability would never be high, although rising coal prices drove the use of water during World War I. Juan Urrutia, a technician who promoted *Banco de Vizcaya's Hidroeléctricas*, and also FS Pearson, chose hydroelectricity, as they were both convinced that water would prove a more economic resource in the long run – despite its demanding funding and meagre initial profitability – but selected their markets based not on proximity to resources but on electricity demand growth expectations.

Demand levels and composition are also construed as key profitability drivers by Hausman and Neufeld in their hypothesis. Between 1900 and 1935, Argentina's economy grew much more than its Spanish counterpart, and per capita income in Argentina was

Table 4. Per capita income in Argentina and Spain in selected dates (index numbers – Argentina in 1900 equals 100 – in 1990 International Geary-Khamis dollars).

	1900	1913	1920	1930	1935	1945	1955
Argentina	100	138	126	148	143	158	190
España	65	75	79	95	94	76	101

Source: Angus Maddison, *Historical Statistics for the World Economy: 1–2003 AD*. URL: <http://www.ggd.com/maddison/>

nearly twice that of Spain in 1913 (see Table 4). Primary exports contributed greatly to Argentina's GDP; but their expansion also promoted early domestic industrial growth. Argentine industry accounted for 25% of its GDP in the 1920s and 30% in the 1940s, while the industry's contribution to Spain's GDP was around 30% from 1914 to 1930, peaking to over 34% in 1928, and dropping in the 1940s to less than 25%.⁴² In turn, there was no significant difference in demand structure between these two countries before World War II.⁴³

Income differences determined per capita production and electric consumption levels, which were 60% higher in Argentina (see Table 5). While per capita income, production and consumption levels differed greatly from one region to the next in both countries, Argentina's market showed greater concentration, where 90% of electric production and consumption was concentrated in the Pampean region – especially, in Buenos Aires city and province, which housed 68% of the nation's population and over 90% of its industrial output. After World War I, this area was almost exclusively served by large modern plants owned by the subsidiaries of SOFINA (CHADE-CADE, CEP and SER) and CIAE. Thus, once they reached an optimal installed capacity to load factor ratio, power stations reaped high returns, maximising their utilisation time as a result of diversified demand in large populated areas. In the 1920s, electricity demand was equally distributed among industrial, residential/commercial and street lighting/transportation consumption, with an increasing share of industrial consumption which peaked to 45% of total demand in 1950. In turn, operating companies located in Argentina's hinterlands (largely owned by American & Foreign Power after 1930) managed a number of distant, barely interconnected low-capacity plants that failed to reach the optimal load flow that would have allowed for economies of scale.⁴⁴

In contrast, Spain's electric system followed a more dispersed development pattern. As the hydroelectric plants were located near to hydraulic resources, lower-performance systems served less populated areas, and high-performance networks developed in strongly industrialised areas, such as Catalonia or the Basque Country, where thermal and hydroelectric production were combined.⁴⁵ In less populated areas, low load factor (average demand versus maximum demand) and utilisation time coefficients caused an overcapacity. The prevailing use of hydroelectricity helped Spain to lower its dependence on imported coal

Table 5. Spain and Argentina: Generating capacity, Annual production and Production per capita, 1900–1950.

Year	Generating capacity (MW)		Electricity production (GWh)		Electricity production p.c. (KWh)	
	Spain	Argentina	Spain	Argentina	Spain	Argentina
1900	71	n.d.	107	n.d.	6	n.d.
1913	213	226	352	302	17	40
1922	736	260	1402	420	65	44
1931	1338	928	3221	1730	136	142
1936	1619	1098	3645	2387	147	179
1945	1876	1311	4170	3605	156	236
1950	2553	1390	6850	5190	248	303

Sources: For Spain, Bartolomé, *La industria eléctrica*; Nicoláu, "Población, Salud y Actividad", 77–154. For Argentina: Thern, "Evolución de las estadísticas", S/F; CHADE, CIAE, SER, Annual Reports, several years; Comisión Económica para América Latina, *La energía en América Latina*. There is no data of electricity self-generation in Argentina before 1930, this item is not included in 1913 and 1922.

and to decentralise both electric production and consumption. However, Spain's greater electric system capacity led to lower performance as compared to Argentina.

