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**Bankers, Industrialists,  
and their Cliques: Elite  
Networks in Mexico and  
Brazil during Early  
Industrialization**

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Bankers, Industrialists, and their Cliques:  
Elite Networks in Mexico and Brazil during Early Industrialization \*

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**Abstract**

The historiographies of Mexico and Brazil have implicitly stated that business networks were crucial for the initial industrialization of these two countries. Recently, differing visions on the importance of business networks have arisen. In the case of Mexico, the literature argues that entrepreneurs relied heavily on an informal institutional structure to obtain necessary resources and information. In contrast, the recent historiography of Brazil suggests that after 1890 the network of corporate relations became less important for entrepreneurs trying to obtain capital and concessions, once the institutions promoted financial markets and easy entry for new businesses. Did entrepreneurs in Brazil and Mexico organize their networks differently to deal with the different institutional settings? How can we compare the impact of the institutional structure of Mexico and Brazil on the networks of entrepreneurs and entrepreneurial finance in general? We explore these questions by looking at the networks of interlocking boards of directors of major joint stock companies in Brazil and Mexico in 1909. We test whether in Mexico businessmen relied more on networks and other informal arrangements to do business than in Brazil. In Brazil, we expect to find less reliance of businesses on networks given that there was a more sophisticated system of formal institutions to mediate transactions and obtain capital and information. Our hypothesis is confirmed by three related results: 1) the total number of connections (i.e., the density of the network) was higher in Mexico than Brazil; 2) In Mexico there was one dense core network, while in Brazil we find fairly dispersed clusters of corporate board interlocks; and most importantly, 3) politicians played a more important role in the Mexican network of corporate directors than their counterparts in Brazil. Interestingly, even though Brazil and Mexico relied on very different institutional structures, both countries grew at similar rates of growth between 1890 and 1913. However, the dense and exclusive Mexican network might have ended up increasing the social and political tensions that led to the Mexican Revolution (1910–1920).

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## I. Introduction

Social scientists usually agree that institutions are an essential requisite for economic growth.<sup>1</sup> Generally, institutional theorists argue that when formal or codified institutions regularize patterns of behavior that define and protect property rights and minimize transaction costs, economies tend to grow faster. Yet, we observe many cases of countries with weak or arbitrarily enforced institutions that grow at a breakneck pace. The implication is that there are substitutes for formal institutions. Specifically, Mexico and Brazil give us a glimpse of two economies that differed in their institutional settings and achieved similar levels of economic growth before World War I. Yet, it is not clear how entrepreneurs interacted with these differing institutional settings and achieved similar results.

The historiographies of both Mexico and Brazil have implicitly stated that business networks were crucial for the initial industrialization of these two countries. For instance, the literature on early Mexican businessmen argues that entrepreneurs relied heavily on an informal institutional structure to obtain necessary resources and information. Sources of capital, for example, were often found through friends and personal connections.<sup>2</sup> For Brazil the story has been less straightforward. Some historians have argued that networks of businessmen and politicians were vital for the early industrialization of

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<sup>1</sup> By “institutions,” we mean humanly devised sets of beliefs, norms, and organizational features that regularize and legitimize patterns of behavior. Avner Greif, “Cultural Beliefs and the Organization of Society: A Historical and Theoretical Reflection on Collectivist and Individualist Societies,” *Journal of Political Economy* 102, 5 (Oct. 1994): 943. Institutions exist in a constantly changing environment of shifting demography, wealth distribution, and societal beliefs. A particular legal framework is a formal institution as long as it is explicitly stated and it serves to regularize patterns of behavior. See, Masahiko Aoki, *Towards a Comparative Institutional Analysis* (Cambridge, Mass. and London: MIT Press, 2001), 5-7.

<sup>2</sup> Mario Cerutti, *Burguesía y capitalismo en Monterrey* (México, 1983), 57-101; Mario Cerutti, “Producción capitalista y articulación del empresariado en Monterrey (1890-1910)” in *Siglo XIX. Revista de Historia* V-9 (January-June, 1990): 160-170; Noel Maurer and Tridib Sharma, “Enforcing Property Rights Through Reputation: Mexico's Early Industrialization, 1878-1913,” *Journal of Economic History* 61 (December 2001): 950-973; Aurora Gomez-Galvarriato, “The Impact of the Revolution: Business and Labor in the Mexican Textile Industry, Orizaba, Veracruz, 1900-1930” (Ph.D. diss., Harvard University, 1999), 104-150; Noel Maurer and Stephen Haber, “Institutional Change and Economic Growth: Banks, Financial Markets, and Mexican Industrialization” in Jeffrey L. Bortz and Stephen H. Haber, eds., *The Mexican Economy, 1870-1930: Essays on the Economic History of Institutions, Revolution, and Growth* (Stanford 2002), 23-49.

