Online Appendix: Social Networks and Elite Entrepreneurship in Latin America: Evidence from the Industrialization of Antioquia

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A1 Case studies

The archival research brought plenty of qualitative evidence that supports the interpretation of the data that I propose in this section. A reasonable way to present that evidence is through a series of brief case studies.

A1.1 Alejandro Echavarría Isaza

Alejandro Echavarría, born in 1859 in Barbosa, a small town in the northeast of Antioquia, exemplified the archetype of an Antioquian industrialist. His father achieved considerable success as a merchant in Barbosa before relocating the family to Medellín to expand their business. Alejandro began his career in the family trading company and later diversified into various industries, including farming and banking.

One of Alejandro's notable ventures was the establishment of *Coltejer*, a textile company, in 1907, in collaboration with his children and his brother's family. *Coltejer* would come to symbolize the industrialization of Antioquia, with the *Coltejer* Building in Medellín standing as a prominent landmark even today.

Echavarría effectively leveraged his trading connections to establish an efficient distribution network for *Coltejer* products. This was a significant achievement considering the challenging

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geographical conditions of the region and the complexities involved in engaging with clients. Bell (1921) describes the extensive reach that the merchants of Antioquia had in Colombian markets:

> "The merchants of Antioquia are actively engaged in expanding their trade with the interior, and traders from Medellín are found in the least accessible regions, even as far west as the platinum-mining country of the Rio Atrato... [They] have the advantage of knowing the country, the credit rating of their clients, and all market and credit requirements." (Bell, 1921, p.231)

However, having an efficient distribution channel was only part of the equation; a successful production system was equally essential. As discussed in Section A2, industrial firms faced significant challenges in recruiting and training workers. In this regard, Echavarría enjoyed a crucial advantage. He maintained close connections with charity societies and the Catholic Church, which played a pivotal role in his network.[1] Echavarría used these connections, along with his rural affiliations stemming from his farming ventures and ties to foreign trade, to create a system that trained rural women and orphans in the necessary skills to work in his company. One such initiative is described by Brew:

> "The Society of San Vicente de Paul began teaching orphans the art of weaving in 1890, and specifically chose this art, as it was labor intensive and did not compete with any of the cottage industries of the day. The merchants who sponsored this institution were very interested in the dissemination of weaving techniques. The Echavarría family supplied materials to the Society of San Vicente and it was some of the Echavarrías who financed an experiment to introduce mechanized looms around 1898, and who established a textile factory in 1907." (Brew, 1977, p. 51)

Built upon these two pillars–a robust and expansive distribution system and a reliable source of skilled personnel–*Coltejer* flourished and emerged as one of the most prosperous textile companies in Colombia (Castrillón Quintana, 2021). It is important to note that Alejandro Echavarría could not have established these pillars through conventional market mechanisms alone; instead, he had to serve as an intermediary between disparate communities. This unique ability to bridge different social groups was made possible by his distinctive position within the elite network.

[1]Many of these connections were established through extensive philanthropic endeavors (see Castrillón Quintana, 2021).

A1.2 Carlos Coriolano Amador

Merchants have long served as the backbone of the business elite in Antioquia, their extensive activities rendering them indispensable contacts for industrial entrepreneurs.

Beyond their role in the local distribution of industrial goods, merchants played a vital role in facilitating the importation of machinery and other essential supplies. Seasoned merchants boasted decades of experience in importing goods, maintaining stable connections with foreign markets, and possessing the requisite knowledge and resources to execute these transactions. Entrepreneurs who forged connections with merchants stood to benefit from their wealth of experience and contacts.

Consider the case of Carlos Coriolano Amador, born in Medellín in 1835. Amador, a prominent and affluent businessman involved in various sectors such as trade, land ownership, and farming, garnered renown for his control over one of Antioquia's largest mines, *El Zancudo*. Furthermore, he founded *Fundación de Sabaleta*, one of the most important foundries during the latter half of the 19th century.

In 1867, Amador intended to order machinery and supplies for his foundry from *Stiebel Brothers*, a commercial house in London. As he was unknown to the British commercial house, one of its partners, James Stiebel, asked Marcelino Restrepo, an important merchant of Medellín who was indirectly connected to Amador, for a reference of him:[2]

> "We have no difficulty in receiving the interests of Mr. Amador and accepting his draft accounts but we do not grant more than 6 months of term for the reimbursement of our invoices. However, before entering into business with said gentleman, I want to know your opinion about him and receive your prudent and experienced advice regarding the responsibility, credit, and commercial concept that said gentleman deserves." (quoted by Botero, 2007a, p.98)

Without Marcelino Restrepo's recommendation, Amador's company would have never received the supplies and likely never reached an operational stage. However, *Fundación de Sabaleta* required several other resources that came from different people with whom he was connected directly or indirectly through different networks–e.g. family, politics, and friendship. For example, in the absence of a stock market, connections with bankers and miners were the most effective way of accessing large amounts of capital. Bankers possessed the liquidity

[2] Several other merchants had a similar type of connections with commercial houses in Europe and offered them to their local contacts. A salient example of this was Francisco del Valle in the 1870s, who offered to reach other person's suppliers and guarantee that they packed the merchandise in a preferred way. This was done to protect the merchandise during the hazardous trip to Antioquia and minimize import tariffs (Boletin Industrial, 1873b).

provided by credit, while miners had direct access to bullion, both of which were essential in a metal-based monetary system.

Amador greatly benefited from mediating between these two worlds. To finance his purchase of machinery and supplies, he required a series of loans that were approved by the banks *Restrepo & Cia.* and *Vicente B. Villa e Hijos*, totaling more than 180,000 pesos (Molina and Castaño, 1987). Carlos Amador had abundant connections with Luciano Restrepo, the head of *Restrepo & Cia.*, and Vicente B. Villa, the head of *Vicente B. Villa e Hijos*. It is worth mentioning that Carlos and Luciano were political allies, while Carlos and Vicente were co-fathers-in-law. Amador himself entered the mining business because his father-in-law owned *El Zancudo*; thus, they were indirectly connected through Amador's wife.

Therefore, Amador exemplifies a recurring pattern in the stories of successful entrepreneurs in Antioquia. Nearly all of them were adept at bringing together a diverse array of resources by leveraging connections from different facets of their lives. Different types of connections introduced different individuals and resources, all of which proved functional for business purposes.

A1.3 The foreign engineers

The arrival of foreign engineers in the mid-19th century played a crucial role in the modernization of the mining sector in Antioquia. Their influence also extended to the industrial sector (see Mayor, 1984; Poveda, 1987; Botero, 2007b).

Initially, foreign engineers directly participated as partners in various early industrial ventures. For example, Reinhold Paschke, a German engineer who arrived in the mines of northern Antioquia in 1860, was one of the founders of the *Compañía de Cerámica Antioqueña* in 1881, which was the region's first ceramics industrial firm. Paschke also served as the company's director for several years. The other founders of the company included merchants, bankers, and miners who had previous collaborations with Paschke or were acquainted with his previous collaborators. While the other partners contributed capital, Paschke's contribution lay in his technical expertise and knowledge of the production process.

In addition to providing technical knowledge, foreign engineers played a crucial role as connections due to their experience and international networks. They were instrumental in advising local elite members on how to pursue education in Europe, particularly in technical fields, as evidenced by personal letters.[3] A key figure in this educational process was James

[3]This knowledge transfer had a significant impact on the development of technical expertise within the region. For example, the establishment of the *Escuela Nacional de Minas de Medellín* in 1886 was driven by Antioqueños who had gained engineering degrees abroad and recognized the need for a local institution with a business-oriented approach. Notably, two of Mariano Ospina Rodríguez's children, Pedro Nel and Tulio,

Tyrell Moore, a British engineer who worked in the mines of Antioquia.[4]

Over time, these engineers integrated themselves into the local elite and assumed a more subtle role in the process of industrialization. The Greiffenstein family exemplifies this pattern. Carlos Greiffenstein Kolleman, an engineer recruited by Moore to work at the Tiribí mines in the late 1850s, provides a notable example (Poveda, 1987). By the 1880s, he had relocated to Medellín, married a local woman, and became a shareholder and manager of a bank. Two of his sons, Guillermo and Ricardo, emerged as significant industrial entrepreneurs. Notably, they established the first industrial glass company in Antioquia, called *La Vidriera de Caldas*.

One of the key advantages Guillermo and Ricardo possessed as industrialists was their ability to bridge the gap between the community of technicians and the traditional elite of the region. Let us consider Guillermo and his adeptness in leveraging political favors. He married Gabriela Ospina Pérez, the granddaughter of Mariano Ospina Rodríguez, a former President of Colombia (introduced in Section A2). Gabriela was also the niece of Pedro Nel Ospina Vásquez, the founder of the *Escuela de Minas*, and the sister of Mariano Ospina Pérez, both of whom also served as Presidents of Colombia.

Political connections had various benefits for industrialists. One of the most significant advantages was the ability of politicians to enact protective measures that favored specific industrial entrepreneurs. Table A1 provides an overview of some of the public interventions in the region's industrial activity during this period.[5]

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initiated this initiative after completing their engineering studies at the University of California in Berkeley. Graduating from the Escuela de Minas became a practical requirement for aspiring members of the industrial elite until the mid-20th century (Restrepo, 2016).

[4] Moore helped Miguel Vásquez Barrientos travel to Europe to initiate his studies, in 1857. Miguel was 15 years old and his father was a good friend of Moore (Safford, 1976). Miguel eventually returned to Antioquia and became one of the most important industrial entrepreneurs in the region.

[5] These interventions were carried out within the framework of a national policy that heavily relied on trade policy to promote industrialization, especially after 1885. For more information on this policy, refer to Ospina (1955).

Table A1: Politics Involvement in Industrial Entrepreneurship in Antioquia

Year	Activity	Government Level	Details
1840s-1900s	Schnapps	Regional	Legal monopoly per municipality assigned every 4 years to a private agent through an open bidding
1864	Chocolate	Regional	Legal monopoly for 10 years to a private agent
1864	Iron	Regional	Legal monopoly to a private agent
1885	Candles and stearic acid	Regional	Legal monopoly for 10 years to a private agent
1886-1900	Matches	National	Legal monopoly per department and tariff exceptions to import machinery and inputs
1888	Ceramic	Regional	Subsidy of $4.000 to an existing firm
1893	Ceramic	National	Tariff exceptions to import machinery and inputs and reduction to taxing load over 5 years
1892-1894	Cigarettes	National	Governmental monopoly
1895	Energy	Municipal	Foundation of a firm with public and private capital
1904	Textiles	Regional	Subsidized public loan
1910	Wheat flour	National	Additional tariff to imports
1912	Energy	Municipal	Legal monopoly to a private agent
1912	Textiles	Municipal	Tax exceptions for 20 years

Note: This table summarizes the most relevant political interventions for promoting industrialization in this region during the period.
Source: Based on Brew (1977), Restrepo (1983), and Mejía (2015b)

The Greiffensteins, however, benefited in a different manner. They capitalized on the opportunities presented by joint ventures between the local government and private entrepreneurs, which became popular during this period. A notable example of this was the establishment of the *Compañía Antioqueña de Instalaciones Eléctricas* in 1896, the country's first modern energy producer. The company was two-thirds owned by the local government (with one-third belonging to the Government of Antioquia and one-third to the municipality of Medellín) and one-third owned by private businessmen. The three largest private shareholders were Eduardo and Pedro Vásquez Jaramillo (brothers-in-law of Mariano Ospina Rodríguez) and Carlos Greiffenstein Vélez, the brother of Ricardo and Guillermo.

Overall, several members of migrant families were able to maintain their entrepreneurial advantage, even after their technical expertise had diminished. Their ability to integrate different segments of the elite appears to have played a crucial role in this process.

A2 Dysfunctional markets and uncertainty

An entrepreneur in Antioquia had to face a whole series of productive and non-productive challenges. Here is a description of some of those.

A2.1 Financial constraints

To begin with, accessing the capital necessary to carry out successful industrial endeavors in Antioquia was extremely challenging. Despite not being large companies on an international scale, almost all of these firms required significant capital investment by local standards.

According to the data presented in Section A5.4.2, only 0.05% of Antioquia's population possessed a private fortune larger than the average entrepreneur's investment in industry. Moreover, in addition to the initial capital required, many industrial firms needed a reliable cash flow to support their operations. Unfortunately, the region's weak financial system was hardly capable of providing this.

During our period of analysis, modern financial institutions expanded systematically. However, their capacity was not enough to become the dominant funding source until the mid-20th century. In Antioquia, there was no stable stock market until the late 1940s, and banks did not exist until the 1870s. Even after their creation, the financial system remained highly unreliable, with a limited reach that was concentrated in Medellín. For instance, in 1888, several banks massively canceled loans already assigned to industrial firms, as reported by Brew (1977).[6] This event put additional pressure on equity and shareholders' connections as sources of funding for companies, leading some of them to bankruptcy. All of this occurred in a context of profound monetary instability, with several different currencies circulating simultaneously, making it particularly challenging to coordinate large-scale crowdfunding efforts (Mejía and Parra-Montoya, 2022).

As a result, high frictions were evident in the lending market, even during periods of credit expansion. For instance, in Medellín, interest rates for private loans remained above 2% per month, while in rural areas, they exceeded 4% (Bell, 1921). Under these circumstances, only exceptionally profitable and robust projects could fully rely on bank credit sources for their operations.

A2.2 Knowledge access

Obtaining the necessary capital to create and operate industrial firms was only one of the challenges. Accessing useful knowledge and technology was another obstacle that needed to be overcome. Unfortunately, the level of human capital in the region was low, and the education system showed little interest in providing technical training (Safford, 1976).

Mariano Ospina Rodríguez, an influential politician, whose children became salient industrial entrepreneurs in Antioquia, pointed out this flaw in the education system of Colombia in an eloquent way:

> "Our schools, all of them, have the very grave defect of inoculating the youth with political spirit, and as politics is the devourer of wealth, it would be said that

[6]Several other types of financial crises took place during the period. For instance, in 1903, a foreign exchange crisis took out of business all the banks created during the 19th century (Mejía, 2022).

> a youth who can count on some capital to begin to work... is incapacitated by the studies of our schools..." (Barrientos, 1913, p.179)

As a result, in most cases, obtaining knowledge of industrial production required studying abroad[7] or bringing in foreign experts. For instance, some cigarette companies such as *La Fábrica de Cigarrillos La Lealtad* and *La Fábrica de Escobar, Restrepo y Compañía* brought in Cuban experts on tobacco growing and processing, as explored in records by Restrepo (1983).

It is noteworthy that the constraints on accessing knowledge posed not only an initial obstacle to the establishment of industrial firms but also had implications for their subsequent performance. In fact, the introduction of Cuban experts to the cigarette industry was prompted by mounting evidence that quality issues were hampering their competitiveness.[8]

A2.3 Recruiting qualified personnel

Entrepreneurs not only needed to acquire specialized knowledge of technical processes, but they also faced the challenge of training workers for an unfamiliar productive structure. The limited manufacturing exposure of the population and the traditional technologies used in the sector until then made it difficult to recruit workers with the necessary skills for industrial production.

The challenge of acquiring the necessary workforce was intensified by the fact that labor was not typically assigned through market mechanisms, but rather through customary practices. This was particularly true for blue-collar workers, given the limited manufacturing exposure of the population and the traditional technologies used in the sector. For instance, even after the abolition of slavery in 1863, 10% of the labor force in Antioquia still worked as servants outside of agricultural activities (Botero, 1888). Given that servitude was more common in agriculture, it is reasonable to assume that the share of the population that worked as servants was likely higher than 20%.