3.2. Electricity companies' profitability in Spain and Argentina

Next, we compare electric utilities' profitability in both countries by means of two ratios: ROE (*Return on equity* or earnings as percentage of equity) and ROA (*Return on assets* or percentage of earnings on assets).⁴⁶

As shown in Figure 2, Spanish companies' ROE remained at 7–10% until the end of the Civil War, peaking around 1930, while their ROA briefly touched 5% in 1930. Subsequently, both profitability metrics dropped slowly, reaching their minimum in 1945, when frozen prices, production restrictions and machinery obsolescence severely strained Spanish electric utilities.⁴⁷ The greatest gap separating financial and economic profitability curves unfolded in 1915–30, as companies increased their investments on assets. Following the crisis and until 1945, both profitability rates grew increasingly closer.

Before the war, *Sevillana* had the lowest values as a result of Seville's small market and fuel costs, but its economic profitability curve resembled that of Vizcaya group's *Hidroeléctricas*, as *Sevillana* relied less on outside capital and recorded higher amortisation rates.⁴⁸ ERZ, comfortably servicing Aragón's market in monopoly conditions, and HE show the highest profitability rates. The outstanding performance of both *Barcelona Traction* and its predecessor, *La Barcelonesa*, depicted by the sharp rising curve in the 1920s, corroborates the impact of a growing, diversified market on electric utilities' profitability.⁴⁹

Figure 3 maps the financial profitability performance of a set of electric utilities in Argentina as well as their ROE and ROA average rates.⁵⁰ Compared to Spanish electric

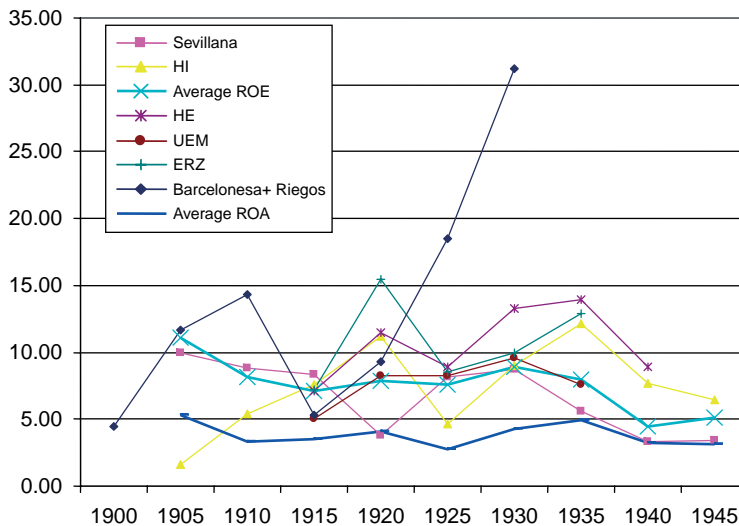


Figure 2. Selected Spanish electric utilities' ROEs, ROE and ROA (five-year average in percentages); (1900–45). Sources: *Anuario Financiero y de Sociedades Anónimas de España*: 1917, 1925, 1930. *Alcaide Inchausti, Compañía Sevillana de Electricidad*; *Germán Zubero, Eléctricas Reunidas*; *Hidroeléctrica Española, Memorias Anuales (1915–40)*; *Hidroeléctrica Ibérica, Memorias Anuales (1905–45)*; *Unión Eléctrica Madrileña, Memorias Anuales (1915–35)*. For average ROE: *Tafunell, 'La rentabilidad financiera'*, 71–111.