the country.<sup>3</sup> The recent historiography of Brazil, however, suggests that when institutions were created to promote financial markets and easy entry for new businesses after 1890, the network of corporate relations became less important for entrepreneurs trying to obtain capital and concessions. Moreover, these recent works argue that the bulk of investment in manufacturing and transportation ventures was raised through the stock and bond markets and not through loans obtained through personal connections.<sup>4</sup>

Did entrepreneurs in Brazil and Mexico organize their networks differently to deal with the different institutional settings? How can we compare the impact of the institutional structure of Mexico and Brazil on the networks of entrepreneurial finance and entrepreneurship in general? We attempt to answer these questions by looking at the networks of interlocking boards of directors of major joint stock companies in Brazil and Mexico in 1909.

We hypothesize that personal connections among people in firms, banks, and the government were more important in Mexico than in Brazil. This arrangement allowed Mexican businessmen and politicians to access information and capital in Mexico without relying heavily on the legal system,

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<sup>3</sup> See, for instance, the trilogy of John D. Wirth, *Minas Gerais in the Brazilian Federation, 1889-1937* (Stanford, 1977); Robert M. Levine, *Pernambuco in the Brazilian Federation, 1889-1937* (Stanford, 1978); Joseph LeRoy Love, *São Paulo in the Brazilian Federation, 1889-1937* (Stanford, 1980), or the work of Flávio A. M. Saes, *As Ferrovias de São Paulo, 1870-1940* (São Paulo, 1981) and *A grande empresa de serviços públicos na economia cafeeira* (São Paulo, 1986).

<sup>4</sup> Ann Hanley, "Business Finance and the São Paulo Bolsa, 1886-1917," in John Coatsworth and Alan Taylor, eds., *Latin America and the World Economy Since 1800* (Cambridge, Mass., 1998), 116; Flávio A. M. Saes, *As Ferrovias de São Paulo, 1870-1940* (São Paulo, 1981), 154-169; Stephen Haber, "The Efficiency Consequences of Institutional Change: Financial Market Regulation and Industrial Productivity Growth in Brazil, 1866-1934," in John Coatsworth and Alan Taylor, eds., *Latin America and the World Economy Since 1800* (Cambridge, Mass., 1998), 115-38; Aldo Musacchio, "Law and Finance in Historical Perspective: Politics, Bankruptcy Law, and Corporate Governance in Brazil, 1850-2002" (Ph.D. diss., Stanford University, 2005), 43. According to Ann Hanley, the economic shock that Brazil experienced at the turn of the twentieth century forced many prominent São Paulo bankers and industrialists to abandon personal networks that they used for monitoring and turn instead to new institutional mechanisms that reduced both their risks and need to closely watch those with whom they did business. While economic and political shocks may drive some businessmen into networks and others out of them depending on the circumstances, Hanley's conclusion suggests the hypothesis that Brazil relied more on institutions by 1909 than Mexico. Ann Hanley, "Is It Who You Know? Entrepreneurs and Bankers in São Paulo, Brazil, at the Turn of the Twentieth Century," *Enterprise and Society* 5 (June 2004): 187-225, see especially p. 189.

“arm’s-length lending,” and other formalized institutions. Entrepreneurs in Brazil, on the other hand, relied to a greater degree on formal institutions to access information and credit.<sup>5</sup>

We argue that networks can substitute for some formal institutions. In our view, businessmen can use networks to monitor one another and negotiate within a system that relies more on convention than on publicly declared rules to function.<sup>6</sup> Also, we explore the role of politicians within the networks of corporate directors. This is because networks may also allow entrepreneurs to break deals with public officials, who themselves may be network members. In return, network membership may allow public officials to claim some of the rents generated by businessmen.

This paper contributes to the literature on elites in Latin America by providing a methodology to systematically study networks. There is a large literature in social and business history dealing with the relationship between businessmen and politicians that has not been systematic in its approach. Even past forms of economic and social analysis, including the dependency school of thought, have argued that elite collusion had institutional and developmental effects. New and more formalized studies on the role of the stock market and banks in Brazil and Mexico have continued to look closely at the role of networks of directors. Unfortunately, business networks have not been clearly defined, nor have they received systematic analysis. Families and personalities that were part of the Mexican or Brazilian elite have often been studied on an *ad hoc* basis, selected through ex-post knowledge.<sup>7</sup> Our methods help determine the most important players and how networks developed within different societies.

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<sup>5</sup> Our analysis is influenced by the comparisons of business networks in the United States and Britain and Britain and Italy done by Mary Rose and coauthors. See Mary B. Rose, *Firms, Networks and Business Values: The British and American Cotton Industries since 1750* (Cambridge, 2000) and Mary Rose and Andrea Colli, “Networks, power and politics: The power of business in Britain and Italy before and during the interwar period in comparative perspective,” Lancaster University Management School Working Paper 005 (1999).