[7]The pursuit of a degree in the US was precisely what Mariano Ospina's children eventually did, and many other elite children followed a similar path. The objective of elite members sending their children to study abroad was to expose them to the technical knowledge available in the US or Europe. In 1862, a merchant arranging the studies abroad for one of his children wrote the following in a letter:

> "My objective in sending him to that country is for him to learn some branches of knowledge that may be useful in this country. But most importantly, I want him to learn mechanics and machinery, not just theoretically but practically and in the areas of most immediate application to our needs" (quoted by Safford, 1976, p.236)

[8]A similar example in a different activity was *La Ferrería de Amaga*, one of the first hardware companies in Antioquia, which used a certain type of wood that had insufficient heating power for iron production. Several regional historians argue that this problem eventually led to the bankruptcy of the firm (Corradine, 2011).

Several entrepreneurs found in migrant women from rural areas the key to accessing personnel that could be qualified. In 1916, 75% of the workforce in the two largest textile factories of Medellín were women. They were usually young or unmarried poor farmers who arrived in the city looking for opportunities. They were coordinated and trained under a system, labeled by some as *Christian paternalism* (Arango, 1988), which favored their adaptation to industrial practices. Roger Brew describes how female labor was able to rapidly adapt to the factory system:

> "In the first place, the role of women in Colombian society has been extraordinarily submissive and the owners and administrators of the factories transferred traditionally revered symbols such as the crucifix from the church to the factory, and at the same time, provided housing for single women, putting them under the care and control of nuns. Second, the female labor force had acquired, over time, the experience of disciplined work and administration, as a result of previous work experience in the coffee plantations or in one of the many companies that existed in Medellín to thresh, pick and pack coffee." (Brew, 1977, p. 37)

A2.4 Machinery and supplies imports

Even with the necessary knowledge and personnel to establish a successful industrial firm, entrepreneurs still needed a specific type of physical capital, most of which was not available locally. This capital typically consisted of large and modern machinery that had to be purchased from foreign markets, often in England or Germany. This involved a complex process of acquiring information about suitable machines for each process and contacting foreign sellers. In addition, entrepreneurs had to manage the long-term maintenance of the machinery. This process involved tasks that the average member of the elite in Antioquia was not familiar with, such as interacting with a large number of intermediaries, managing intricate correspondence in foreign languages, and embarking on several-month-long trips to Europe.

Furthermore, transporting the imported machinery to factories in Antioquia was a significant undertaking in itself. In contrast to other industrial areas in Latin America, which were located on the coast (such as Buenos Aires or Sao Paulo), where the internal transport of machinery did not take more than a calm couple of hours/days trip, in Antioquia, this process usually took months under harsh conditions. This trip included a 70-day journey by boat from the port on the coast (Barranquilla) to the port on the closest river (Poveda, 1998). Then, reaching the industrial cities required covering over 250 kilometers by mule in the difficult mountain conditions described above, which took several weeks.[9] This process

[9]A railroad from Puerto Berrío (the port in the closest river) to Medellín was approved in the mid-1870s.

brought a whole set of technical challenges and risks. For instance, in 1902, the machinery for the recently created textile firm, *Compañia Antioqueña de Tejidos*, arrived completely broken after the trip from England. This implied a long and extensive reparation by locals, which, eventually, led to the closure of the company (Ospina, 1955).[10]

A2.5 Market size

The previous challenges were strictly related to production. Unfortunately for the entrepreneurs of Antioquia, there were plenty of other obstacles that they had to overcome to establish a successful industrial firm, even after the product left the factories.

Firstly, the geographical isolation and difficult topography of Antioquia severely limited access to a market large enough to support the scale required for most modern industrial production. To give an idea of the minimum transport costs in the region, transporting a cargo of 125 kilograms by mule–the most efficient method for local transport–costs between 20 and 45 cents in a non-high-slope area. This was equivalent to the cost of transporting one ton in the northern United States by horse carriage (Safford, 2010)

The trade commissioner of the US in Colombia explicitly pointed out this as a limitation for the expansion of industrial activity in Antioquia:[11]

> "There can be no question of the industrial development of Antioquia or that this region is rapidly becoming the principal manufacturing center of Colombia, however, handicapped it may be by the mountainous nature of the country and the lack of good transportation facilities." (Bell, 1921, p. 232)

However, it was not completed until the early 1920s, although sections of the railroad were progressively completed before then. By 1905, only 66 kilometers were available. For the other industrial capitals of Antioquia, the arrival of railroads took even longer. They were approved by the early 1910s, but the first sections were not available until a decade later (Meisel et al., 2014; Martinez and Mejía, 2020).

[10]Accessing raw materials represented a similar challenge. For instance, Restrepo (1983) extensively describes how early textile firms had to import their entire demand for cotton and wool. They deployed a massive campaign to encourage the cultivation of cotton locally. Newspaper articles with messages such as "*We need cotton! Lots of cotton!*" or "*Sow cotton*" were frequent. *Compañia Antioqueña de Tejidos* itself got engaged in a program to provide imported seeds to farmers and committed to buying the entire production of whoever was willing to produce it.

[11]This type of concern was extremely common, at least, since the late 18th century, when the Spanish envoy, Mon y Velarde said:

> "Those roads have always been the unfortunate beginning of the slowness of trade and the considerable losses suffered by merchants in their transports, and the owners of mules in their high mortality." (Diosa González, 2015, p.36)

A2.6 Market penetration

Even firms that had access to a fairly large market had to compete for that market with well-established incumbents. Manufacturing consumers were used to traditional-style products or industrial imports, which were usually associated with having higher quality precisely because of their non-local origin.

To illustrate this point, consider the following announcement in a Medellín newspaper in 1873. It was paid by the commercial house *Pedro Uribe F. e Hijo*, which moved its store to a new location:

> "Pedro Uribe F. e Hijo notify the public that they have moved their warehouse to the premises formerly occupied by Mr. Modesto Molina, in front of Mr. Lope M. Montoya's house. They offer the public a new assortment of English and French merchandise and good terms, northern flour of the best quality, and pumps of all styles". (Boletin Industrial, 1873a, p.11)

Notice that the announcement had two components, the information about the new location and the description of the quality of their products based on their foreign origin. There were several paid advertisements of this kind in every edition of local newspapers.

Regional historians have identified this appetite for imports and traditional products as a constraint for local industries. For example, Brew (1977) mentions the experience of local cigarettes against the incumbent Cuban cigarettes, and local beer against the overwhelming preferred *aguardiente*. Most of the local industrial precursors in these sectors closed after a few years.

A2.7 Political barriers and institutional turmoil

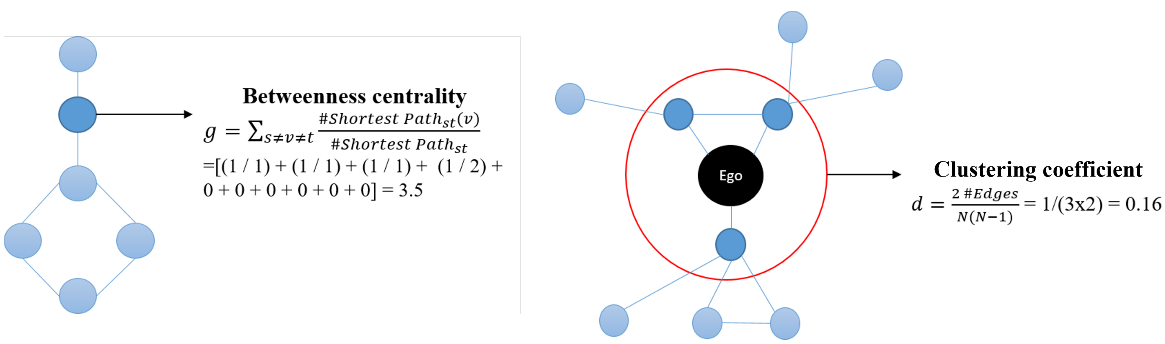
If economic constraints were not enough, the political environment of Antioquia–and Colombia, for that matter–was not at all favorable for entrepreneurial activity. Institutional turmoil was the norm. Seven civil wars broke out during the period, bringing the destruction of physical and human capital. A concrete example of how this affected industrial entrepreneurs in Antioquia was the regular practice among combatants to destroy commercial ships going from Barranquilla to Antioquia, hindering imports of supplies even more (Poveda, 1998). Antioquia itself was invaded several times by external armies, and the new groups in power frequently persecuted businesspeople from opposing factions. This was the case, for instance, of Eduardo Vásquez Jaramillo, one of the most important industrial entrepreneurs of the period, who was forced into exile and saw all his properties confiscated by the new liberal government in the late 1870s (Botero, 2003).

The institutional turmoil also had several more subtle but not less important consequences on entrepreneurial activity. Even when wars did not directly impact the region, the aggregate instability that came with them was problematic. This was the case during la *Guerra de los Mil Días*, which brought immense monetary chaos that led to hyperinflation, devaluation, and eventually, a banking crisis that intensified the challenges of finding reliable sources to finance the operations of industrial firms (Correa, 2009).

A3 Network metrics

There are several indexes of betweenness centrality and clustering coefficient. I use the most frequently used in the literature. Both indexes have predefined algorithms available in the *igraph* package of R and Python.

Figure A1: Betweenness centrality and clustering coefficient



Note: This figure presents two networks and the estimates of betweenness centrality and clustering coefficient for one of their nodes.

Similarly, degree, eigenvector centrality, and closeness centrality are constructed following the default algorithm of the igraph package (see Csardi and Nepusz, 2006).

A4 Data collection

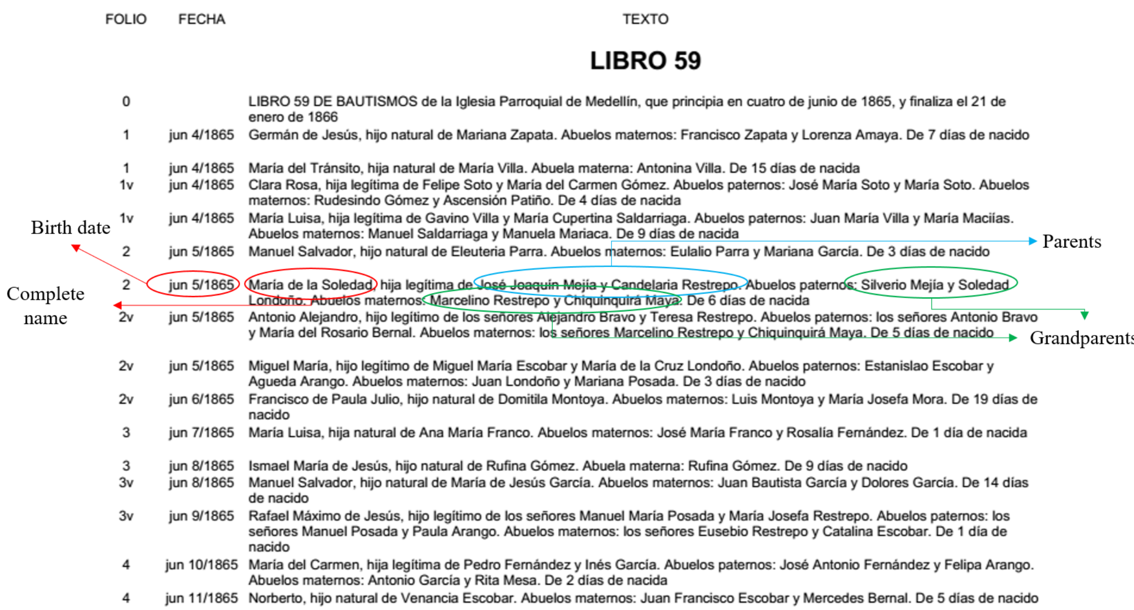
I use a large variety of sources for constructing the data used in this paper. This included more than 100 primary sources (located in over 15 archives across Antioquia) and around 185 secondary sources. All the sources were manually transcribed. I used a double-check criterion to maximize the accuracy of the information presented. Individuals must have been identified in at least two sources for being included in the sample. The match of the individuals across sources was also performed manually.

The data-collection work started in April 2010 with the first component of the relational data. It ended in May 2015 with a final update of the firm data. A preliminary version of the relational data with details on the sources used can be found in the form of a biographical dictionary in Mejía (2012). Missing data on dates was extrapolated from the information of family members.

The following section presents examples of some of the sources used.

A4.1 Examples of the primary sources used

Figure A2: Sample of Baptism Records. Medellín, book 59, June 1865-January 1866.