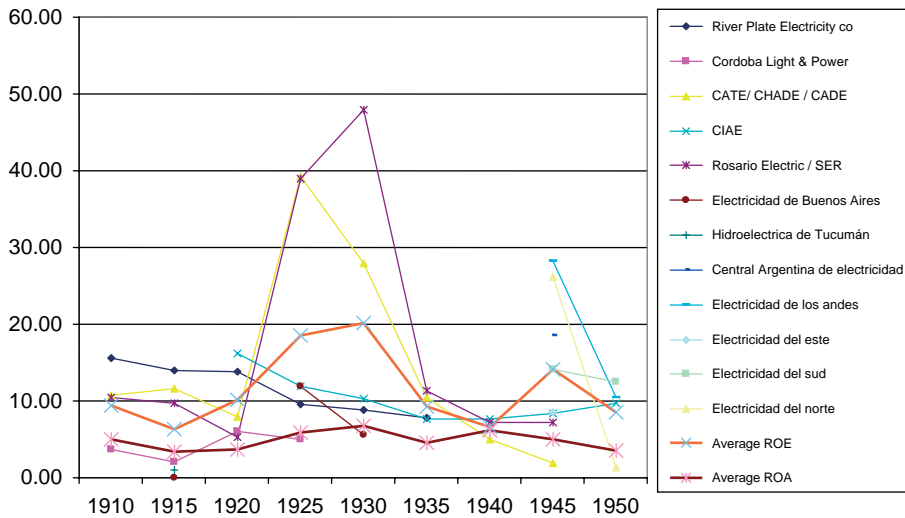


Figure 3. Selected Argentine electric utilities' ROEs, ROE and ROA (five-year averages in percentages). (1910–50). * Sources**: Córdoba Light & Power, *Annual Reports*, 1908, 1910, 1913, 1915, 1921; DUEG-CATE, *Informes Anuales* 1906–19, CHADE, *Memorias anuales* 1920, 1936; CADE, *Balance general* 1938, 1940, 1944. CIAE, *Memorias y Balances* 1917–50; The Rosario Electric Company, *Annual Reports*, 1904, 1908, 1910; [Municipalidad de Rosario](#), *Informe de la Comisión Fiscalizadora*; SOFINA, *Annual Reports*, 1926–46; Compañía de Electricidad de la Provincia de Buenos Aires, *Annual Reports*, 1913–41; Compañía Hidroeléctrica de Tucumán, *Memoria y Balance*, 1915–1941; American & Foreign Power, *Annual Reports*, 1924–42; *Guía de Sociedades Anónimas*, *Anuarios* 1924, 1930, 1937–38, 1944–45. Notes: * Five-year averages are based on complete data series for CATE, CIAE and SER. For all other companies, as data were missing for some years, the next available data have been considered. Overall ROE and ROA averages have been calculated on both. **American & Foreign Power's annual reports do not provide a breakdown for its Latin American subsidiaries' equity, assets, and income. As a result, data for its subsidiaries in Argentina have been taken from company directories published in cited years.

utilities' rates, foreign companies' profitability was higher, while the profitability accomplished by SOFINA's subsidiaries (CATE/CHADE and SER) vastly exceeds average rates. This would support our hypothesis that industry-leading international electric holdings deployed their investments in the most dynamic urban markets, with concessions that granted more favourable conditions for foreign investment. In particular, exchange rates had an impact on SER's extremely high profitability in 1921–31, as a result of its equity depreciation in Belgian francs, which was not updated until 1927.⁵¹ Nonetheless, if we adjusted the 1920–26 equity according to the 1927 accounting update, SER's profitability curve would stand at 52% in 1926, still a very high rate. CIAE's profitability remained close to the Spanish average rate until the 1929 crash, consistently above 10%. Even investing heavily in Buenos Aires' competitive market, CIAE maintained a high profitability rate, albeit not as high as SER's, as the latter operated in monopoly conditions.

The financial profitability of companies operating in Argentina ranged between 10% and 20% of their equity, except during the war periods, when it dropped to 7% as a result of fuel cost increases. The sharpest rising trend spans from 1920, peaking in 1930, in a similar pattern to their Spanish counterparts, but with a 10-point higher rate. After that, ROE decreased until the end of World War II, when it rose once again. Their economic profitability curve followed a similar trend, ranging between 5% and 7%. In the 1920s, the

gap between financial and economic profitability widened, as a result of a sharp ROE increase. It should be noted that this period featured a rise in companies' equity and investments, which means that the increase of financial profitability points to companies' capitalisation through outside funding. The equity rise did not have a negative impact on the companies' financial profitability, as the favourable exchange rate raised the earnings growth rate of European companies. High financial profitability rates – as well as the search for new markets – proved appealing for American companies in the late years of this decade. The opposite scenario unfolded after the 1930s crisis, when Argentina's currency devaluation precipitated a drop in revenues in foreign currency.⁵² Nonetheless, when the curve fell as a result of decreasing earnings in homeland currency and asset revaluation in 1933–34, these companies' ROE remained high, rising slightly above that of their Spanish counterparts' in the 1930s.