<sup>6</sup> We define networks as patterns of relationships in which two or more actors share a type of social activity over a definite period of time. They are also organizational features that can regularize and legitimize certain patterns of behavior such as the enforcement of contracts, access to credit, and the exchange of information. According to Mark Granovetter, networks may be more important when certain institutional features are weak or absent. This may include the lack of third-party enforcement when such contracts are informally enforced through embedded relationships. Mark Granovetter, “Economic Action, Social Structure, and Embeddedness,” *American Journal of Sociology* 91 (November 1985): 9, 27.

<sup>7</sup> For business and social history approaches to business and elite networks see Eul-Soo Pang, *Bahia in the First Brazilian Republic: Coronelismo and Oligarchies, 1889-1934* (Gainesville, Fla., 1979); Flávio A. M. Saes, *As Ferrovias de São Paulo* and *A grande empresa de serviços públicos na economia cafeeira* (São Paulo,

Our hypothesis that Mexican business networks were more important substitutes for formal institutions than Brazilian networks is largely confirmed by three related results: 1) the total number of connections (i.e., the density of the network) was higher in Mexico than Brazil; 2) Mexico there was one dense core network, while in Brazil we find fairly dispersed clusters of corporate board interlocks; and most importantly, 3) politicians played a more important role in the Mexican elite network than their counterparts in Brazil.

The Mexican results confirm much of what has already been stated by other business and economic historians, especially regarding the number of strong connections between banks and firms. Given that Mexico relied heavily on an informal set of rules that mediated the relationship between the economic and political elites, firms, banks, and the government functioned symbiotically. The main personalities in the Mexican business network were often prominent politicians who helped firms to get charters and privileges. These politicians facilitated the exchange of information among firms by serving on many boards at one time.

In contrast, Brazil had a relatively more standardized and open set of institutional rules. The Brazilian network of directors was more fragmented into clusters, had fewer ties between companies, and showed little political presence. We are not arguing that political connections were unnecessary for entrepreneurs in Brazil, rather, that politicians were less central for business networks. We were surprised by this final finding because the Brazilian literature on elite networks has traditionally seen politicians as playing an important role in business. For example, the trilogy of monographs by John Wirth, Robert Levine, and Joseph Love implicitly defends the idea that the network of political elites

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1986); Mario Cerutti, *Burguesía y capitalismo*; Diana Balmori, *Notable family networks in Latin America* (Chicago, 1984); Mark Wasserman, *Capitalists, Caciques, and Revolution: The Native Elite and Foreign Enterprise in Chihuahua, Mexico, 1854-1911* (Chapel Hill, 1984); Leonor Ludlow and Carlos Marichal, *Banca y poder en México, 1800-1925* (México, 1986); Mario Cerutti, *Burguesía, capitales e industria en el norte de México* (México, 1992); Leonor Ludlow and Alicia Salmerón, *La emisión de papel moneda en México: Una larga negociación político-financiera* (México, 1997); and Zephyr Frank, "Elite Families and Oligarchic Politics on the Brazilian Frontier: Mato Grosso, 1889-1937," *Latin American Research Review* 36 (Spring 2001). For works that have tried to systematize business networks, the most notable exception for Brazil is Ann Hanley, "Is It Who You Know? Entrepreneurs and Bankers in São Paulo, Brazil, at the Turn of the Twentieth Century," *Enterprise and Society* 5 (June 2004): 187-225. See also the trilogy of Wirth, *Minas Gerais*; Levine, *Pernambuco*; and Love, *São Paulo*. For Mexico, Mario Cerutti has made great contributions to systematizing the relationship among families of the north of Mexico. Cerutti, "Produccion capitalista," 149-192.

was extremely dense, with strong connections between politicians and businessmen. Therefore, we expected to find many of those politicians in our network of directors.<sup>8</sup>

Mexico and Brazil are good cases by which to test our hypothesis for three reasons. First, within Latin America, they are two of the richest countries and have the largest populations. Gross domestic product levels were most likely similar at the turn of the century, and both countries relied on exports as the main source of growth during this period. Second, both countries adhere to the Civil Law tradition and were colonized by Catholic countries, with a low ratio of colonizers to indigenous and slave populations.<sup>9</sup> Third, when the British company that edited the yearbooks we are using for the present analysis compiled the data, both countries were undergoing an industrial transition at a heightened pace. By choosing two cases that share a number of structural and historical commonalities, we hope to hold constant a maximum number of variables.

This paper is divided into four sections. In the next section we explain the institutional differences between Mexico and Brazil. The third section presents the methods we used to study and compare networks of board interlocks. In the fourth section, we present our results and the fifth section concludes.