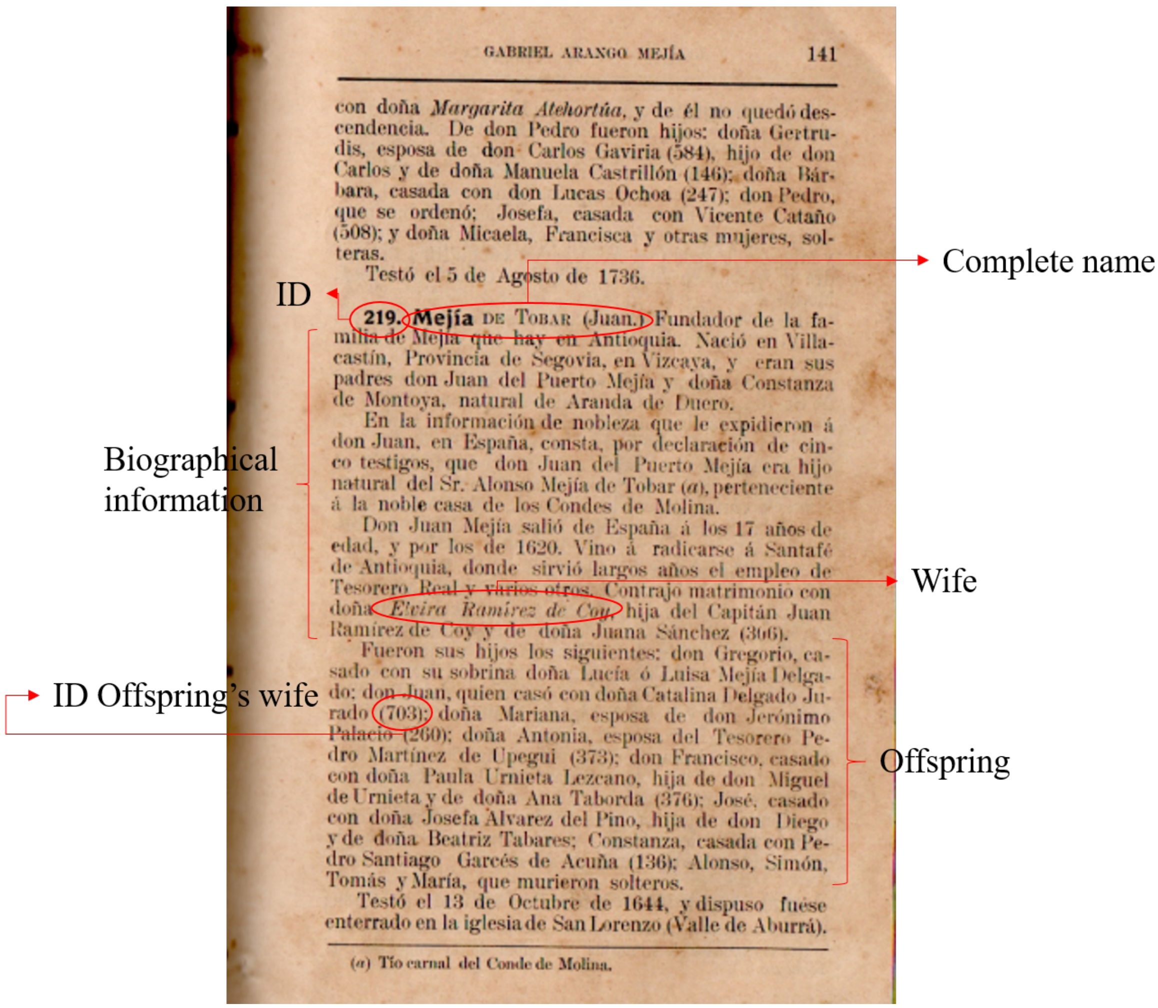


LIBRO 59

FOLIO	FECHA	TEXTO
0		LIBRO 59 DE BAUTISMOS de la Iglesia Parroquial de Medellín, que principia en cuatro de junio de 1865, y finaliza el 21 de enero de 1866
1	jun 4/1865	Germán de Jesús, hijo natural de Mariana Zapata. Abuelos maternos: Francisco Zapata y Lorenza Amaya. De 7 días de nacido
1	jun 4/1865	María del Tránsito, hija natural de María Villa. Abuela materna: Antonina Villa. De 15 días de nacida
1v	jun 4/1865	Clara Rosa, hija legítima de Felipe Soto y María del Carmen Gómez. Abuelos paternos: José María Soto y María Soto. Abuelos maternos: Rudesindo Gómez y Ascensión Patiño. De 4 días de nacida
1v	jun 4/1865	María Luisa, hija legítima de Gavino Villa y María Cupertina Saldarriaga. Abuelos paternos: Juan María Villa y María Maciías. Abuelos maternos: Manuel Saldarriaga y Manuela Mariaca. De 9 días de nacida
2	jun 5/1865	Manuel Salvador, hijo natural de Eleuteria Parra. Abuelos maternos: Eulalio Parra y Mariana García. De 3 días de nacido
2	jun 5/1865	María de la Soledad, hija legítima de José Joaquín Mejía y Candelaria Restrepo. Abuelos paternos: Silverio Mejía y Soledad Londoño. Abuelos maternos: Marcelino Restrepo y Chiquinquirá Maya. De 6 días de nacida
2v	jun 5/1865	Antonio Alejandro, hijo legítimo de los señores Alejandro Bravo y Teresa Restrepo. Abuelos paternos: los señores Antonio Bravo y María del Rosario Bernal. Abuelos maternos: los señores Marcelino Restrepo y Chiquinquirá Maya. De 5 días de nacido
2v	jun 5/1865	Miguel María, hijo legítimo de Miguel María Escobar y María de la Cruz Londoño. Abuelos paternos: Estanislao Escobar y Agueda Arango. Abuelos maternos: Juan Londoño y Mariana Posada. De 3 días de nacido
2v	jun 6/1865	Francisco de Paula Julio, hijo natural de Domitila Montoya. Abuelos maternos: Luis Montoya y María Josefa Mora. De 19 días de nacido
3	jun 7/1865	María Luisa, hija natural de Ana María Franco. Abuelos maternos: José María Franco y Rosalía Fernández. De 1 día de nacida
3	jun 8/1865	Ismael María de Jesús, hijo natural de Rufina Gómez. Abuela materna: Rufina Gómez. De 9 días de nacido
3v	jun 8/1865	Manuel Salvador, hijo natural de María de Jesús García. Abuelos maternos: Juan Bautista García y Dolores García. De 14 días de nacido
3v	jun 9/1865	Rafael Máximo de Jesús, hijo legítimo de los señores Manuel María Posada y María Josefa Restrepo. Abuelos paternos: los señores Manuel Posada y Paula Arango. Abuelos maternos: los señores Eusebio Restrepo y Catalina Escobar. De 1 día de nacido
4	jun 10/1865	María del Carmen, hija legítima de Pedro Fernández y Inés García. Abuelos paternos: José Antonio Fernández y Felipa Arango. Abuelos maternos: Antonio García y Rita Mesa. De 2 días de nacida
4	jun 11/1865	Norberto, hijo natural de Venancia Escobar. Abuelos maternos: Juan Francisco Escobar y Mercedes Bernal. De 5 días de nacido

Note: Sample of a baptism book. This figure presents one page of a baptism book. In baptism books, priests recorded the names of every child baptized, in addition to the complete names of their parents, and grandparents. The large majority of Antioquia's population during this period was Catholic. Additionally, the Catholic Church held a prominent position as the most capable institution in the region. It exercised strong control over its congregation, with baptism being a ritual strictly enforced. Consequently, baptism books serve as an exhaustive source of information for the entire population. However, it is unfortunate that baptism records have not been systematically preserved. As a result, my access was limited to a non-random sample of books from various locations.

Figure A3: Sample of a Genealogical Study. Gabriel Arango's Genealogies. Mejia Family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con doña *Margarita Atehortúa*, y de él no quedó descendencia. De don Pedro fueron hijos: doña Gertrudis, esposa de don Carlos Gaviria (584), hijo de don Carlos y de doña Manuela Castrillón (146); doña Bárbara, casada con don Lucas Ochoa (247); don Pedro, que se ordenó; Josefa, casada con Vicente Cataño (508); y doña Micaela, Francisca y otras mujeres, solteras.

Testó el 5 de Agosto de 1736.

219. Mejía DE TOBAR (Juan.) Fundador de la familia de Mejía que hay en Antioquia. Nació en Villacastín, Provincia de Segovia, en Vizcaya, y eran sus padres don Juan del Puerto Mejía y doña Constanza de Montoya, natural de Aranda de Duero.

En la información de nobleza que le expidieron á don Juan, en España, consta, por declaración de cinco testigos, que don Juan del Puerto Mejía era hijo natural del Sr. Alonso Mejía de Tobar (*a*), perteneciente á la noble casa de los Condes de Molina.

Don Juan Mejía salió de España á los 17 años de edad, y por los de 1620. Vino á radicarse á Santafé de Antioquia, donde sirvió largos años el empleo de Tesorero Real y varios otros. Contrajo matrimonio con doña *Elvira Ramírez de Coy*, hija del Capitán Juan Ramírez de Coy y de doña Juana Sánchez (366).

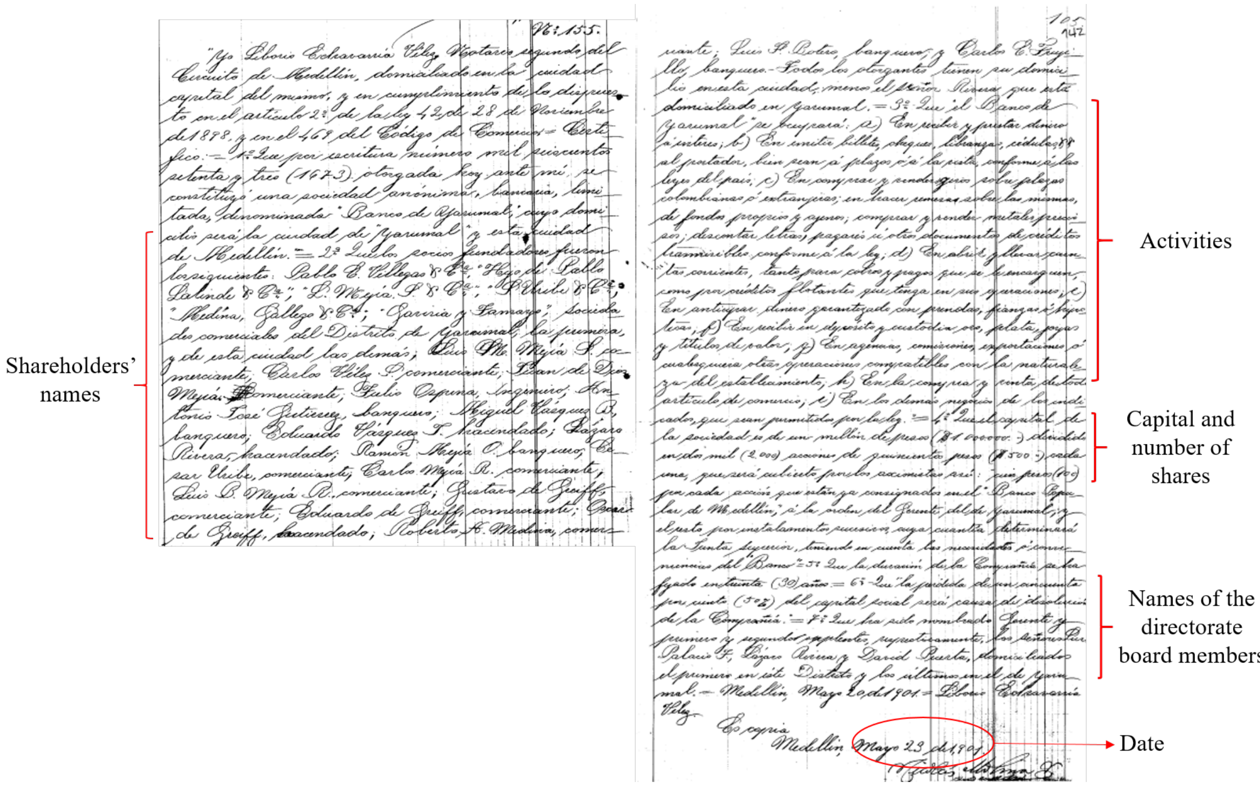
Fueron sus hijos los siguientes: don Gregorio, casado con su sobrina doña Lucía ó Luisa Mejía Delgado; don Juan, quien casó con doña Catalina Delgado Jurado (703); doña Mariana, esposa de don Jerónimo Palacio (260); doña Antonia, esposa del Tesorero Pedro Martínez de Upegui (373); don Francisco, casado con doña Paula Urnieta Lezcano, hija de don Miguel de Urnieta y de doña Ana Taborda (376); José, casado con doña Josefa Alvarez del Pino, hija de don Diego y de doña Beatriz Tabares; Constanza, casada con Pedro Santiago Garcés de Acuña (136); Alonso, Simón, Tomás y María, que murieron solteros.

Testó el 13 de Octubre de 1644, y dispuso fuése enterrado en la iglesia de San Lorenzo (Valle de Aburrá).

(*a*) Tío carnal del Conde de Molina.

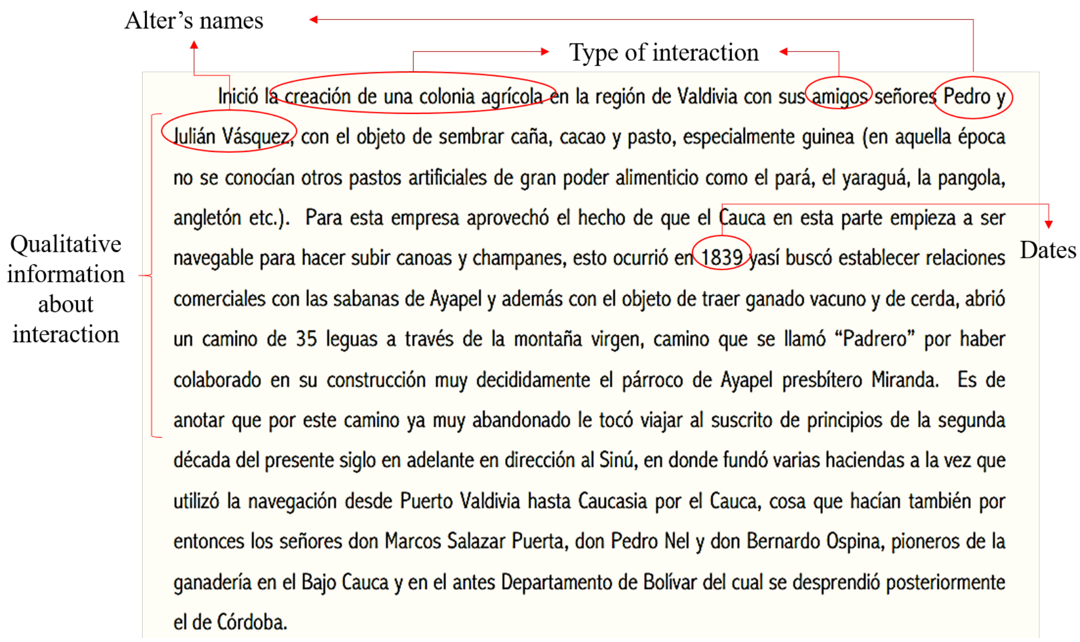
Note: This figure represents one page of a genealogical study, which is a document created by local scholars or genealogy enthusiasts and often published. Genealogical studies aim to organize the ancestral origins of various lineages. In this specific page, we find information about the first Mejia that arrived in Antioquia, as documented in Arango (1911). The page includes the complete names of the person, their spouse, and their descendants. Additionally, it provides details about dates and locations of birth and death. Each individual is assigned a unique ID, facilitating cross-referencing with other sections of the same source. Please note that the available information may vary for each person and across different genealogical studies. For this research, multiple genealogies were consulted, and they all exhibit similar characteristics.

Figure A4: Sample of Constitutional Document. Banco de Yarumal. 1901



Note: This figure presents the entire constitutional document of a bank in northern Antioquia, *Banco de Yarumal.* It includes the name of every shareholder of the firm, the activities performed by the firm, other equity structure details, and the name of the board members. All this, at the time the firm was founded. In fact, the formal foundation of a firm was the creation itself of this document. Most of the information on business networks comes from this type of source. Constitutional documents are also an essential element of my industrial firm dataset.