Figure 4 shows quite clearly that electricity companies' profitability in Argentina was consistently higher than in Spain, especially in 1920–35. These dissimilarities encompass both financial and economic profitability, except in World War I.⁵³ Any bias resulting from fixed capital amortisation rates and criteria applied by companies in every country underscores this difference: in Argentina, high amortisation rates tended to undermine income, while in Spain the opposite happened. In both countries, the differences in amortisation accounting methods may be attributed to the investment decisions and funding strategies of electricity companies. High financial profitability stood as foreign companies' strategy to capture funds in international markets. In turn, amortisation deductions did not significantly affect ROE rates for the more capitalised foreign electric utilities, which consistently updated their fixed assets' financial and technical amortisation. In contrast, domestic electric utilities delayed depreciation records to show higher net earnings to attract local investors.

Differing profitability levels of electric utilities may have been consistent with foreign investment decisions on both sides of the Atlantic Ocean. While some of these differences may be attributed to business management and technology, we lean towards the belief that electric utilities' investment location choices, based on market size and type, as well as their market control levels were their primary profitability drivers. Argentina's Pampean

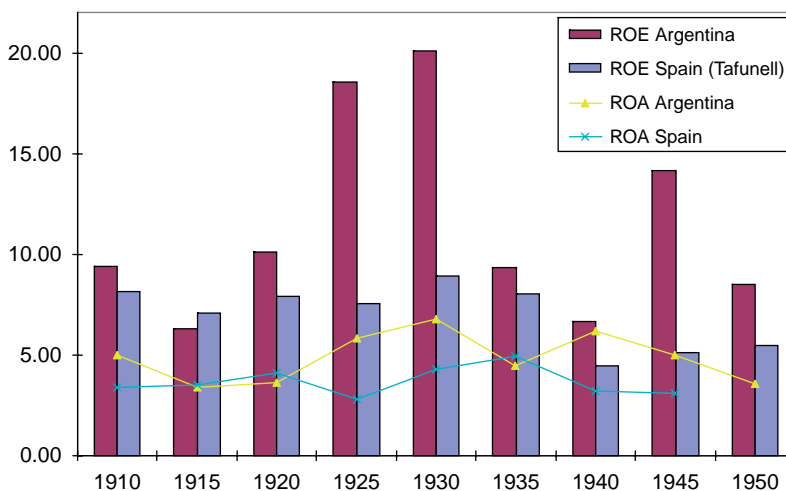


Figure 4. Electric utilities' ROE and ROA in Argentina and Spain, 1910–50 (five-year averages in percentages). Sources: See Figures 2 and 3.

cities and Spain's Catalanian region, where foreign electric utilities persisted, shared similar per capita income, consumption levels and demand densities, although industrial demand remained higher in Catalonia. Foreign electric utilities' continued operations in Barcelona and their withdrawal from all other Spanish markets may be explained, in this rationale, by the former's high profitability and the latter's low profitability.

On the other hand, Spanish companies managed to replace foreign utilities as a result of the development of a domestic capital market and the creation of business partnerships among electric groups that guaranteed technological transfers. In Spain, early hydroelectric ventures required lower capital investments than those in Catalonia or the ones that would have been required in Argentina, due to the large distances separating waterfalls and the nation's largest markets.

It should be noted that Argentina was a low-risk country in the analysed period. By 1914, Argentina was the main destiny of British investment, attracting more foreign capital than any other Latin American nation. Foreign firms obtained high returns as new business opportunities emerged in an open economy, which was growing fast, according to the reports of British firms. In the first global economy, the managerial capabilities of free-standing firms contributed to minimise risks, taking advantage of abundant resources, mostly underemployed, at lower costs. Following World War I, the expansion of Argentine domestic market in a low political risk environment also attracted new German and American companies. Therefore, opportunity parameters explain better than risk why the rates of return were higher in South America than in Europe in this period.⁵⁴

Lastly, the impact of currency fluctuations on profitability rates also shaped international companies' investment decisions. A favourable exchange rate would considerably raise electric utilities' profitability, attracting new investments. On the contrary, local currency devaluations, exchange rate policies, and rising political risks in hosting economies threatened earning transfers abroad. Spain's strong peseta in the early 1920s favoured asset redemption practices and drove CHADE to Spain. Instead, in the early 1930s, Dictator Primo de Rivera's fall and the establishment of the Second Spanish Republic brought new risks for foreign companies, while Argentina continued to deliver a satisfactory level of profitability, despite the turmoil in other international markets. This helps an understanding of American investors' differing behaviour in Argentina and Spain. While *American & Foreign Power* became the third group in Argentina in 1930, the attempts made by large groups like Electric Securities in Spain ended abruptly.