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<sup>8</sup> See Wirth, *Minas Gerais*, 140-163; Levine, *Pernambuco*, 89-90; Love, *São Paulo*, 152-175; and others like Linda Lewin, *Politics and Parentela in Paraíba: A Case Study of Family-Based Oligarchy in Brazil* (Princeton, N.J., 1987), 10-11. According to Anne Hanley, "Is It Who You Know?" this might have depended on the time period studied, given that networks became less relevant for doing business after 1890.

<sup>9</sup> According to work by Kenneth Sokoloff and Stanley Engerman, as well as Daron Acemoglu, Simon Johnson, and James A. Robinson the process of colonial settlement had an important impact on the subsequent institutional development of former colonies. Kenneth Sokoloff and Stanley Engerman, "Factor Endowments, Institutions, and Differential Paths of Growth Among the New World Economies: A View from Economic Historians of the United States," in Stephen Haber, ed., *How Latin America Fell Behind* (Stanford, 1997), 260-304; Daron Acemoglu, Simon Johnson, and James A. Robinson, "The Colonial Origins of Comparative Development: An Empirical Investigation," *American Economic Review* 91 (December 2001): 1370. According to these theories we would expect Mexico and Brazil to have similar institutional structures by 1913. Moreover, we might expect Civil Law countries to have very similar protections to investors throughout history, which would lead to very similar development of financial markets. Rafael La Porta, Florencio Lopes-de-Silanes Andrei Shleifer, and Robert Vishny, "Legal Determinants of External Finance," *The Journal of Finance* 52 (July 1997): 1131-1150; Rafael La Porta, Florencio Lopes-de-Silanes, Andrei Shleifer, and Robert Vishny, "Law and Finance," *Journal of Political Economy* 106 (December 1998): 1113-1155.

## II. Institutions and politics in Brazil and Mexico

Brazil and Mexico had different political histories during the nineteenth century, a fact reflected in the legal frameworks that regulated their economic activity. After independence Brazil established a constitutional monarchy with some checks and balances. This provided stability during most of the nineteenth century. Brazil's constitutional monarchy ended in 1889, when this long-standing system was overthrown by a nonviolent republican revolution. Between 1889 and 1891, a provisional government was established. The new republican government drafted a constitution, modified the banking laws, and enacted a comprehensive law on joint-stock companies. The republic was democratic but had very low political participation.<sup>10</sup> Nevertheless, the federal system created through the 1891 constitution allowed far more competition of elites for representation within the federal government and competition among the states to attract business and investment. For example, states such as Minas Gerais and São Paulo competed to get the best railroad network to export coffee and agricultural goods. Also, political representation of state elites alternated during much of the first republic. The famous *café com leite* arrangement occurred for many years, when the republican elite of São Paulo largely alternated control of the presidency with the republican elite of Minas Gerais between 1891 and 1930.

Mexico followed a different path. It experienced long periods of instability after its independence from Spain, and the sequence of civil wars and coups d'états did not end until 1876 when Porfirio Díaz enacted a dictatorship. Before Díaz, power resided mostly in the hands of *caciques*, or regional bosses, who sharply curtailed the power of the federal government. State power during the *porfiriato* (1876-1910) was consolidated and centralized for 30 years, usually at the expense of the *caciques*.<sup>11</sup> Even though both governments had similar liberal regimes, albeit less democratic in Mexico, they operated with crucial differences. One important difference is that in Mexico there was a

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<sup>10</sup> Joseph Love has estimated that less than a third of the population participated in elections during the period 1889-1930. See the table on page 9 of Joseph L. Love, "Political Participation in Brazil, 1881-1969," in *Luso-Brazilian Review* VII-2 (December, 1970): 3-24.

<sup>11</sup> Alan Knight, *The Mexican Revolution, Vol I: Porfirians, Liberals and Peasants* (Lincoln, Nebraska, 1990): 15-36.

higher level of state instability throughout the nineteenth century. As formal and recognized government power changed hands many times at the highest levels in the Mexican government, this may have slowed a subsequent establishment of a strong rule of law.