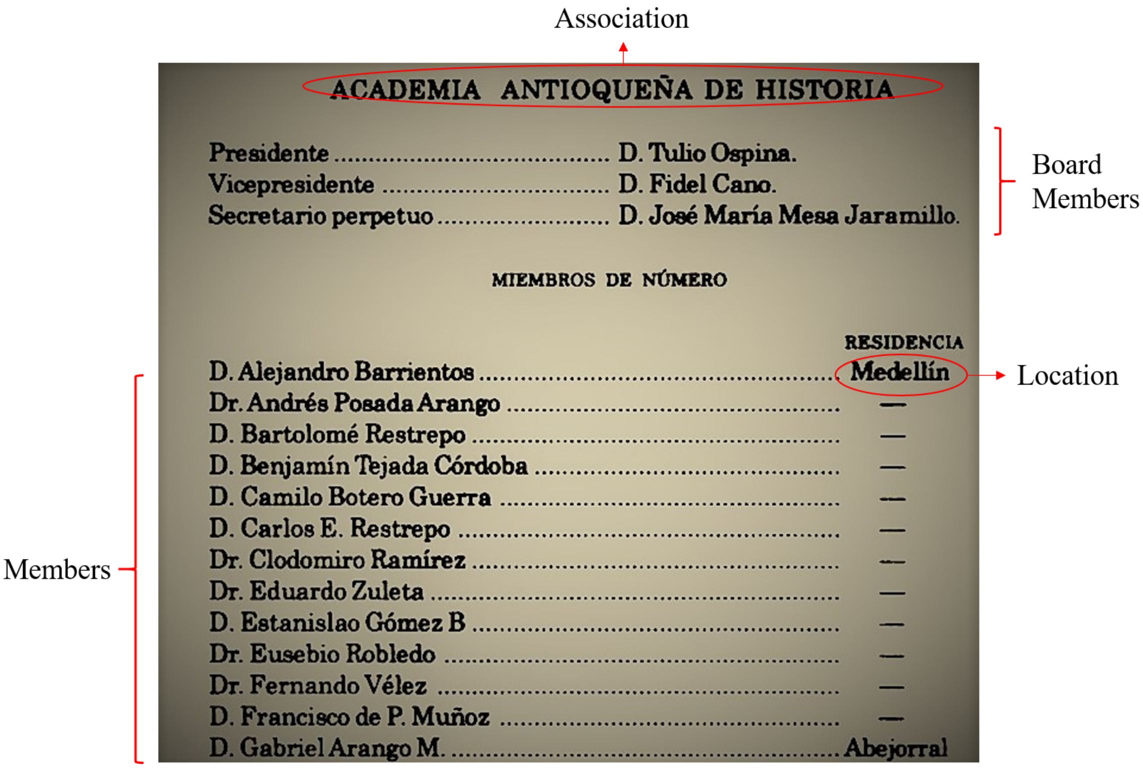
Figure A5: Sample of Narratives and Entrepreneurial Studies. Echavarria (1971)



Inició la creación de una colonia agrícola en la región de Valdivia con sus amigos señores Pedro y Julián Vásquez, con el objeto de sembrar caña, cacao y pasto, especialmente guinea (en aquella época no se conocían otros pastos artificiales de gran poder alimenticio como el pará, el yaraguá, la pangola, angletón etc.). Para esta empresa aprovechó el hecho de que el Cauca en esta parte empieza a ser navegable para hacer subir canoas y champanes, esto ocurrió en 1839 y así buscó establecer relaciones comerciales con las sabanas de Ayapel y además con el objeto de traer ganado vacuno y de cerda, abrió un camino de 35 leguas a través de la montaña virgen, camino que se llamó "Padrero" por haber colaborado en su construcción muy decididamente el párroco de Ayapel presbítero Miranda. Es de anotar que por este camino ya muy abandonado le tocó viajar al suscrito de principios de la segunda década del presente siglo en adelante en dirección al Sinú, en donde fundó varias haciendas a la vez que utilizó la navegación desde Puerto Valdivia hasta Caucasia por el Cauca, cosa que hacían también por entonces los señores don Marcos Salazar Puerta, don Pedro Nel y don Bernardo Ospina, pioneros de la ganadería en el Bajo Cauca y en el antes Departamento de Bolívar del cual se desprendió posteriormente el de Córdoba.

Note: This figure displays a section of a narrative written by Echavarria (1971). Echavarría belonged to the elite class of Antioquia and was a prominent entrepreneur. The document, published as a memoir by the local Academy of History, offers insights into the region's business activities as recalled by Echavarría. Such sources are valuable for their qualitative information, shedding light on personal connections and characteristics of individuals. They serve as repositories of knowledge passed down through oral traditions, making them unique and hard to find in other types of sources. It is important to note that the attributes and information available in these sources may vary significantly from one author to another.

Figure A6: Sample of Elite's Associations. Academy of History



Note: This figure presents a fragment of the list of the members of the Academy of History. The Academy of History was an organization that promoted local history. The literature has identified that this project–as well as the other projects I consider in the sample–was an elite initiative. Some of these types of projects had completely philanthropic purposes. In this case, I consider that every pair of individuals that were members of the Academy of History at the same time had an intellectual tie.

Figure A7: Grave of José María Amador (a delta individual)

Note: This figure showcases the grave of José María Amador, one of the delta individuals. Tragically, shortly after his honeymoon, Amador fell ill with what the doctors of that time referred to as the "love disease." Despite enduring weeks of agony, he passed away in November 1893. Today, it is believed that the cause of his death was tuberculosis, likely contracted from a sexually transmitted disease.

A5 Further analysis and robustness checks

A5.1 Partnership structure and business connections

During the 19th century, Colombia's legal framework was profoundly unstable, as the country was governed by ten different constitutions. The partnership law was not immune to this instability, and it was not until 1887 that clear regulations were established for creating firms. The civil, commercial, and mining codes, approved that year, defined three types of associations: civil, commercial, and mining associations. Of these, the commercial association was the most widely used by firms, and it had three sub-types: *sociedad colectiva*, *sociedad* *en comandita*, and *sociedad anónima.* A fourth type, *sociedad de responsabilidad limitada* (limited liability companies), was created in 1937.

Most firms were structured as *sociedad colectiva*, which was essentially a traditional partnership where all owners were jointly liable for the company's legal actions and debts. *Sociedad en comandita* was a limited partnership where one or more people promised to contribute to the social fund, and one or more persons agreed to exclusively manage the company. This figure was equivalent to the *Kommanditgesellschaft* in German law. In the context of Antioquia, *sociedades en comandita* were atypical.

The third type of association was *sociedad anónima*, a conventional corporation formed by shareholders who contributed to the common fund up to the amount of their respective shares. This type of association was managed by revocable representatives and was known by the designation of the company's purpose. Although more frequent than *sociedades en comandita*, *sociedades anónimas* were still uncommon. In fact, they were often viewed with distrust, as the following quote from 1898 illustrates:

> "We believe that the first of the proximate causes that motivate the indicated sterility is the distrust with which the public in general, and especially businessmen, look at anonymous companies, a distrust that, without a doubt, is based only on the almost irresponsibility with which our laws have surrounded–unwittingly–these kinds of associations.
>
> This distrust is so common and so accepted that we know of respectable business houses that have as a rule invariably not opening credits to corporations and not entering into important negotiations with them; and the fact is very frequent that if such negotiations are entered into, the private signature of the members of the company is required as security.
>
> It is well understood that companies that encounter such setbacks cannot go far." (Restrepo, 1898, p. 243)

The partnership structure is crucial to understanding the business networks discussed in Section 3.3, which specifically refer to property networks. In these networks, two individuals are considered connected if they were shareholders of the same company. This criterion is deemed reasonable for inferring strong business interactions within a traditional partnership environment like Antioquia during the period under study. As highlighted in Section 2.3, the majority of firms in urban areas were *casas comerciales* structured as *sociedades colectivas*, where the family head shared business ownership with adult children and their spouses. Consequently, the property criterion results in networks characterized by a low number of connections per person, moderately high local density, and relatively short diameters (refer to

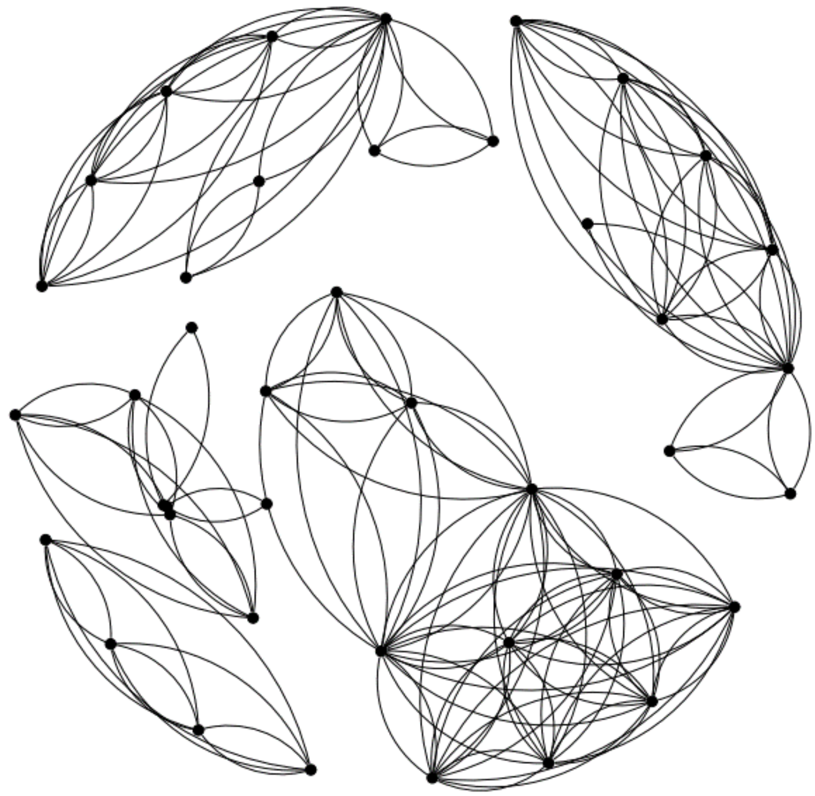
Table 3). These network features are consistent with other human networks that exhibit close connections (see Watts and Strogatz, 1998; Girvan and Newman, 2002).

However, the property criterion is not an ideal measure of social interactions in a corporate environment, where each firm has a large number of shareholders. The literature on economic history suggests that the emergence of corporations often led to the dilution of personal interactions among shareholders, with impersonal exchanges in capital markets or institutionalized interactions in assemblies or councils taking their place (see Chandler Jr, 1993; Hilt, 2008). Furthermore, the *social brain hypothesis* from the literature on social networks in evolutionary anthropology suggests that there is a limit to the number of individuals with whom a person can maintain a "coherent face-to-face relationship" (Dunbar, 2010). This limit is estimated to be around 150 people and arises from cognitive and temporal constraints; forming and maintaining meaningful social interactions requires significant attention and time. Given that, it is not reasonable to expect that the hundreds of shareholders of a corporation would have close personal interactions.

During my period of analysis, there was only one sector where corporate structures were dominant, banking. In most cases, the leaders of the banking projects were personally connected. However, it is highly unlikely that most of the stockholders shared these types of interactions as they were mostly retail investors. For example, *Banco de Medellín* had 442 shareholders, and *Banco de Oriente* had 227, with more than 40% of them owning less than four stocks, equivalent to 80 pesos. As such, following the property criterion, the banking network shows a large number of connections (more than 160 per person), massive clusters, and a minuscule diameter–features that are not common among human networks of close connections. Therefore, I have excluded banking ties from my analysis.

Having said that, several authors, such as Lamoreaux (1986, 1996), Frydman and Hilt (2017), and Hilt (2018), show the importance of banking relationships within corporate settings, particularly through the connections between board members. Building upon this, I constructed a network representing the interlocking directorates among banks in Antioquia for which data has been preserved. In this network, two individuals are linked if they served on the board of directors of the same bank simultaneously, as depicted in Figure A8.

Figure A8: Directorate banking network



Note: This figure presents the graph of the network of bankers. Dots represent members of banks' boards of directors (i.e. nodes) and lines represent interactions between them (i.e. edges).

Including these connections in the complete network does not change the qualitative findings of the paper (see Table A2). Therefore, there is no indication that their omission has led to a misguided interpretation of the impact of networks on entrepreneurship. However, their inclusion does enhance the strength and statistical significance of the relationship between entrepreneurship and betweenness centrality. This suggests that the connections of bankers through directorates were indeed important in the process of resource collection for entrepreneurs. This seems consistent with the fact that the significance of being a banker disappears once these banking connections are introduced. Essentially, once direct connections to bankers are accounted for, the importance of being a banker diminishes, and instead, the focus shifts to being well-connected within the network.

Table A2: Cross Section: Industrial Entrepreneurship and Social Networks Including Directorate Connections. OLS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
					Entrepreneurship					
Betweenness	0.147***		0.146***	0.141**	0.147***	0.143***	0.137**	0.146***	0.139**	0.127**
	(0.054)		(0.055)	(0.055)	(0.055)	(0.055)	(0.055)	(0.055)	(0.054)	(0.055)
Clustering coefficient		-0.051	-0.008	-0.009	-0.005	-0.007	-0.002	-0.009	-0.009	-0.006
		(0.032)	(0.030)	(0.031)	(0.031)	(0.030)	(0.031)	(0.031)	(0.030)	(0.031)
Banker				0.076						0.024
				(0.057)						(0.061)
Immigrant					0.189					-0.160
					(0.175)					(0.220)
Engineer						0.274*				0.225
						(0.160)				(0.175)
Miner							0.348**			0.304*
							(0.144)			(0.172)
Politician								-0.012		-0.024
								(0.071)		(0.072)
Merchant									0.178**	0.152**
									(0.070)	(0.074)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	954	954	954	954	954	954	954	954	954	954

Note: This table shows the results of a regression analysis that examines the correlation between industrial involvement and social networks, after controlling for a set of basic variables and an extended set of confounding factors. The unit of observation is the individual, and industrial involvement is measured as the number of firms founded by an individual during their lifetime. All independent variables are standardized, and robust standard error estimates are reported in parentheses. Significance levels are denoted as follows: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

This is one of the various ways in which partnership structure potentially mediated the influence of social interactions on entrepreneurship. Another way in which this could happen was the practices of creation and dissolution of firms. For instance, under traditional partnership structures, the entry or exit of a partner frequently implied the legal closure and reopening of what was essentially the same firm. This could inflate the measure of entrepreneurship potentially bias the results of the paper. However, in this regard, Section A5.2 shows that higher global connectivity is not only associated with the number of industrial firms created, but also with having created at least one industrial firm, which is something that should be immune to this concern. Furthermore, I show in Section 5.1 that individuals with higher betweenness centrality created industrial firms that lasted longer. Therefore, if anything, the possible bias resulting from the artificial closures and reopening of firms should be playing against my results.

Unfortunately, a more detailed analysis of the role of partnership structures is limited by the sources available today and the scope itself of the paper. Nonetheless, I believe that future studies focused on Antioquia should delve deeper into this issue, taking advantage of the increasing availability of primary sources and building on the work of previous papers in other parts of the world such as Guinnane et al. (2007); Musacchio et al. (2008); Guinnane and Martínez-Rodríguez (2018); Artunç and Guinnane (2019).

A5.2 Extensive margin: to be or not to be an entrepreneur

Most of the regressions in this paper exploit what could be considered the *intensive margin decision*–i.e. the number of industries founded by an individual. However, you might also consider an *extensive margin decision*, in which the question is rather if individuals decided to become (or do not become) entrepreneurs. For capturing this latter margin, I explore the cross-individual data with a logistic model that estimates how the probability of creating at least one industrial firm relates to the position that individuals have in the social network.

Table A3 shows that the estimates for the extensive margin decision are equivalent in qualitative terms to those of the intensive margin decision (Table 5).

Table A3: Cross Section: Industrial Entrepreneurship and Social Networks. Logit

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
					Entrepreneurship					
Betweenness	0.193***		0.188***	0.170***	0.197***	0.178***	0.161**	0.187***	0.172***	0.131*
	(0.061)		(0.060)	(0.062)	(0.061)	(0.062)	(0.063)	(0.060)	(0.062)	(0.069)
Clustering coefficient		0.205	0.143	0.143	0.154	0.078	0.126	0.140	0.167	0.114
		(0.200)	(0.205)	(0.207)	(0.207)	(0.211)	(0.202)	(0.205)	(0.206)	(0.211)
Banker				0.447*						0.220
				(0.237)						(0.261)
Immigrant					1.238*					0.168
					(0.722)					(0.807)
Engineer						0.868**				0.675
						(0.406)				(0.432)
Miner							1.264***			0.989***
							(0.334)			(0.359)
Politician								0.055		0.052
								(0.275)		(0.293)
Merchant									0.806***	0.751***
									(0.246)	(0.261)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	954	954	954	954	954	954	954	954	954	954

Note: This table establishes the statistically and economically significant correlation between industrial involvement and social networks after accounting for a set of basic controls and an extended set of confounders. The unit of observation is the individual. Industrial involvement is measured as having founded at least one industrial firm. Independent variables are standardized. Coefficients from columns 1- 10 are in log-odds units. The coefficients in column 10b are marginal effects. Robust standard error estimates are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

A5.3 Alternative models

The outcome variable in most of my analyses is a counting variable, the number of firms created. Some argue that an OLS approach is not appropriate in such a setting. In this section, I show that my results are robust to other conventional estimation methods.