4. Conclusion

After early pioneering lighting efforts, commercial electricity expanded primarily as a result of foreign companies' initiatives, which in successive waves contributed to the creation of electric markets. Until World War I, investment cycles in Spain and Argentina coincided: early British investment carried out by free-standing companies was followed by German investments, headed by AEG and European investment banks with partnering Belgian and Swiss holdings, unfolding between 1894 and 1910. Subsequently, foreign companies consolidated in Argentina, upping their investments in the 1920s, while in Spain foreign investments focused only on a few dynamic yet concentrated markets that did not exceed a third of the country's overall electric output. Then, domestic investment took the lead. In 1928–31, American capital also managed to expand strongly in Argentina, with *American & Foreign Power*. While U.S. corporations also made large-scale attempts to enter Spain's electric markets, they desisted in 1931. In 1945, barely

three electric companies featured foreign interests in Spain, while foreign companies owned 75% of electric utilities in Argentina.

The first foreign companies set up operations in both nations' leading markets by population and income, which were also the most industrialised districts – namely, Barcelona, Madrid, Bilbao, Buenos Aires and Rosario. Industrialisation drove the development of electric networks, prompting a correlation between powerhouse location and larger consumption markets in the early stage. However, starting after World War I, this correlation was interrupted in Spain, but it continued in Argentina.

When World War I broke out, Argentina and Spain took different paths in electricity development. First, Spanish electric utilities strengthened their market shares, while in Argentina German companies were displaced by subsidiaries from Belgian and Italian–Swiss holding companies. Second, armed conflict caused trouble for equipment and fuel supplies, but coal substitution opportunities drove alternative production schemes. In Spain, restrictions encouraged development of hydroelectric production, which helped to lower dependency on coal, while Argentina's prevailing thermoelectric production bolstered its dependence on British coal until World War II, leading to more severe deficits in times of war. Spain's expansion of hydroelectric production contributed to decentralising production, building a more equitable regional distribution and consumption pattern, albeit with large performance differences between areas with higher and lower electric consumption. In contrast, in Argentina, of generating plants were initially located close to leading urban markets, yielding an electric network that concentrated in the Pampean coastal region, whose consumption ensured a large return on equipment at low costs and with economies of scale.

The maintenance of a concessional regulatory system managed by local governments increased the fragmentation of Argentina's electric market and contributed to furthering initial regional differences in service supply and tariff schemes. Until 1943, the regulatory framework built in the late nineteenth century guaranteed very favourable conditions for foreign companies servicing the nation's most dynamic electric markets, fuelling greater economic concentration of the electric industry with the creation of regional electricity monopolies and oligopolies.

In both Spain and Argentina, regulatory frameworks tended to promote private investments in electric networks, saving State intervention for critical scenarios in order to guarantee electricity supply. Nevertheless, some differences between the countries are noteworthy. In Spain, hydroelectricity development demanded earlier State regulation in order to restrict access to water resources. Thus, the outbreak of World War I encouraged the introduction of price controls – a step taken 30 years later and only for a short period in Argentina. On the other hand, foreign companies' supremacy in the Argentine market implied that regulatory initiatives in the 1930s challenged not only the obtainment of extraordinary profits but also the control by foreign holding companies, which would lead to more serious confrontations between the State and companies in the 1940s. In contrast, in Spain, Franco's State interventions, including bailouts and the creation of the public electric company, were torn between collaboration and confrontation, discretionally favouring some groups of companies over others, but never entirely breaking away from the market distribution status-quo established by the industry itself.