The political histories of these two countries are interwoven with their different institutional settings, especially in relation to the enforcement of property rights. Although few have done systematic studies on the topic, Noel Maurer and Tridib Sharma argue that one reason for the existence of elite networks in Mexico is the poor protection of property rights.<sup>12</sup> Since collateral was hard to obtain in case of default, banks and firms developed entrepreneurial groups to closely monitor their activities and enforce credit contracts. A similar argument is maintained by Stephen Haber, Armando Razo, and Noel Maurer, who argue that, given the poor protection of property rights in Mexico, the government and the elites developed an implicit regulatory pact. In their notion of “vertical political integration,” the government and the elites became partners in the distribution of privileges and rents, while guaranteeing the enforcement of property rights to selected groups that gave political support and loyalty to Porfirio Díaz, Mexico’s dictator (1876-1910).<sup>13</sup>

For Brazil there are even fewer historical studies of contract enforcement and the protection of property rights. The information available shows a striking contrast with what is known about Mexico. For example, the rights of creditors to their collateral were often enforced by the courts during bankruptcy cases in Brazil between 1850 and 1916. This helped the development of a large and relatively impersonal source of funding: the bond market.<sup>14</sup>

Entrance to the market was very different in Brazil and Mexico. In Mexico, even though chartering procedures were very simple after the Commerce Code of 1889, entrance to banks was very

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<sup>12</sup> Maurer and Sharma, “Enforcing Property Rights”: 950-973.

<sup>13</sup> Stephen Haber, Armando Razo, and Noel Maurer, *The Politics of Property Rights: Political Instability, Credible Commitments, and Economic Growth in Mexico, 1876-1929* (Cambridge, 2003), 47-51

<sup>14</sup> Musacchio, “Law and Finance in Historical Perspective,” 75-109.

limited.<sup>15</sup> Therefore, perhaps the most important barrier to entry in Mexico was access to finance. Since financial markets were underdeveloped and the institutional settings did not allow banks to do arms-length lending, new firms entering the market in Mexico depended on family and personal connections to obtain funding. Stephen Haber has shown that between the end of the nineteenth century and 1940, the textile industry encountered more difficulties growing in Mexico than in Brazil. He argues that limitations on financing options hindered the development of the Mexican industry.<sup>16</sup> In part, these limitations on finance were a consequence of the chartering laws for banks.

Chartering policy in Mexico restricted access to entry for banking institutions. To even begin operations, an emission bank had to prove that it held between a quarter million and half a million dollars (about \$4.7 million to \$9.4 million today), while commercial banks were required to have approximately between \$100,000 to \$150,000 (between \$1.8 and \$3 million today). The first bank that chartered in each state received a quasi-monopoly for note circulation for that state. For nonfinancial firms, the capital requirements to charter a business were less onerous. If an entrepreneur wished to create a business that could compete with one of the state-protected private monopolies (such as the dynamite industry), they were likely to be denied charter.<sup>17</sup>

In Brazil, chartering was an administrative procedure that carried far fewer obstacles. After 1882, the capital required to establish a firm was 10% of total capitalization. The approval of the charter depended only on the decision of the local *Junta Comercial*, the local commercial office. For banks, charters were relatively easy approved, except when their objective was to issue notes. In this case, bank charters needed approval of the minister of finance. Moreover, the rules under the federalist political system in Brazil allowed more competition between the states to charter banks. Conversely, in Mexico a strong central government under Diaz helped integrate local quasi-monopolies with a system

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<sup>15</sup> Aurora Gomez-Galvarriato and Aldo Musacchio, "Organizational Choice in a French Civil Law Underdeveloped Economy: Partnerships, Corporations and the Chartering of Business in Mexico, 1886-1910" (Working Paper SDTE 295, Division of Economics, CIDE, Mexico, 2004), 7-8.

<sup>16</sup> Stephen Haber, "Industrial Concentration and the Capital Markets: A Comparative Study of Brazil, Mexico and the United States, 1830-1930," *Journal of Economic History* 51 (Sep. 1991): 559-580.

<sup>17</sup> Haber, Razo, and Maurer, *The Politics of Property Rights*, 87.

of privileges and reduced the number of Mexican banks. The banking sector during Mexico's *Porfirian* period was based on two large national banks that had privileges of branching and note circulation.

Brazil had a longer history of attempts to create a banking system, and this experience added to the number and strength of Brazilian banks. The richest states began chartering one or several state banks as early as the 1830s, but those efforts were not too successful until the end of the nineteenth century. By the end of the 1880s, though, the Brazilian banking system was growing in importance, and several state banks began to appear far from the country's capital. With the establishment of a federalist republic after 1891, a federalized banking system emerged, mostly composed of many state banks. Some of these banks had national branches, such as Banco do Brasil, the British Bank of South America Ltd., and the London and River Plate Bank Ltd.<sup>18</sup> By 1909, the Mexican banking system was composed of two big national banks, the Banco de Londres y Mexico and Banco Nacional de Mexico (Banamex), and many state banks, generally one or two per state (around 40 banks total). In practice, given the prohibitive taxes on notes issued by second-comer banks, only the first state bank to charter was able to successfully issue notes, which limited entry to further competition.<sup>19</sup>

Brazilian firms had more formal options to get funds beyond banks. Financial markets were more developed, and the federal system promoted the creation of stock markets in many states. For example, in Mexico there is evidence of a fairly important stock exchange for mining ventures in Mexico City. The stock exchange for joint-stock company shares in this capital, however, had very low participation. The list of quotations published in the financial journals of the time shows only a handful of securities that investors actively traded. Other, smaller stock exchanges operated in cities like Guadalajara, but the journals give little information about the activities of these financial centers. As