The usual way of modeling count data is through a Poisson regression. However, as the descriptive statistics suggest, we are facing overdisperse data.[12] On the context of overdispersion, negative binomial regressions are frequently preferred.[13] Moreover, zero-inflated negative binomial models are commonly used if there is a large presence of zeros (Cameron and Trivedi, 2013).[14]

[12]This concern is corroborated by a Pearson and Hosmer-Lemeshow goodness-of-fit test.

[13]A supportive evidence for choosing this model is that the likelihood-ratio test for the parameter alpha indicates that the negative binomial model outperforms the Poisson model for my data.

[14]A Vuong test suggests that a regular negative binomial regression outperforms a zero-inflated one.

In any case, in the cross-sectional setting, the estimates from all these approaches offer quite similar results among them and with respect to the OLS estimates presented in Table 5.

Table A4: Cross section: Industrial Entrepreneurship and Social Networks

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
	Entrepreneurship					
	Negative Binomial		Poisson		Z.I. Negative Binomial	
Betweenness	0.022***	0.017***	0.022***	0.017***	0.019**	0.016**
	(0.007)	(0.006)	(0.005)	(0.005)	(0.007)	(0.008)
Clustering coefficient	0.108	0.096	0.106	0.115	0.080	0.099
	(0.227)	(0.203)	(0.222)	(0.236)	(0.212)	(0.211)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Confounders	-	Yes	-	Yes	-	Yes
Observations	954	954	954	954	954	954

Note: This table establishes the statistically and economically significant correlation between industrial involvement and social networks after accounting for a set of basic controls and an extended set of confounders. The unit of observation is the individual. Industrial involvement is measured as the number of firms founded by an individual during their lifetime. Independent variables are standardized. Coefficients are the difference in the logs of the expected number of industrial firms founded if the predictor would be one standard deviation above the mean, given the other predictor variables held constant. Robust standard error estimates are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Although somewhat more challenging, when looking at the panel data, the basic alternative estimation methods also provide equivalent results to the OLS. The challenges here refer to the difficulties of nonlinear fixed-effects models. Most of those come from the *incidental parameter problem* (see Fernández-Val and Weidner, 2016). In this context, authors such as Hilbe (2011) and Cameron and Trivedi (2013) prefer fixed-effects Poisson models with cluster standard errors to fixed-effects negative binomial regressions, even in situations of data overdispersion.

Table A5: Panel: Industrial Entrepreneurship and Social Networks

	(1a)	(1b)	(1a)	(2a)	(2b)	(2c)
	Entrepreneurship					
	Negative Binomial			Poisson		
Betweenness	0.129***		0.137***	0.137***		0.147***
	(0.026)		(0.026)	(0.0436)		(0.0481)
Clustering coefficient		0.186**	0.220***		0.142	0.186
		(0.074)	(0.075)		(0.118)	(0.116)
Individual FEs	Yes	Yes	Yes	Yes	Yes	Yes
Number of decades	8	8	8	8	8	8
Observations	774	774	774	774	774	774
Number of groups	140	140	140	140	140	140

Note: This table shows the correlation between industrial involvement and social networks using individual-decade as the unit of observation. The sample period covers 1850-1930, and industrial involvement is measured as the number of firms founded by an individual during the respective decade. Coefficients are the difference in the logs of the expected number of industrial firms founded if the predictor would be one standard deviation above the mean, given the other predictor variables held constant. Classical standard error estimates are reported in parentheses for columns 1. Robust standard error estimates are reported in parentheses for columns 2. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

This shows that the main results of this paper do not come from specificities in the estimation methods but from more profound patterns in the data.

A5.4 Measurement error

Extensive literature exists on the potential inference bias in sampled networks, as discussed in studies such as Smith et al. (2017); Wagner et al. (2017); Smith and Moody (2013); Wang et al. (2012); Huisman and Steglich (2008); Kossinets (2006); Borgatti et al. (2006); Costenbader and Valente (2003). This body of research explores the inherent conflict in sampled network data between the representativeness of nodes and edges.

A random sample of nodes provides a representative sample of the population in terms of node attributes, but it disregards the network structure. Consequently, the distributions of structural metrics in the sampled network may not replicate those of the real network, as essential nodes and ties might be overlooked. On the other hand, non-random sampling methodologies that aim to capture the network structure may introduce bias in the selection of nodes (Faugier and Sargeant, 1997).

This conflict can be viewed within the framework proposed by Van Meter (1990) in the discussion of the trade-off between the "ascending sampling method" and the "descending sampling method." Descending methods involve strategies developed at the level of general populations, enabling the configuration of a more representative sample. Conversely, ascending methods involve research strategies developed at the local level and specifically adapted to the study of selected social groups, offering better-defined networks.

In my data-collection design, I consider the insights of Van Meter (1990) by combining descending and ascending methodologies. The second component of the relational data corresponds to the descending methodology, while the first component represents the ascending methodology (see Section 3.2). While this approach does not completely resolve the conflict between the representativeness of nodes and edges, in this section, I demonstrate that it alleviates any significant concerns related to sampling-error bias that could potentially impact my main results.

A5.4.1 Network-structure inaccuracy: Selection of edges

In the conversation on sampling network bias, one set of biases arises due to an inaccurate representation of the actual connections in the network.

The second component of my sampling is expected to have errors in the recorded edges as it does not capture ties between different social spheres. However, there is no reason to believe that these errors are systematically related to individual identities. Thus, in the context of random measurement error, this concern would result in an attenuation bias in my estimations. Consequently, the coefficients in Table 5 should be interpreted as conservative estimates of the true effects.

Similarly, a comparable bias could exist in the first component of the data. Specifically, the inclusion of the snowball sample's seeds, which comprise the largest bankers in 1888, may introduce a bias by creating a structure in which sampled edges disproportionately represent paths involving these seeds and their acquaintances. In the estimation of Table 5, this implies that the seeds would be more connected by construction. As the seeds possess distinct attributes and were not randomly selected, the effect of their network position may confound the effect of their attributes.

To address this concern, I estimate the regressions in Table 5 excluding the seeds and their immediate family. Additionally, given that the expansion of the chain of nodes might have occurred particularly rapidly among members of the banking system, I test the effects of excluding all bankers from the sample collected in 1888 (see Table A10). The results remain virtually unchanged across all three subsamples and are consistent with those in Table 5. This provides confidence that the main findings of the paper are not driven by bias originating from the selection of the snowball-sample seeds.

Table A6: Cross-section: Industrial Entrepreneurship and Social Networks. Seeds-Exclusion Test. OLS

	(1)	(2)	(3)	(4)	(5)	(6)
	Entrepreneurship					
	No seeds		No seeds' family		No bankers 1888	
Betweenness	0.068**	0.051*	0.091**	0.070*	0.101***	0.079**
	(0.030)	(0.029)	(0.038)	(0.036)	(0.038)	(0.037)
Clustering coefficient	0.036	0.011	0.009	-0.016	0.046	0.007
	(0.069)	(0.068)	(0.074)	(0.073)	(0.080)	(0.078)
Confounders	-	Yes	-	Yes	-	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	950	950	929	929	802	802

Note: This table establishes the statistically and economically significant correlation between industrial involvement and social networks after accounting for a set of basic controls and an extended set of confounders. The unit of observation is the individual. Industrial involvement is measured as the number of firms founded by an individual during their lifetime. Independent variables are standardized. Columns 1 and 2 exclude the four seeds. Columns 3 and 4 exclude sons, daughters, and wives of the seeds. Columns 5 and 6 exclude every banker in 1888. Coefficients are the difference in the logs of the expected number of industrial firms founded for one standard deviation increase in the predictor variable, given the other predictor variables held constant. Robust standard error estimates are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Another concern regarding the selection of edges is the potential bias in the archival information available. It is possible that historiography has a specific interest in industrial entrepreneurs, or that industrial firms had more comprehensive recording methods, leading to a larger amount of relational information about industrial entrepreneurs. In such cases, the effects of network position could confound the effects of data preservation.

To address this concern, I collected data on the number of search results on Google for different variations in spelling the names of each individual. While these measures may not provide an entirely accurate representation of the recorded information for each individual, they have been shown to be effective in capturing real differences in popularity and interest across subjects in various contexts (Seifter et al., 2010; Choi and Varian, 2012). Table A7 demonstrates that including these controls does not alter the main results. Additionally, these controls are not significant and positively correlated with industrial involvement, suggesting that there is no inherent historiographical bias towards industrial entrepreneurs.

Table A7: Cross-Section: Industrial Entrepreneurship and Social Networks. Historiography-Bias Test. OLS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Entrepreneurship				
Betweenness	0.092**	0.071**	0.092**	0.071**	0.090**	0.069*	0.090**	0.069*
	(0.038)	(0.036)	(0.038)	(0.036)	(0.038)	(0.036)	(0.038)	(0.036)
Clustering coefficient	0.003	-0.021	0.002	-0.022	0.004	-0.021	0.003	-0.022
	(0.074)	(0.073)	(0.074)	(0.073)	(0.075)	(0.073)	(0.075)	(0.073)
GoogleI	-2.907*	-2.318*						
	(1.625)	(1.297)						
GoogleII			-0.566***	-0.459**				
			(0.211)	(0.182)				
GoogleIII					0.089	0.110		
					(0.099)	(0.103)		
GoogleIV							0.110	0.140
							(0.110)	(0.115)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Confounders	-	Yes	-	Yes	-	Yes	-	Yes
Observations	954	954	954	954	954	954	954	954

Note: This table establishes the statistically and economically significant correlation between industrial involvement and social networks after accounting for a set of basic controls and an extended set of confounders. The unit of observation is the individual. Entrepreneurship is measured as the number of industrial firms founded by an individual during their lifetime. Independent variables are standardized. Googles variables refer to the number of results on Google.com with different keywords. GoogleI refers to the bare name and surnames (e.g. "Antonio José Álvarez Carrasquilla"). GoogleII refers to the bare name and surname and the word Antioquia (e.g. "Antonio José Álvarez Carrasquilla" Antioquia). GoogleIII refers to the bare name and surname and the words Antioquia Siglo XIX (e.g. Antonio José Álvarez Carrasquilla Antioquia Siglo XIX). GoogleIV refers to the bare name and surname and the words Antioquia Siglo XX (e.g. Antonio José Álvarez Carrasquilla Antioquia Siglo XX). Heteroskedasticity robust standard error estimates are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

A5.4.2 Sample representativeness: Selection of nodes

Another set of concerns pertains to the inclusion or omission of nodes with specific characteristics. In line with typical snowball sampling practices (see Biernacki and Waldorf, 1981), individuals with more prominent positions in the network were potentially more likely to be included in the first component of my sample compared to isolated nodes. If the relationship between industrial involvement and betweenness centrality was non-monotonic, or if isolated nodes exhibited different behavior compared to non-isolated nodes, it is possible that the results in Table 5 could be biased.

The literature uses three strategies to minimize this potential bias.

First, as demonstrated by Van Meter (1990) and Atkinson and Flint (2001), a large sample size can help reduce this type of bias. In this study, the sample is fairly large. To offer an idea of this, consider that in the late 19th century, annual interest rates were around 9%. Thus, a capital of 3,250 pesos would have yielded an annual income of 292.5 pesos. Referring to the solely available wealth census for 19th-century Antioquia (Robinson and García-Jimeno, 2010), it is estimated that in 1851, only 309 individuals in Antioquia possessed a capital income, including land rent, surpassing 292.5 pesos. Assuming that income distribution and the capital-to-labor ratio remained unchanged, and utilizing population estimates from Mejía (2015a), it can be inferred that by 1905, only 422 people would have earned more than 292.5 pesos from capital income. This figure accounts for 68% of the working-age individuals in my sample for the year 1905. Consequently, my sample encompasses not only individuals wealthy enough to be considered average industrial entrepreneurs, but a broader range of individuals.

Second, scholars such as Faugier and Sargeant (1997) emphasize the importance of selecting seeds in snowball sampling that are as unrelated as possible to reach isolated individuals. In line with this recommendation, my design incorporates four distinct seeds from different families. Table A8 displays the shortest path distances among the seeds. Although, on average, they are closer to each other than two randomly selected individuals in the sample (average distance of 4.8), none of the seeds are directly connected to one another. In certain cases, they are quite far apart. For instance, seeds A and B are four steps away from each other, which is a considerable distance given their contemporaneity.

Table A8: Distance matrix. Complete network. Snowball seeds

	Seed A	**Seed B**	**Seed C**	**Seed D**
Seed A	0			
Seed B	2	0		
Seed C	3	2	0	
Seed D	4	2	2	0

Note: This table presents the distance matrix of snowball seeds in the complete network.

Third, the second component of the sample follows a descending methodology, which overcomes the link-tracing concerns associated with the snowball sample. This approach enables me to capture isolated individuals who would be unlikely to be reached through snowball sampling alone. Table A9 provides insights into the characteristics of individuals in the first and second components of the sample. The individuals in the second component exhibit lower average betweenness centrality, indicating a more fragmented network. Additionally, they are less involved in industrial entrepreneurship, although this difference is not statistically significant.

Table A9: Comparisons of the components of the sample

	Second component	First component	Difference
Industrial	0.11	0.12	-0.01
Entrepreneurship	0.19	0.21	-0.02
Betweenness	0.3	6.84	-6.54***
Clustering coefficient	17.91	16.44	1.46**

Note: This table presents the mean of the independent variables of interest (i.e. Betweenness centrality and clustering coefficient) and the dependent variables (i.e. industrial involvement in its discrete and counting version) by components of the sample. The second component excludes individuals who are uniquely connected through banking ties. *** p<0.01, ** p<0.05, * p<0.1.

Furthermore, if anything, including these isolated individuals in the regression analysis actually increases the size of the coefficients. This suggests that using only the nodes from the first component of the sample does not appear to introduce bias by excluding isolated nodes.

Table A10: Cross section: Industrial Entrepreneurship and Social Networks. OLS. Sample Bias Test

	First component	Full Sample
	Entrepreneurship	
Betweenness	0.085**	0.095***
	(0.038)	(0.035)
Clustering coefficient	-0.031	0.005
	(0.022)	(0.018)
Male	0.239***	0.239***
	(0.030)	(0.025)
Observations	954	1,352

Note: This table establishes the statistically and economically significant correlation between industrial involvement and social networks. The unit of observation is the individual. Industrial involvement is measured as the number of firms founded by an individual during their lifetime. Betweenness centrality and Clustering coefficient are standardized. Full sample includes First and Second components. Second component excludes individuals who are uniquely connected by banking ties.

A5.5 Reverse causality: persistence in time

It is natural to expect that there is a reciprocal relationship between an individual's position in the social network and their entrepreneurial decisions.[15] Consequently, the results from tables 5 and 6 could reflect either the impact of global connectivity on entrepreneurship or the impact of entrepreneurship on global connectivity. To disentangle this issue, I leverage time variation and incorporate lags of the predictors (i.e. network metrics) while keeping the outcome (i.e. industrial involvement) at time t. This allows me to establish a specification that addresses the concern of reverse causality mentioned earlier. Since current entrepreneurship cannot explain past social interactions, any significant correlation observed in this new specification

[15] Authors like Lee (2010) demonstrate that brokerage positions are influenced by previous individual performance.

must arise from social networks influencing entrepreneurship and not the other way around.