Both nations' systems followed similar technological advancement paths, but their performance differed as a result of plants' greater geographical dispersion as related to Spanish consumption markets, which led to lower per-capita production and consumption rates than in Argentina. In the most heavily populated Spanish cities with greater industrial

consumption, electric utilities' profitability neared that of their counterparts in Argentina, thus encouraging the persistence of foreign companies. Especially the foreign companies operating in Barcelona, Buenos Aires and Rosario enjoyed very high profitability rates until 1930.

Spain's less profitable markets were serviced by Spanish companies following World War I. The increasing involvement of Spanish companies in the country's electric market strengthened the regional development of electric networks with more relative competition, driving substantial growth in installed capacity, despite the regional differences in electricity consumption. Spanish companies' operations were supported by Spain's dynamic capital market from the early twentieth century and by the lower investment costs incurred by early hydroelectric systems. As a result of these conditions, Spain's electric industry was moderately concentrated.

Electric utilities' profitability in both countries follows a similar chronology associated with international economic conditions that affected this business, such as difficulties to secure supplies in times of war, or the impact of the 1930s crisis on exchange rates. However, profitability levels also differed considerably on both sides of the Atlantic Ocean as a result of market structure characteristics, foreign capital involvement and companies' investment strategies. In Argentina, electric utilities' financial profitability was consistently higher than that of their counterparts in Spain, except during World War I. This difference grew sharper in 1920–30, when investment increases were offset by growing earnings as a result of an exchange rate that benefited foreign companies. Economic profitability also proved higher in Argentina, as agglomeration economies attracted multinational electricity companies to wealthy urban areas, where they got better returns to scale.

Electrical multinationals' global strategies brought about different electrification schemes in late-industrialising countries. Economic conditions in investment hosting countries gave way to more intensive electrification processes that zeroed in on highly concentrated urban markets in Argentina, while Spain's electrification combined low intensity and uneven returns with a lower dependence on foreign supplies and an electric network that was more equitably distributed across the nation's territory.

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Notes

1. [Cipolla](#), *The economic history of world population*; [Wrigley](#), *Continuity, chance and change*; [Malanima](#), "Energy crisis and growth."
2. [Rubio and Bertoni](#), *Energía y desarrollo en el largo siglo XX*; [Bertoni, Román, and Rubio](#), "El desarrollo energético de España y Uruguay"; [Bartolomé](#), "La industria eléctrica en España." A recent study of Latin American electrification in [Tafunell](#), "La revolución eléctrica en América Latina," 327–59