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<sup>18</sup> The number of banks in each country is difficult to trace throughout the nineteenth century. For Brazil see Carlos Manuel Pelaez and Wilson Suzigan, *Historia monetaria do Brasil* (Brasilia, Brazil, 1976); and 19<sup>th</sup> century *Almanak Administrativo, Mercantil e Industrial* ("*Almanak Laemmert*") (Rio de Janeiro, 1889-1914). This later source shows that in Brazil by 1909 there were between one or two state banks in most Brazilian states, as well as a system of national branches for many Rio de Janeiro banks. For Mexico, we base our accounts on Maurer, *Finance and Oligarchy*. For advertisements of foreign banks in Brazilian newspapers see *Journal do Commercio* (Rio de Janeiro, 1889-1930).

<sup>19</sup> Noel Maurer estimates the actual cost of taxes on notes to show that it was not profitable for late entrants to be a part of the issuing business. Maurer, "Finance and Oligarchy: Banks, Politics, and Economic Growth in Mexico, 1876-1928" (Ph. D. diss., Stanford University, 1997), 48-49.

for the bond markets, Mexico depended on foreign financial markets because there was no domestic market for such securities. In contrast, the Rio de Janeiro Stock Exchange had approximately more than 100 listings of stocks and more than 30 bonds throughout the period. Furthermore, the Brazilian debenture market was buoyant, and there were relatively strong stock exchanges in Rio de Janeiro, São Paulo, Recife, Salvador, and Santos.<sup>20</sup>

As a result of these and other factors, Mexican entrepreneurs needed connections to certain important people in order to access large amounts of capital. Being part of the elite network was very important to get concessions, privileges, and all sorts of political favors. Personal elite connections were also crucial to get equity buyers or bank credit. For instance, manufacturing firms showed very low debt-equity ratios, and researchers who have studied this phenomenon have emphasized the importance of the network in substituting for financial markets. Maurer and Sharma argue that since the protection of property rights was poor in *Porfirian* Mexico, groups of entrepreneurs, particularly textile firms, emerged to enforce property rights through a reputation mechanism that would allow them to get credit from banks. Their study argues that credit through impersonal mechanisms was not common in *Porfirian* Mexico.<sup>21</sup>

Evidence from Brazilian historiography is less broad, but generally scholars have argued that more impersonal sources of finance generated less collusion between firms and entrepreneurs to get credit. One study looked closely at the textile industry and found that commercial and financial

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<sup>20</sup> For a comparison of Brazil and Mexico see Stephen Haber, "Financial Markets and Industrial Development: A Comparative Study of Governmental Regulation, Financial Innovation, and Industrial Structure in Brazil and Mexico, 1840-1930," in Stephen Haber, ed., *How Latin America*, 158-159. For Brazil the argument has been complemented with detailed data on capitalization and number of firms traded in Hanley, "Business Finance," 116 and Musacchio, *Law and Finance in Historical Perspective*, 52-57.

<sup>21</sup> , Maurer and Sharma, "Enforcing Property Rights": 952-955. For the use of family and network connections for the financing of companies in Mexico see Gomez-Galvarriato, "The Impact of the Revolution," 139-147; Haber, *Industry and Underdevelopment: The Industrialization of Mexico, 1890-1940* (Stanford, 1989), 67-69; Wasserman, *Capitalists, Caciques and Revolution*, 273-286; Raquel O. Barcelo Quintal, "El desarrollo de la banca en Yucatan; el henequen y la oligarquia henequenera," in Ludlow and Marichal, eds., *Banca y Poder en México*, 165-208; and Cerutti, "Produccion capitalista y empresariado en Monterrey": 160-170.

regulations in Brazil's textile industry facilitated entry and access to credit.<sup>22</sup> As a consequence, textile firms grew rapidly, especially when funding came through the stock exchange. Even though banks did not play a strong role in financing the industrialization of Brazil, the stock exchange was important in providing firms with finance through either equity or bond issues.<sup>23</sup> Institutional frameworks, including political considerations, chartering and banking laws, and foreign participation, differed greatly between Mexico and Brazil.

Given the differences in the institutional frameworks of Mexico and Brazil, we would expect to find significant differences in the networks of interlocking boards. In Brazil, where formal institutions eased the regulation of entry, reduced the costs of information, facilitated access to credit, and enforced contracts through court intervention, we would expect a more dispersed network of directors. This is because under these institutional settings, we would not expect to find entrepreneurs relying heavily on networks to substitute for formal institutions. In contrast, we would expect to find that in Mexico the authoritarian environment, the lack of third-party contract enforcement, and the complications to access credit and information led companies to rely on networks to substitute for those institutional failures.