Table A11: Panel: Industrial Entrepreneurship and Social Networks. OLS. Reverse Causality Test

	Entrepreneurship							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Betweenness	0.092***	0.060***						
	(0.024)	(0.023)						
Clustering coefficient	0.000	-0.038**						
	(0.014)	(0.016)						
Betweenness T-1			0.030**	0.020**				
			(0.013)	(0.010)				
Clustering coefficient T-1			-0.016	-0.028**				
			(0.013)	(0.013)				
Betweenness T-2					-0.001	-0.001		
					(0.012)	(0.012)		
Clustering coefficient T-2					-0.019	-0.021		
					(0.018)	(0.018)		
Betweenness T-3							-0.021	-0.018
							(0.016)	(0.016)
Clustering coefficient T-3							-0.035	-0.029
							(0.025)	(0.025)
Individual FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Network Controls	-	Yes	-	Yes	-	Yes	-	Yes
Number of Periods	8	8	7	7	6	6	5	5
Observations	11,256	11,256	9,893	9,893	8,393	8,393	6,776	6,776
Number of individuals	1,806	1,806	1,806	1,806	1,806	1,806	1,806	1,806

Note: This table establishes the statistically and economically significant correlation between industrial involvement and social networks. The unit of observation is individual-decade. The sample period is 1850-1930. Industrial involvement is measured as the number of firms founded by an individual until the considered decade. Independent variables are standardized. Coefficients are the difference in the logs of the expected number of industrial firms founded if the predictor would be one standard deviation above the mean, given the other predictor variables held constant. Classical standard error estimates in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Indeed, Table A11 shows that betweenness centrality at period $t-1$ is positive and significantly correlated with industrial involvement at period t. The magnitude of the lagged coefficient is smaller. This might point out that the contemporary regressions do capture an effect from entrepreneurship to social networks. It could also be a sign of a decay in the effectiveness of social networks over time. Contacts that existed a decade ago might not be as useful as current contacts. This is consistent with the fact that two-decades-lagged levels of global connectivity do not significantly correlate with entrepreneurship.

In any case, Table A11 shows that the positive correlation between entrepreneurship and global connectivity found in tables 5 and 6 cannot be exclusively interpreted as a result of individuals that got involved first in industrial activities and, then, saw their connectivity improved.

A5.6 Selection of delta individuals

The fundamental assumption in the identification strategy of the section Exogenous network variation is that the death of the delta individuals was unexpected. The selection of the delta individuals ensures precisely that. A person was considered a delta individual if there was a significant indication, found in any of the sources, that their death was unforeseen. In most cases, this indication was an explicit mention of the circumstances surrounding the death, such as an assassination, an accident, or an illness at a young age. An example of this was the death of José María Amador (see Figure A7). In a few cases, the indication was more subtle, such as death at a young age after a recent marriage (see Table A12 for details).

Table A12: Delta Individuals

Name	Decade of death	Age at death	Cause of death
Manuel Echeverri Bermúdez	1850	28	Unknown
Inés Pérez Lalinde	1860	20	Unknown
Pascual Bravo Echeverri	1860	28	Assesinated
Mauricio Uribe Santamaría	1870	46	Unknown disease
Uladislao Vásquez Jaramillo	1870	43	Assesinated
Víctor Restrepo Maya	1870	43	Died in an accident
Antonio José Santamaría Ángel	1870	23	Assesinated
Isabel Pérez Lalinde	1880	29	Unknown
Julián Vásquez Jaramillo	1880	40	Unknown
José María Amador Uribe	1890	24	Tuberculosis
Claudina Villa Muñoz	1890	56	Unknown
Santiago Ospina Vásquez	1900	48	Unknown disease
Ana Echavarría Echavarría	1910	31	Unknown

Note: This table list the attributes of the delta individuals.

In order to show that there is no particular bias in the selection of the delta individuals, I present a balance test in Table A13. This shows that that delta individuals, on average, were not statistically different than the rest of the sample except for their earlier death.

Table A13: Balance test. Non-delta population vs delta population

	Non-delta population	Delta population
Age at death	69.23***	35.3***
	(11.75)	(11.26)
Male	0.76	0.69
	(0.009)	(0.133)
Wealth 1850	1.41	1.61
	(1.38)	(1.11)
Mining	0.079	0.153
	(0.27)	(0.375)
Merchant	0.214	0.384
	(0.41)	(0.506)
Liberal	0.09	0.153
	(0.375)	(0.286)
Foreign ancestry	0.024	0.076
	(0.153)	(0.277)
Clustering coefficient	26.4	14
	(36)	(11.2)
Betweenness	71	140
	(176)	(91)
Creation of firms	0.152	0.076
	(0.621)	(0.277)
Observations	955	13

Note: This table presents the means of different variables for the delta individuals and the rest of the population. Standard deviation in parentheses. Stars define the significance of t-test. *** p<0.01, ** p<0.05, * p<0.1.

Finally, my confidence on the validity of the quasi-experiment are reassure by the fact that its results are not sensitive to the selection of any delta individual in particular. Table A14 replicates specification (4) of Table 7 excluding one shock at a time–i.e. in one period, the synthetic network does not consider the disappearance of one delta individual. The results of A14 and Table 7 are practically the same.

Table A14: Quasi-experiment: Industrial Entrepreneurship and Social Networks. Sensitivity to shock composition. OLS

	Entrepreneurship				
	(¬Manuel E.)	(¬Ines P.)	(¬Pascual B.)	(¬Mauricio U.)	(¬Uladislao V.)
Change Betweenness	0.013*	0.013*	0.013*	0.014*	0.013*
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
	(¬Victor R.)	(¬Antonio Jose S.)	(¬ Isabel P.)	(¬Julian V.)	(¬Jose Maria A.)
Change Betweenness	0.013*	0.013*	0.013*	0.014*	0.013*
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
	(¬Claudina V.)	(¬Santiago O.)	(¬Ana E.)		
Change Betweenness	0.013*	0.013*	0.013*		
	(0.007)	(0.007)	(0.007)		
Individual FEs	Yes	Yes	Yes	Yes	Yes
Clustering coefficient Control	Yes	Yes	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes	Yes	Yes
Network Controls	Yes	Yes	Yes	Yes	Yes
Number of Periods	8	8	8	8	8
Observations	11,242	11,242	11,242	11,242	11,242
Number of individuals	1,805	1,805	1,805	1,805	1,805

Note: This table establishes the statistically and economically significant correlation between industrial involvement and social networks. The unit of observation is individual-decade. The sample period is 1850-1930. Each specification represents the same regression without considering the disappearance of the given delta individual. Entrepreneurship is measured as the number of firms founded by an individual during the considered decade. Robust standard error estimates are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Overall, this provides an intuitive understanding that the deaths of delta individuals can be seen as exogenous shocks. Additionally, it helps address a concern regarding the "untimely dissolution" of industrial firms, where the death of a partner may lead to a mechanical channel of legal re-foundation rather than a direct change in entrepreneurial involvement. However, the analysis reveals that the delta individuals were not significantly central in any network and were not highly influential industrialists. It is noteworthy that out of the seven identified individuals, only two were industrialists, and their deaths did not occur simultaneously. Consequently, there were very few direct instances of industrial companies being created or dissolved due to these shocks.

A5.7 Placebo tests

A5.7.1 Exogenous shocks validity

To indicate that change in the levels of entrepreneurship that come with the disappearance of the delta individuals is not an weird artifact, I provide a placebo test. This test consists of checking if the disappearance of delta individuals generated any change in levels of entrepreneurship in the past. The results of this test are presented in Table A15

Table A15: Placebo quasi-experiment: Industrial Entrepreneurship and Social Networks. OLS

	Past Entrepreneurship			
	(1)	(2)	(3)	(4)
Change Betweenness	-0.028	-0.000	0.001	0.003
	(0.035)	(0.034)	(0.034)	(0.033)
Individual FEs	Yes	Yes	Yes	Yes
Clustering coefficient Control	-	Yes	Yes	Yes
Time FEs	-	-	Yes	Yes
Network Controls	-	-	-	Yes
Number of Periods	8	8	8	8
Observations	11,241	11,241	11,241	11,241
Number of individuals	1,805	1,805	1,805	1,805

Note: This table establishes the statistically and economically non-significant correlation between past entrepreneurship and contemporaneous change in betweenness centrality. The unit of observation is individual-decade. The sample period is 1850-1930. Entrepreneurship is measured as the number of firms founded by an individual during the considered decade. Robust standard error estimates are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

As anticipated, Table A15 demonstrates that changes in global connectivity resulting from the death of delta individuals are not correlated with variations in the levels of entrepreneurship before the shocks occurred.

A6 Alternative mechanisms

A6.1 Beyond business interactions

As mentioned in the Introduction, previous studies in the literature on social networks in economic history have predominantly focused on business interactions. These studies have provided valuable insights into how new businesses, in a wide variety of contexts, often emerge from partnerships formed in previous ventures. Through these partnerships, valuable information about the qualities of partners is exchanged. Through them, the capital necessary for the new venture is also gathered. High centrality in the business network is certainly functional for whoever plans to create more business in the future.

Therefore, it is reasonable to imagine that business interactions are driving the results of the previous section. Thanks to the distinctive aspect of the dataset, which also captures non-business interactions, I can investigate how plausible this is. To assess the importance of business interactions, I replicate the analysis presented in Table 5 using a network that exclusively represents non-business interactions. The results, presented in Table A16, demonstrate that the overall qualitative patterns remain consistent with those obtained from the complete set of interactions, although their magnitude and statistical significance decrease.

This indicates that in addition to the mechanisms driven by business partnerships identified in the existing literature, connections in informal spheres of interaction such as family, friendship, and politics were also functional in entrepreneurial tasks.

Table A16: Cross Section: Industrial Entrepreneurship and Non-Business Networks. OLS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
					Entrepreneurship					
Betweenness	0.053*		0.051*	0.044	0.053*	0.048*	0.044*	0.051*	0.046*	0.052*
	(0.028)		(0.028)	(0.028)	(0.028)	(0.028)	(0.027)	(0.028)	(0.027)	(0.028)
Clustering coefficient		-0.029	-0.016	-0.018	-0.012	-0.016	-0.012	-0.015	-0.018	0.004
		(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.029)	(0.031)
Banker				0.133**						0.075
				(0.064)						(0.064)
Immigrant					0.149					-0.324
					(0.174)					(0.211)
Engineer						0.315**				0.264
						(0.157)				(0.172)
Miner							0.414***			0.407**
							(0.149)			(0.188)
Politician								0.024		-0.003
								(0.079)		(0.080)
Merchant									0.224***	0.185**
									(0.076)	(0.078)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Network Controls	-	-	-	-	-	-	-	-	-	Yes
Observations	954	954	954	954	954	954	954	954	954	954

This table shows the results of a regression analysis that examines the correlation between industrial involvement and social networks that do not include business interactions, after controlling for a set of basic variables and an extended set of confounding factors. The unit of observation is the individual, and industrial involvement is measured as the number of firms founded by an individual during their lifetime. All independent variables are standardized, and robust standard error estimates are reported in parentheses. Significance levels are denoted as follows: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

In other words, all the classical mechanisms that the literature has explored in which previous business interactions leverage posterior entrepreneurship cannot fully explain why individuals with high global connectivity within the elite of Antioquia became more deeply involved in entrepreneurship.

A6.2 Not a diffusion story

A natural second hypothesis is one of diffusion.

Heretofore, my analysis has primarily focused on the structural characteristics of the network, placing emphasis on the network's overall structure rather than the specific attributes of its individual nodes. However, an alternative perspective in understanding the impact of networks on individual behavior is to shift the focus towards the latter. This is the approach followed by the literature on diffusion and peer effects (e.g. Bloom et al., 2016; Fafchamps and Söderbom, 2013), and has been promoted in economic history, among others, by Esteves and Mesevage (2019). According to this perspective, connections between individuals matter because attributes and behaviors can be transmitted through them. The closer one is to another individual who exhibits a certain attribute or behavior, the higher the likelihood of adopting that attribute or behavior themselves. This notion could explain the relevance of non-business interactions in my analysis. For example, an individual may be exposed to entrepreneurial activities within their family, which can influence them to replicate such behavior and ultimately become an entrepreneur themselves.

To test this idea one can bring tools from spatial econometrics. A canonical Manski model is probably the most conventional of those tools and the one that Esteves and Mesevage (2019) recommend. In this setting, the outcome Y of an individual i is predicted by the attributes X of that individual and also by the attributes and outcomes of their peer, the individual j. The way in which j impacts i's outcome depends on their proximity to i, which is captured by W–in most cases, W is an adjacency matrix or other matrix of distance. Formally, $Y_i = \rho W Y_j + \beta X_i + \theta W X_j + \lambda W u_j + \epsilon$.

Thus, there are three different types of social-interaction effects. First, $\rho W Y_j$ captures the relationship between i's outcome and j's outcome. Second, $\theta W X_j$ captures the relationship between i's outcome and j's observable attributes. Finally, $\lambda W u_j$ captures the relationship between i's outcome and j's unobservable features.

Following LeSage (2014) and using the specifications of Table 5, I can test the relevance of each of these types of effects. Table A17 shows that none of these peer effects is significant under any specification.

Table A17: Peer-effects significance

	SAR		SEM		SLX	
Regression	Test statistic	P-value	Test statistic	P-value	Test statistic	P-value
(1)-(3)	0.19	0.66	0.14	0.71	8.61	0.38
(4)	0.02	0.9	0.53	0.47	10.37	0.32
(5)	0.21	0.64	0.12	0.73	9.32	0.41
(6)	0.25	0.62	0.09	0.77	10.69	0.3
(7)	0.35	0.55	0.02	0.9	13.42	0.14
(8)	0.17	0.68	0.16	0.68	8.77	0.46
(9)	0	0.97	0.49	0.49	7.29	0.61
(10)	0	0.98	0.41	0.52	18.09	0.2

Note: This table presents tests that compare a linear regression with the form $y = \alpha + X\beta + \epsilon$ to three alternative specifications: SAR:$y = \alpha + \rho W y + X\beta + \epsilon$, SEM:$y = \alpha + X\beta + u$, $u = \lambda W u + \epsilon$, and SLX: $y = \alpha + X\beta + WX\theta + \epsilon$. SAR and SEM tests use a Lagrange Multiplier test, while the SLX test is a likelihood ratio test. The number in the first column refers to the specification number in Table 5.

The reason why none of these effects seem to matter can be found in the behavior of the residuals of the OLS model. The low values of the Moran index presented in Table A18 indicate a very low spatial autocorrelation of those residuals.

Table A18: Moran's autocorrelation index

	(1)-(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Moran's I	0.023	0.024	0.023	0.021	0.018	0.023	0.020	0.016
P-value	0.011	0.009	0.011	0.016	0.034	0.010	0.020	0.046

Note: The table shows the results of Moran's index, which measures spatial autocorrelation in the residuals of a regression model without spatial components ($Y = \alpha + X\beta + \epsilon$). The reported p-value tests the null hypothesis that there is no spatial autocorrelation, and that the observed values are the result of a random distribution of individuals across space.

Intuitively, it seems that the emergence of industrial entrepreneurship in Antioquia cannot be easily attributed to a diffusion process. In contrast to other contexts, such as those that Stuart and Ding (2006) and Falck et al. (2012) study–i.e. biotech scientists in the US late-20th century and British students in the 2000s–individuals in Antioquia did not become entrepreneurs because they were close to other entrepreneurs. This does not mean that social interactions were irrelevant; rather, it suggests that structural features played a distinct role, independent of spillover effects. The forthcoming sections will delve into the exploration of this role.