3. Primary sources used in this research are held in Widener Library (Harvard University), Baker Library (Harvard Business School), Guildhall Library (London) and Archivo Histórico de Hidrola en Alcántara (Cáceres).
4. Bartolomé and Lanciotti, "Análisis comparado."
5. Bartolomé, "La red nacional"; Bartolomé and Lanciotti, "Análisis comparado", 5–14.
6. Hausman, Hertner, and Wilkins, *Global Electrification*.
7. Hertner, "Financial Strategies"; Segreto, "Le nuove strategie," 861–907; Broder, "L'expansion international," 65–77. For Canadian companies, see Armstrong and Nelles, *Southern Exposure*; Hertner and Nelles, "Contrasting Styles," 191–214. For American companies, see Hausman and Neufeld, "U.S. Foreign Direct Investment," 361–90. For a comprehensive overview see Hausman, Hertner, and Wilkins, *Global electrification*.
8. Hertner and Nelles, "Contrasting Styles"; Hausman, Hertner, and Wilkins, *Global Electrification*, 95–105; Sofina SA, "Sofina's participations"; Brion and Moreau, *Inventaire des archives*, XVII.
9. Hertner, "Financial Strategies," 145–59; Schroter, "The German Question," 375–80.
10. Hertner, "Globale Elektrifizierung zu Beginn des 20.," 47–80.
11. Columbus also financed a group of small electric utility companies in several Argentine provinces, all of them managed by CIAE's board.
12. Tortella, *A Guide to Sources of Information*; Loscertales, "Inversiones alemanas en España."
13. Hertner and Nelles, "Contrasting Styles." In 1897, Schuckert and Sociedad Española de Carburos Metálicos founded *Electro-Química de Flix*, reorganised as Siemens-Schuckert Industria Eléctrica in 1910.
14. Hertner and Nelles, "Contrasting Styles"; Doria and Hertner, "Urban Growth"; Alcalde Ceravalls, *El cas "Barcelona Traction"* 79. Another company was founded in 1911, Energía Eléctrica de Cataluña, merged into Barcelona Traction later.
15. Ministerio de Agricultura, Industria, Comercio y Obras Públicas, *Estadística de la Industria Eléctrica en España*; Garrues, "Electricidad e industria en la España rural," 97–138. As Garrues has recently noted, some of these peripheral systems remained profitable during the Post-war era. Garrués-Irurzun, "Traditional Electricity Systems," 245–85.
16. The corporate strategy of this bank was examined by Valdaliso, "Los orígenes de Hidroeléctrica Ibérica," 97–129.
17. The group took part in at least 27 firms, investing more than 850 million pesetas in 1930. Tedde and Aubanell, "Hidroeléctrica Española," 193–278.
18. Bartolomé, "Un holding a escala ibérica," 119–51.
19. Anuario Financiero y de Sociedades Anónimas de España 1925; Bartolomé, *La industria eléctrica en España*, Anejo 3. Spanish entrepreneurs have been analysed by Nuñez Romero-Balmas, "Empresas de producción," 199–227 and Nuñez Romero-Balmas, "Last years," 483–504. Also see Alcalde, *El cas "Barcelona Traction"*, 75.
20. Bartolomé, *La industria eléctrica*.
21. SOFINA and Motor Columbus raised American capital in the 1920s. Additionally, two new holding companies were created: *European Electric Corporation* (EEIC, Montreal, 1930), acquiring shares in SADE and *Compagnie Ital-Belge, Compagnie Européenne por Enterprises d'Electricité* (Europel), and *Iberian Electric Ltd*. Hausman, Hertner, and Wilkins, *Global electrification*, 192.
22. Lanciotti, "Foreign Investments in Electric Utilities," 503–28; Lanciotti, "Ciclos de vida," 403–38; Hausman and Neufeld, "U.S. Foreign Direct Investment," 361–90.
23. General Electric launched Sociedad Ibérica de Construcciones Eléctricas and General Eléctrica española, proyecto al que se uniría AEG.
24. According to Broder, the Dictatorial Government of Primo de Rivera (1923–30) granted subsidies to dam projects, which attracted Swiss and American investments; however Bartolomé considered that the results were barely relevant. Broder, "Les investissements suisses," 441–61; Bartolomé "¿Fue el sector eléctrico," 789–818.
25. Broder, "Les investissements suisses." *Elektrobank's* stockholding was highly diversified in 1938–39: 6.6% in Spain and Portugal.
26. 73% of total stocks were registered in Spain, but they represent investments in Africa, Portugal, Andorra and Argentina.
27. Cámara Oficial de Productores y Distribuidores Electricidad [COPDE], *Datos Estadístico – técnicos*.