### **III. Sources and methodology**

Network analysis has a long tradition within the social sciences and its origins can be traced to George Simmel's sociological and philosophical work on dyads and triads at the turn of the twentieth century. In the last few decades, scholars have begun to refine computational models for network analysis, and large data sets, previously too large to graph and measure, are now being used. This type of analysis, developed primarily by economic sociologists, has been a useful tool in exploring the economic and social relationships among firms, and leadership and power relations among company employees. There are two types of networks we study as defined in the economic sociology literature.

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<sup>22</sup> Stephen Haber, "Financial Markets and Industrial Development: A Comparative Study of Governmental Regulation, Financial Innovation, and Industrial Structure in Brazil and Mexico, 1840-1930" in Haber, *How Latin America*, 146-178.

<sup>23</sup> Hanley, "Business Finance and the São Paulo Bolsa," 116; Musacchio, "Law and Finance in Historical Perspective," 43.

First, we analyze “corporate networks,” with connections between firms that share members of boards of directors. If one or more people work for two boards of directors of two different firms, then one or more links between the latter are created. Second, we look at “elite networks,” with connections between individuals who sit on the same boards of directors. The network in both cases is the total “web” of relationships between these actors (companies or directors). We use quantitative techniques to study the density of the networks and the frequency of interlocking boards among companies. Additionally, we plot some of these webs into a bidimensional space in order to visualize the structure of the network and give the researcher a chance to observe patterns undetected in the data.

To test our hypotheses we use a data set of 98 Mexican firms and 371 Brazilian firms that shared board members in 1909. A company or bank becomes part of a network when one or more of its board members sit on the board of another company. This creates Mexican and Brazilian networks of 1,206 and 1,039 connections, respectively. We also create networks of company directors, where a relationship or tie is established between two individuals when they share a seat in the same board(s) of directors.

We create a database with director names and company information from the *Mexican Yearbook* and the *Brazilian Yearbook* for the year 1909.<sup>24</sup> These books present a list of joint-stock companies, their boards of directors, object of the firm, capital, some stock prices in the previous year, and the size of the debenture issues (long-term senior secured bonds). Qualitative and fragmentary evidence of the prominent actors of these companies is drawn from a wide variety of biographies and secondary sources.

The first step to analyze and compare the networks we built is to look at the density of the network. This is a ratio of the total number of ties (interlocks) between actors (companies) to the total

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<sup>24</sup> Unfortunately, the British who wrote the *Brazilian Yearbook* did not publish any earlier or subsequent yearbooks. The *Mexican Yearbook* has a wider length of publications, and one interesting extension of this project would be to add both a temporal component and data from the 1913 yearbook. In that year, many of the personalities who figure prominently in our networks for 1909 are gone due to the Mexican Revolution. Many, such as Porfirio Diaz, Jr., had taken up comfortable exile in Paris. *Brazilian Yearbook* (London, 1909), *Mexican Yearbook: A Statistical, Financial, and Economic Annual, Compiled from Official and Other Returns, 1909-1910* (London, 1910).

number of possible ties that companies could have (the total number of directorships). In other words, density is an important indicator of the reliance of companies on interlocks.

We then turn to the analysis of elite networks by looking at the web of connections between company directors through board interlocks. We tabulate the connections between directors and then use a network visualization program called Pajek to plot the networks.<sup>25</sup> This technique is important for demonstrating specific structures of the network that are not obvious through either the cross-tabulation tables or the centrality measures. For instance, cliques of directors hidden in the data may be revealed through their visualization.

The simplest way to measure centrality is by looking at “Degree” or “degree of connections.” This is the total number of connections to a single point. We present the average number of connections per sector and the number of firms with interlocks as a first approach to differentiate the Brazilian and Mexican networks. These simple measures can tell us how much firms relied on interlocks to do business.

In this paper we do not present all the results of our analysis of directors’ centrality, but we show the 15 most connected directors in our networks for both Brazil and Mexico. Degree or the number of interlocks is a very “local” measure of centrality, because it does not take into account the directors who have ties to well-connected individuals. Therefore, whenever we rank directors according to their centrality we use “eigenvalue centrality.” Eigenvalue centrality is perhaps the most robust measure of centrality because it recursively takes into account the number of connections of a personality and the connections of those to whom that personality is connected as repeated throughout the whole network.<sup>26</sup>

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<sup>25</sup> Pajek is available on the internet at <http://vlado.fmf.uni-lj.si/pub/networks/pajek/>. Wouter de Nooy, Andrej Mrvar, Vladimir Batagelj, and Mark Granovetter, *Exploratory Social Network Analysis with Pajek* (Cambridge, 2005), explain how to use this software.