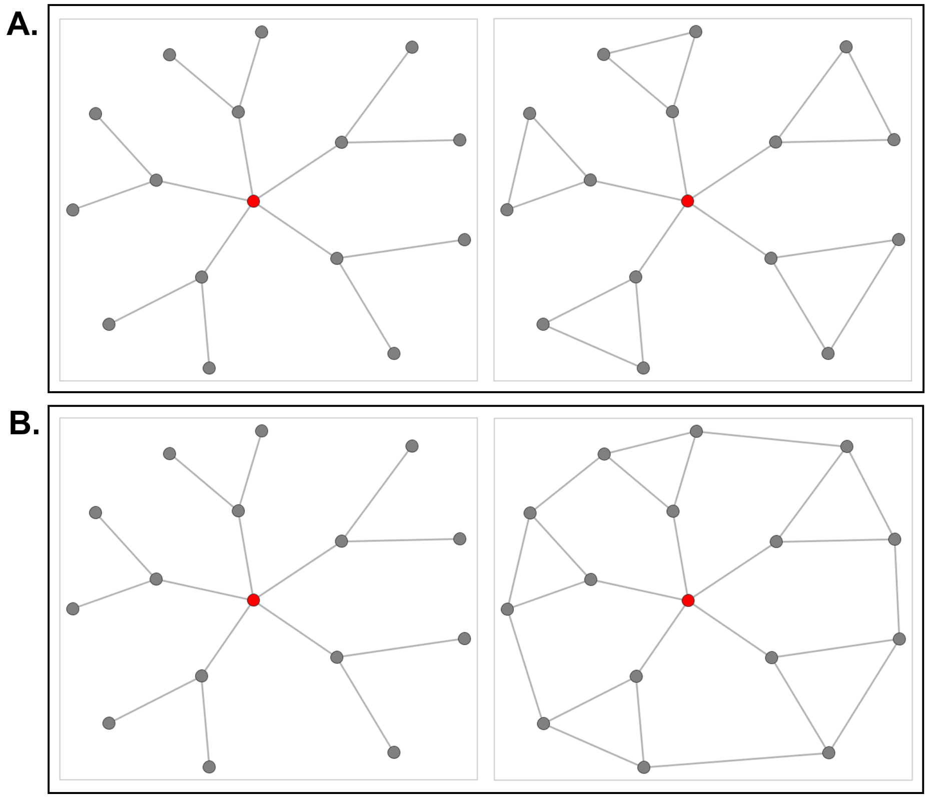
A6.3 What type of global connectivity mattered?

Considering that the structure of the network is crucial, digging into what exactly we are capturing with the betweenness centrality might give us some insights into what mechanisms are behind the Main Results. In order to do this, we can compare betweenness with some of the other two most popular measures of global connectivity: *eigenvector centrality* and *closeness centrality.*

Eigenvector centrality measures the influence of an individual by considering the number of connections that their connections (and the connections of their connections, and so on) possess. This metric reveals an individual's ability to reach areas of the network beyond their immediate neighborhood. Importantly, eigenvector centrality is independent of an individual's capacity to bridge different parts of the network. To illustrate this distinction, Figure A9-Panel A showcases two similar network topologies. In both cases, the red dot (referred to as "ego") possesses the same betweenness centrality value (180), but exhibits a lower eigenvector centrality on the right (0.529) compared to the left (0.598). In this scenario, as the connectivity of other nodes to better-connected nodes increases from left to right, the relative influence of ego diminishes. Nevertheless, ego maintains the same role of bridging different branches of the network.

Closeness centrality, on the other hand, quantifies the average shortest distance between a node and all other nodes in the network. It provides a measure of how easily an individual can access other individuals in the network, regardless of whether the individual serves as a bridge or if they are connected through intermediary nodes. To illustrate this concept, Figure A9-Panel B presents two networks with similar topologies. In both cases, ego has the same closeness centrality value (0.04) but exhibits a lower betweenness centrality on the right (40) compared to the left (180). In this case, (when moving from left to right) as connections on the periphery are established, the significance of ego as a bridge diminishes because branches can now directly reach other branches without passing through ego. However, ego maintains the same proximity to the rest of the nodes in the network as before.

Figure A9: Betweenness centrality vs eigenvector and closeness centrality



Note: This figure illustrates two ideal experiments in a network setting. Nodes represent individuals, and edges represent connections among them. In Panel A, Ego has the same betweenness centrality but a lower eigenvector centrality on the right side compared to the left side. In Panel B, Ego has the same closeness centrality, but a lower betweenness centrality on the right side compared to the left side.

Do these alternative measures of global connectivity serve as reliable predictors of entrepreneurship in our context?

To explore this, Table A19 reproduces the estimations from Table 5, but includes closeness and eigenvector centrality as additional variables. The findings provide valuable insights. Firstly, none of these measures diminish the significance of betweenness centrality. Additionally, both closeness and eigenvector centrality exhibit negative coefficients. However, only eigenvector centrality demonstrates statistical significance in the complete specification.[16]

[16]A comprehensive examination of the robustness of this negative correlation between entrepreneurship and these alternative measures of global connectivity extends beyond the scope of this paper, as does a detailed reflection on its underlying rationale. Nonetheless, one could speculate on possible explanations. In my opinion, the most plausible interpretation is that higher influence confers advantages in other domains such as politics or trade, potentially leading to specialization and a divergence from industrial entrepreneurship.

Table A19: Cross Section: Industrial Entrepreneurship and Social Networks. OLS

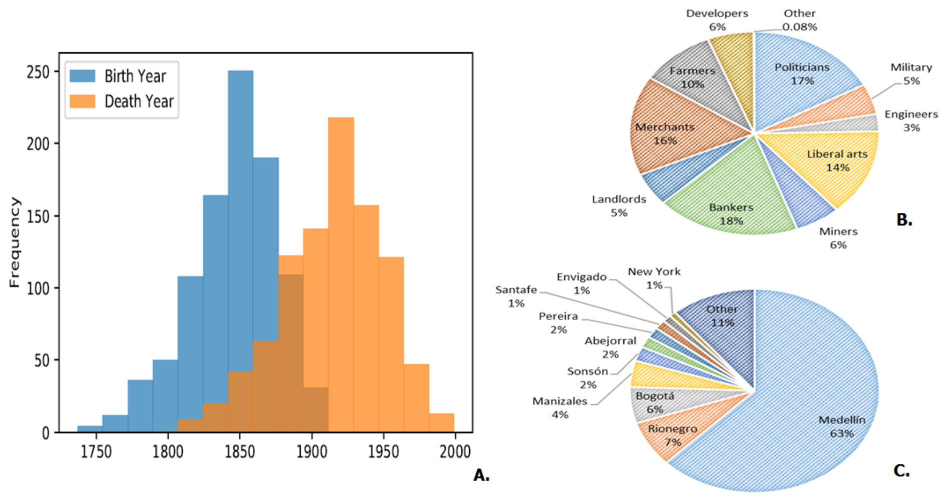
	(1)	(2)	(3)	(4)	(5)	(6)
			Entrepreneurship			
Betweenness	0.090**				0.107***	0.075**
	(0.037)				(0.040)	(0.031)
Clustering coefficient		0.038			0.078	0.048
		(0.071)			(0.085)	(0.074)
Closeness			-0.021		-0.071	-0.041
			(0.048)		(0.049)	(0.053)
Eigenvector				-0.022	-0.088***	-0.099**
				(0.019)	(0.033)	(0.040)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Confounders	No	No	No	No	No	Yes
Observations	954	954	954	954	954	954

Note: This table shows the results of a regression analysis that examines the correlation between industrial involvement and social networks, after controlling for a set of basic variables and an extended set of confounding factors. The unit of observation is the individual, and industrial involvement is measured as the number of firms founded by an individual during their lifetime. All independent variables are standardized, and robust standard error estimates are reported in parentheses. Significance levels are denoted as follows: *** p<0.01, ** p<0.05, * p<0.1.

Hence, the findings in Main Results go beyond capturing the general importance of connections beyond the local level; they reveal a more specific pattern. In the context of Antioquia, the ability to bridge individuals played a crucial role in entrepreneurship, even among individuals who possessed equal levels of influence in the global network and an equal capacity to connect with people in distant parts of the network.

A7 Network graphs and additional figures

Figure A10: Attributes of the elite of Antioquia



Note: A. This figure displays the number of individuals in the sample according to their year of birth and death. B. This figure shows the distribution of economic activities performed by the individuals in the sample. Note that activities were not mutually exclusive. C. This figure presents the distribution of cities where the individuals in the sample died.

Table A20: Descriptive statistics from wealth censuses of Medellín

	Elite				**All**			
Source	Mean	Median	90th pct	Observations	Mean	Median	90th pct	Observations
Census 1860	8,147.8	801	20,001	170	2,089.3	101	3,001	3,173
Census 1890	52,612.3	10,001	80,001	168	26,759.6	7,001	50,001	747
Census 1909	5,811.9	3,576	13,401	126	2,367.8	351	6,001	817
Census 1936	28,212.8	8,273	63,052.5	146	11,580.4	3,501	28,977	2551

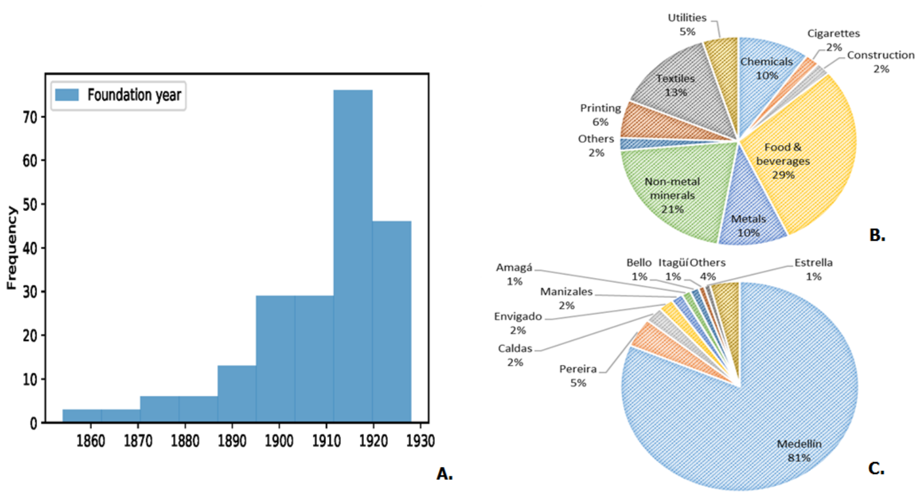
Note: This table summarizes data on the wealth of individuals in Medellín, expressed in current pesos, based on the censuses of 1860, 1890, 1909, and 1936. The table presents the mean, median, and 90th percentile values. The category *All* includes all observations in the censuses, while the category *Elite* refers to individuals in the first component of the sample that were successfully matched with the census data.

Table A21: Descriptive statistics from industrial firms

	Information on founders?				Founders among the elite?		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	All	Yes	No		Yes	No	
Variable	All	Mean	Mean	Difference (2)-(3)	Mean	Mean	Difference (5)-(6)
Start	1911	1908	1913	-5.18***	1907	1910	-2.83
	(12.6)	(15.7)	(9.1)	[12.34]	(15.8)	(15.3)	[0.72]
Close	1944	1942	1947	-4.99	1943	1926	17.63
	(47.9)	(51.3)	(38.1)	[0.08]	(52.4)	(43.8)	[0.21]
Survival	41.4	44.3	33.2	11.09	44.3	43.5	0.85
	(42.0)	(43.9)	(39.7)	[0.49]	(45.3)	(26.2)	[0.001]
Capital	16,902	17,642	14,685	2,957	22,998.0	311.8	22,686.28
	(83,285)	(91,272)	(54,104)	[0.02]	(104,063.9)	(504.0)	[0.8]
Workers	88.7	122.3	64.8	57.48**	132.5	59.0	73.46
	(106.6)	(120.1)	(89.9)	[5.24]	(125.5)	(50.0)	[1.30]
Energy capacity HP	42.7	79.3	13.0	66.31***	82.1	20	62.10
	(64.4)	(82.3)	(11.2)	[17.22]	(83.2)	(0.0)	[0.53]
Number of firms	292	126	166		97	29	

Note: This table summarizes data on the industrial firms in the dataset, presenting the mean and standard deviation (in parentheses) for various variables. *Workers* is the average number of workers during the 1920s. *Start* and *Close* refer to the average year of creation and closure of the firms, respectively. *Survival* represents the difference between the year of closure and the year of creation. *Capital* refers to the capital subscribed in current pesos at the creation of the firm. Standard errors are indicated in square brackets. Significance levels are denoted by asterisks as follows: *** p<0.01, ** p<0.05, * p<0.1.

Figure A11: Attributes of industrial firms in Antioquia



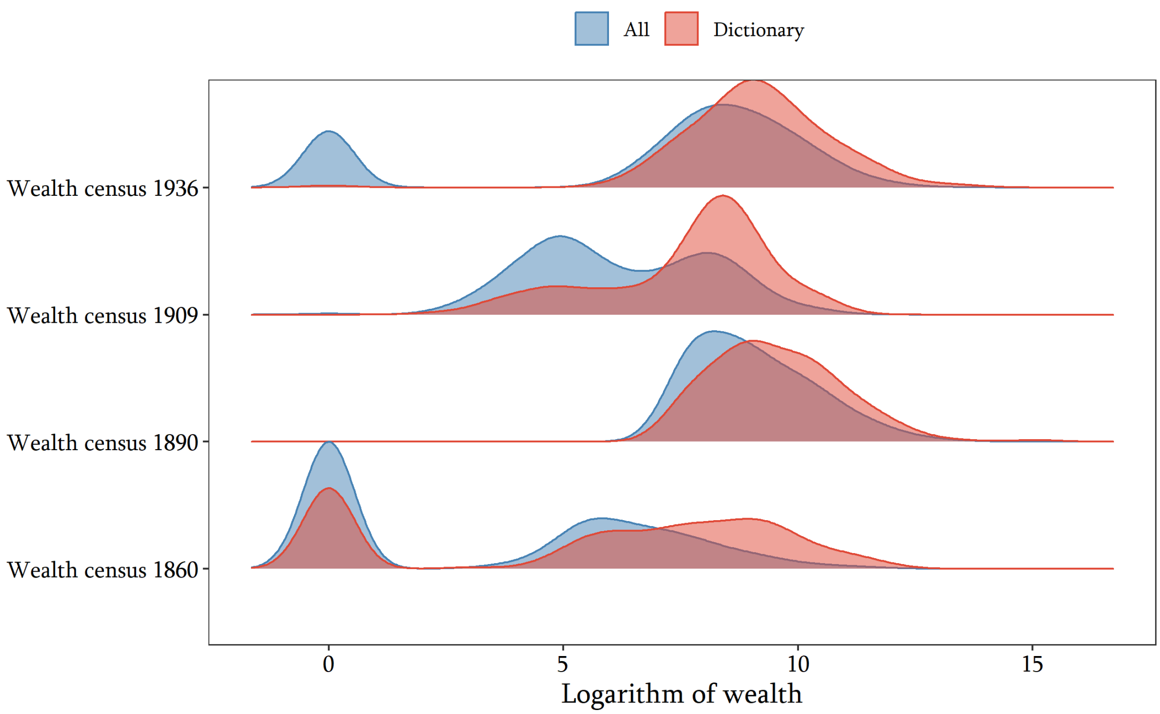
Note: A. This figure displays the number of firms in the sample according to their year of foundation. B. This figure shows the distribution of economic activities performed by the firms in the sample. Note that activities were mutually exclusive. C. This figure presents the distribution of locations of the firms in the sample at the city level.