28. The most common index to measure market concentration is Herfindahl-Hirschmann Index (HHI), defined as the sum of squares of the market share of the largest firms in an industry. A HHI above 2500 shows high concentration, and indexes below 2500 indicate moderate concentration. Unfortunately, we do not have data on total electricity sales in Argentina and Spain for the period; but we get a proxy based on the production share of electricity firms over total electricity production in both countries. A HHI of 3034 reveals that electricity industry in Argentina was highly concentrated, while the Spanish electricity market was more competitive with a HHI of 1800.
29. Lanciotti, "Foreign Investment."
30. Prados de la Escosura and Roses, "Long-run Estimates," Table 5, 35.
31. Nuñez Romero-Balmas, "Las empresas eléctricas," 127.
32. However, most electricity companies supported Franco during the Civil War. Pueyo, "La post-guerra."
33. Hidroeléctrica Ibérica and Saltos del Duero merged to create Iberduero in 1944.
34. Nuñez Romero-Balmas, "Last years".
35. Other factors affecting electrification are examined by [name deleted to maintain the integrity of the review process], "Análisis comparado."
36. Hausman and Neufeld, "The Structure and Profitability," 225–43. On calculating profitability, see Tafunell, "La rentabilidad financiera," 71–111.
37. The integration of electricity networks came late for both countries, after the 1970s. In Argentina, electricity networks only covered isolated urban areas and the electrification of rural areas started in the late 1950s. In Spain, private companies started connecting some regional markets with transmission networks in the late 1930s, but integration was delayed because it made no business sense to connect small systems with similar supply-demand structures.
38. Rubio and Bertoni, *Energía y desarrollo en el largo siglo XX*.
39. Loscertales, "Inversiones alemanas."
40. The advantages of hydroelectric power were promoted by specialised magazines like *Houille Blanche*, *Revue Générale de l'électricité* and *Electrical World*.
41. Hertner and Nelles argued that *Barcelonesa* was sold because its profitability was lower than other AEG investments. Hertner and Nelles, "Contrasting Styles," 198.
42. Industry's contribution to Argentina's GDP was 27% in 1910–14, and 25% in 1925–29. Diaz Alejandro, *Essays on the economic history*. Also see Colin Lewis, "Industry before 1930." For Spain, see Prados de la Escosura, *El progreso económico*, Table, A.11.3.
43. Tramways were the main consumers of electricity in Argentina, while industry accounted for two-thirds of total consumption in some Spanish regions as Cataluña, País Vasco and Comunidad Valenciana. Bartolomé and Lanciotti "Análisis comparado," section I. Tables 2 and 3.
44. For the structure of electricity markets in both countries, see Bartolomé and Lanciotti "Análisis comparado."
45. Per capita electricity consumption was similar in both industrial regions before the Spanish Civil War, but while in Catalonia generation depended on a large network, that combined energy supplies from different and distant utilities; in the Basque Country, small generation systems were able to supply regional consumers such as workshops and undertakings.
46. To calculate ROE and ROA, we consider net profits before tax. Equity, Assets and profits are book values, denominated in the currency of firms' headquarters (pounds sterling, Belgian Francs, German Marks), except in the case of those operating companies registered in the host countries, which values denominated in Argentinean pesos and Spanish current pesetas. We use book values based on the fact that the currency of the European firms fluctuated greatly during the interwar period, and electricity companies rarely deflated their assets before World War II. Assets and profits are not inflation-adjusted in ROA and ROE, as price fluctuations did not have much influence in profitability trends, except for brief periods of high inflation (1936–40, in Spain; 1942–43 and 1948–50 in Argentina). More details in Bartolomé and Lanciotti "Análisis comparado," Appendix b.
47. Profitability dropped even though profit shares increased at the expense of wages after the Civil War, as Vilar has recently noted. Vilar, *Los salarios del miedo*, table 4.6, 274.
48. Spanish companies applied very low amortization rates and their accounting procedures tended to overestimate profitability ratios. See Bartolomé and Lanciotti "Análisis comparado," Appendix a.

49. According to Alcalde Ceravalls, profitability of investment would have been even higher, up to 84% in 1930, because part of the share capital was invested in securities. Alcalde Ceravalls, *El cas "Barcelona Traction,"* Table 3, columns 6 and 31, 111–12.
50. The Spanish companies selected for our sample led large systems. The Argentinean sample is more comprehensive, including subsidiaries of international holding companies (CATE-CHADE-CADE, SER, CIAE, Electricidad de los Andes, Electricidad del Este, Electricidad del Sud, Central Argentina de Electricidad, Electricidad del Norte), and also British companies operating in secondary cities (Córdoba Light & Power, Hidroeléctrica de Tucumán, River Plate Electricity and Electricidad de la Provincia de Buenos Aires (acquired by SOFINA in 1929).
51. From 1919 to 1926, Belgian franc depreciated 309% against the Argentine peso.
52. The exchange rate depreciation, recorded in profit-and-loss statements, pushed profits down in the 1930s, as shown in Figures 2–3.
53. In war periods, a drop in the profits of electricity companies in Argentina was caused by the high cost of vegetable-based fuel which replaced British coal.
54. Wilkins, *Comparative Hosts*, 18–50; Pollard, "Capital Exports 1870–1914"; Chapman, "British-Based Investment Groups"; Luch and Lanciotti, "Las empresas europeas". For the analysis of political risk and multinational strategies, see Jones, *Multinational Strategies and Developing Countries*, and also Jones and Lubinsky, "Managing Political Risk". To define political risk and country risk, see Berg and Guisinger, "Capital flows." 269–74.

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