Table A22: Industrial Firms in Antioquia. 1945

	Number of firms	Firms with more than 1 branch	Average capital (current pesos)	Average capital (xGDP per capita)
Food processing	179	5	$ 44,694	238
Paper and paperboard	5	0	$ 7,360	39
Graphic arts	59	0	$ 38,079	203
Rubber products	8	0	$ 58,022	309
Beverages	24	2	$ 232,470	1237
Leather	163	2	$ 16,814	89
Precious metals	33	0	$ 13,749	73
Wood	163	1	$ 10,993	58
Metallurgy and machinery	114	3	$ 75,858	403
Non-metallic minerals	170	2	$ 64,100	341
Chemical and pharmaceutical	78	1	$ 47,518	253
Tobacco	60	1	$ 114,642	610
Textiles	67	1	$ 608,891	3239
Clothing	139	2	$ 42,396	226
Others	12	0	$ 6,745	36

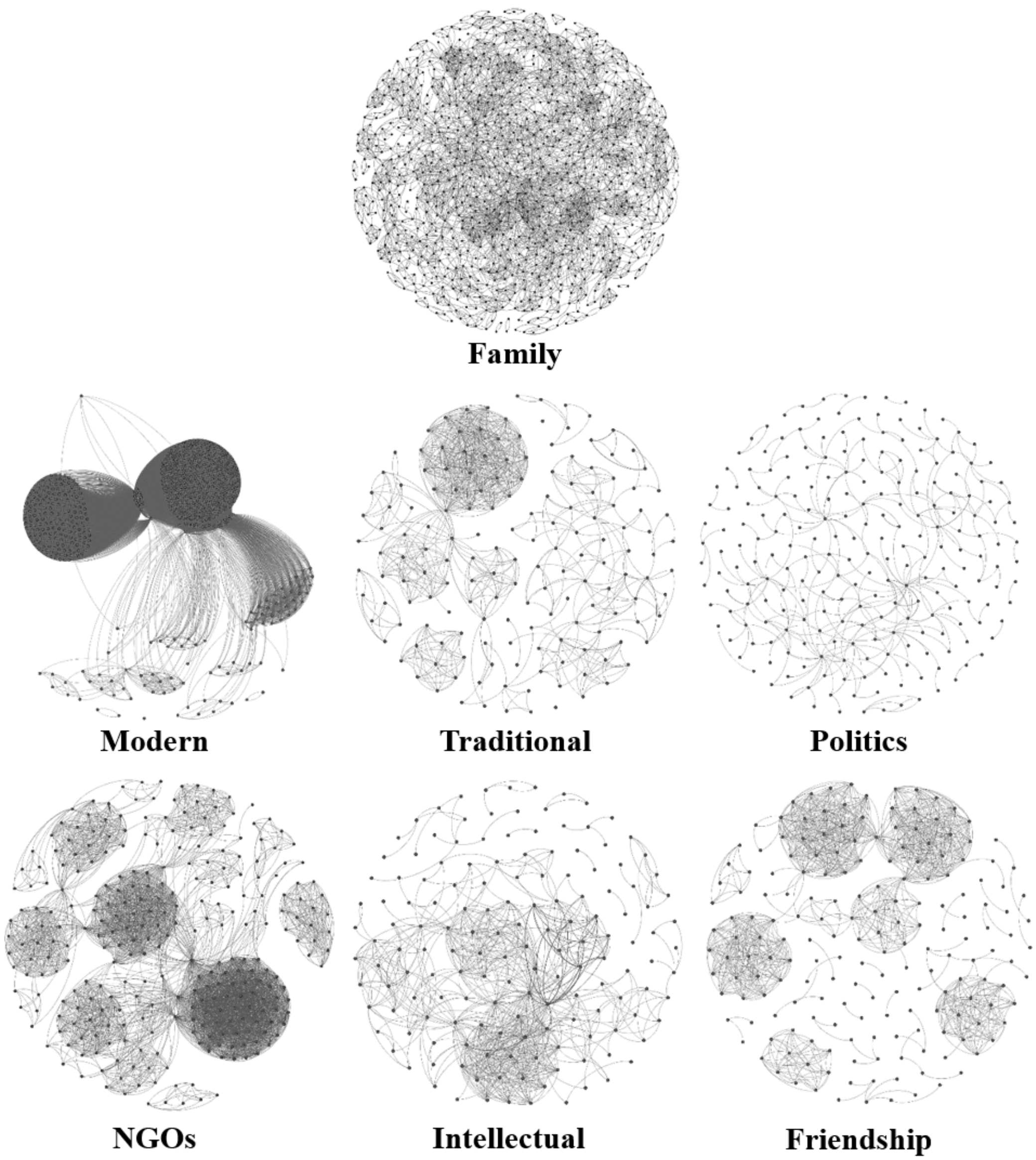
Note: This table summarizes the basic information on the industrial firms of Antioquia.
Source: Based on (Palacio Rudas, 1945)

Figure A12: Wealth distribution. Medellín. 1860-1936



Note: This figure presents the distributions of wealth for the different censuses available for Medellín. All refers to all the observations of the censuses, and dictionary refers to the individuals in the first component of the sample that I was able to match with the census data.

Figure A13: Static Networks

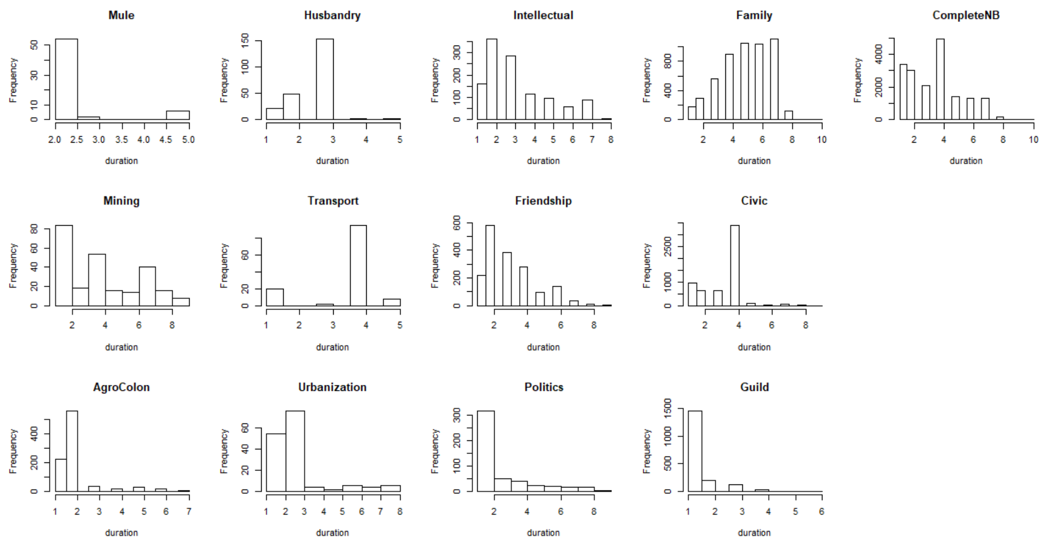


Note: This figure shows the graph of each static network. The dots in the figure represent individuals (i.e., nodes), and the lines represent interactions between them (i.e., edges).

Figure A14: Evolution of the Main Characteristics of the Complete Network

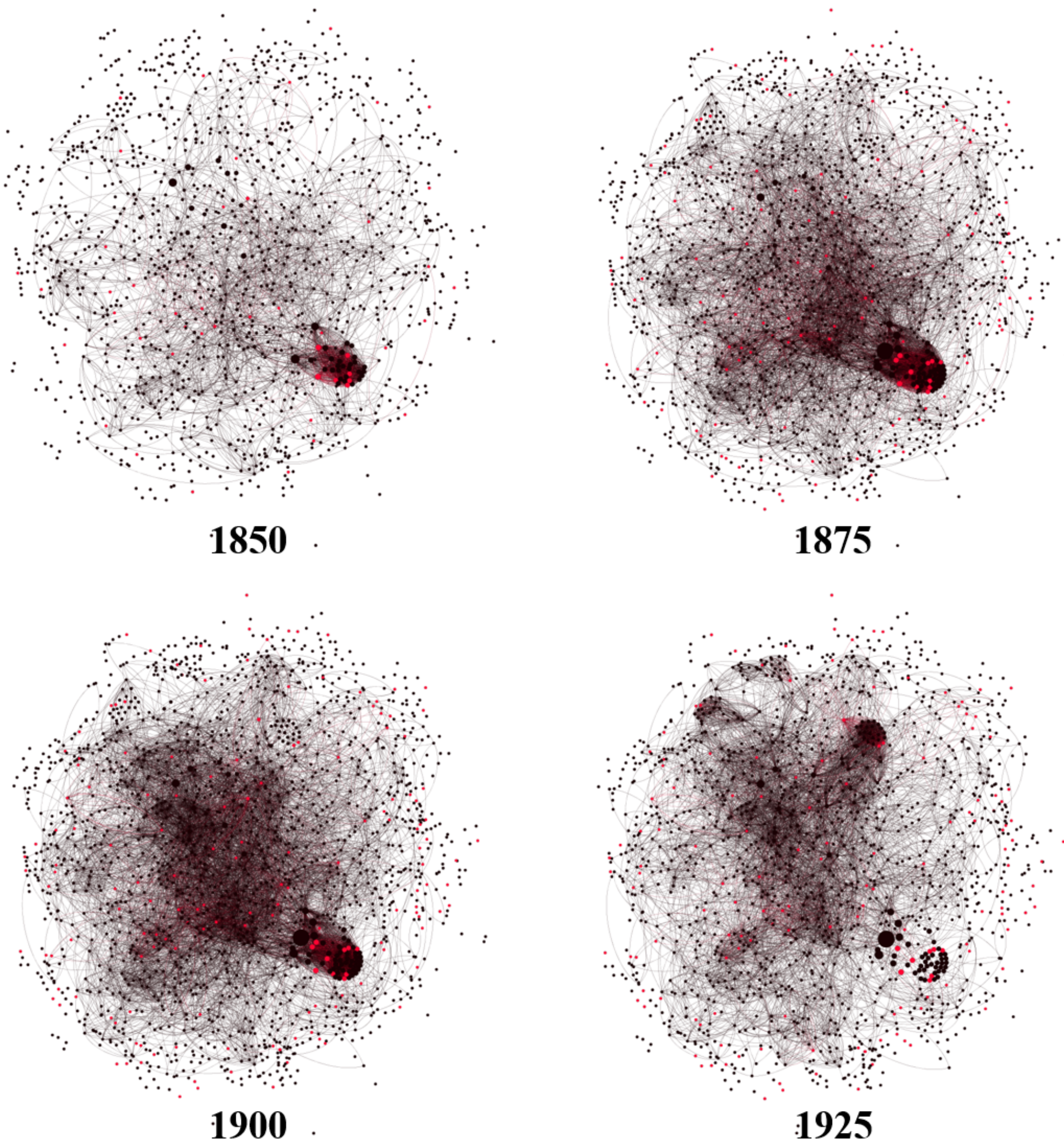
Note: A. This figure presents the number of nodes and edges of the complete network by year. B. This figure presents the diameter and the average path length (left axis) as well as the density (right axis) of the complete network by year. C. This figure presents the average betweenness centrality (left axis) and the average clustering coefficient (right axis).

Figure A15: Edge Duration by Type of Interaction. Histogram



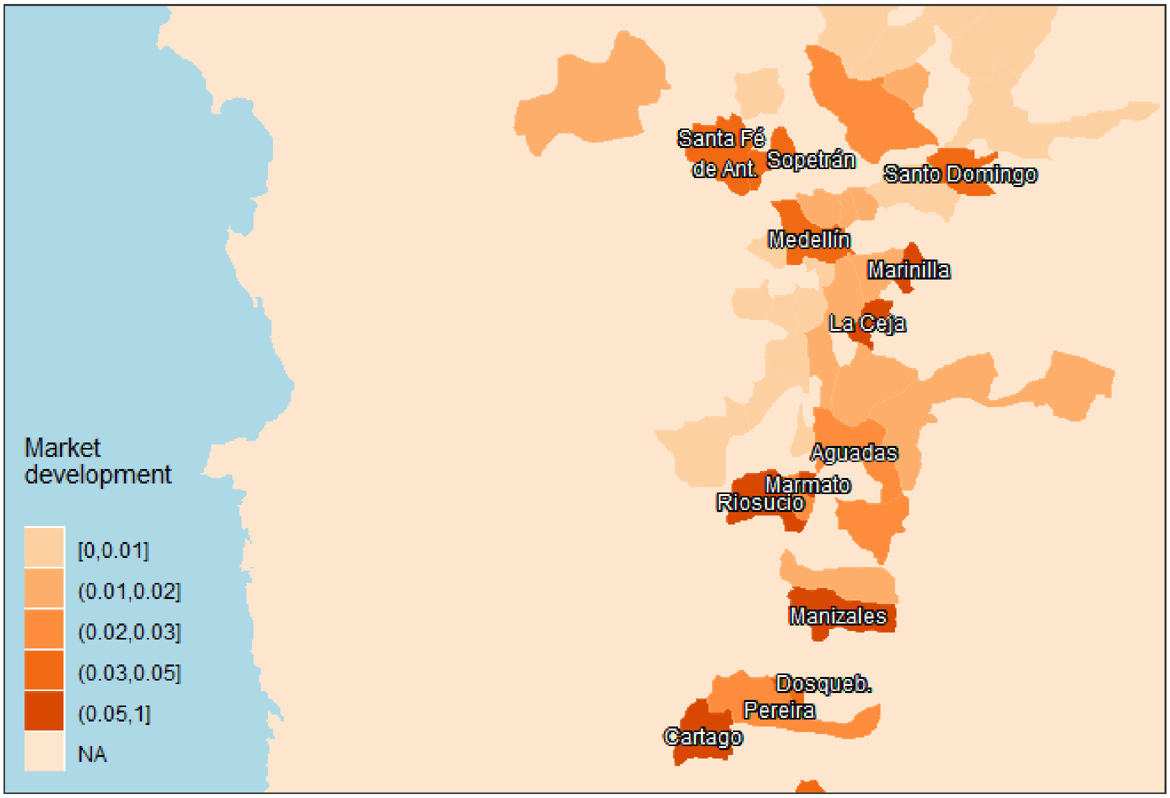
Note: In this figure, each graph depicts the number of edges based on their duration (i.e., the number of decades they remain active) for a specific type of interaction. An edge is created when an interaction between two nodes is identified. It disappears either when information indicates the termination of the interaction or when one of the nodes involved in the interaction passes away.

Figure A16: Complete Network in Time



Note: This figure illustrates the complete network graph at four different time points: 1850, 1875, 1900, and 1925. Each dot in the graph represents an individual (node), and the lines connecting the dots represent interactions between them (edges). Nodes highlighted in red represent industrial entrepreneurs. The size of the nodes is proportional to their degree.

Figure A17: Market development. Antioquia. 1912



Note: This figure depicts the study area with the current municipal boundaries. Market development is measured as the ratio of the number of *empleados* (wage workers, mainly in urban activities) to the number of *jornaleros* (workers hired under traditional labor relations, often tied to ancestral serfdom institutions) for municipalities in the 1912 Census. Empleados operated similarly to modern office jobs, while jornaleros were predominantly agricultural workers paid on a daily basis, often compensated with production (Bejarano, 1998). Therefore, this ratio serves as a scale-free proxy for the relative importance of markets in the economy.

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