<sup>26</sup> For a broad survey of network methods and theoretical applications, see Stanley Wasserman and Katherine Faust, *Social Network Analysis: Methods and Applications*. (Cambridge and New York, 1997) or Meter Carrington, John Scott, and Stanley Wasserman, *Models and Methods in Social Network Analysis* (New York and Cambridge, 2005).

One possible weakness of relying strongly on one type of link between firms or directors, such as corporate board interlocks, is that this study excludes other networks that may have connected entrepreneurs, such as kinship, clubs, or friendship relations. We do not believe this hinders this study for two reasons. First, we systematically document the friendships and working relationships between people who partly owned and managed joint-stock companies when possible. Second, because other studies on kinship and association ties have found similar patterns to the networks that we find between directors, it is likely that the results would be strengthened through the inclusion of kinship and association ties.<sup>27</sup>

In the period we study, company directors represented a set of shareholders who were usually more interested in the performance of the firm than any other stockholder. In most companies, owning a certain number of shares was an explicit requirement to be a director. This is why we believe that these boards represented people who were more likely to be active in obtaining resources and information for the company. A close examination of the relationships between shareholders would have also shown an interesting web of links, but minority shareholders are not always compelled to work for the well being of the firm. Since board members are often shareholders who have a high stake in the profits of the firm, the exclusion of shareholder networks is partly compensated for by the fact we are studying directors, who were shareholders with a stake in the company. Also, we posit that boards of directors are elected not only because of the managerial capacity of their members, but also by the resources (e.g., capacity to get loans), information, and political connections these individuals may bring to the firm.

There is a large sociology literature that discusses the functions of interlocking boards of directors.<sup>28</sup> Borrowing from the resource dependence perspective of organizational behavior theory, we

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<sup>27</sup> For example, see Cerutti, "Produccion capitalista y empresariado en Monterrey," 173-179 for Mexico and Wirth, *Minas Gerais in the Brazilian Federation*, 142, for Brazil.

<sup>28</sup> Sociologists have long debated the function of interlocking boards of directors. Interlocks in this literature can be used for 1) collusion (M.S. Mizruchi, *The American Corporate Network: 1904-1974* [Beverly Hills, 1982]; J.M. Pennings, *Interlocking Directorates* [San Francisco, 1980]); 2) cooptation and monitoring (J.R. Lang and D.E. Lockhart, "Increased environmental uncertainty and changes in board linkage patterns," *Academy*

maintain that interlocking boards were used both to regulate the exchange of resources and to allow the government, corporations, and financial institutions to monitor one another.<sup>29</sup> Information that could influence firm decisions was passed from bank to firm or government to firm. At the same time, banks could obtain firm information through interlocks, and they could monitor what borrowing companies were doing with their loans. While different networks did not always serve the same function, we strongly believe that they can, at the very least, indicate structural differences between Brazil and Mexico.

#### IV. Findings

We found that connections among firms, banks, and the government were more numerous and important in Mexico than in Brazil. When the total number of firms with board interlocks in Brazil and Mexico is measured by sector, we find that board interlocks were important in both countries. *Table 1* shows the sector averages of the number of connections per firm in Brazil and Mexico. We can see that Mexican firms shared approximately three directors with other firms' boards of directors, while the average for Brazil was about two. Banks, railroads, and utilities exemplify this trend. For nearly all three of these important sectors, Mexican firms had twice as many interlocks as Brazilian firms. For all

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*of Management Journal* 33 [March 1990]:106-128; Paul Sheard, ed., *International Adjustment and the Japanese Firm* [Canberra, Australia, 1992]); 3) legitimacy (P. Selznick, *Leadership in Administration* [New York, 1957]; W.R. Scott, *Organizations: Rational, Natural, and Open Systems* [Englewood Cliffs, NJ, 1992]); 4) career advancement (M.L.Mace, *Directors: Myth and Reality*. [Boston, 1971]); or 5) social and intraclass cohesion (M. Zeitlin, "Corporate Ownership and Control: the Large Corporation and the Capitalist Class," *American Journal of Sociology* 79 [March 1974]: 1073-119; Donald Palmer, Roger Friedland and Jitendra V. Singh, "The Ties that Bind: Organizational and Class Bases of Stability in a Corporate Interlock Network," *American Sociological Review* 51 [December 1983]: 781-796). This paper holds that board interlocks were important for exchanging resources and information between two organizations. These networks certainly led to greater social cohesion.

<sup>29</sup> See Stephen A. Allen, "Organizational Choices and General Management Influence Networks in Divisionalized Companies," *The Academy of Management Journal* 2 (Sep. 1978): 341-365; Jeffrey Pfeffer and Gerald R Salancik, "The External Control of Organizations" *Administrative Science Quarterly* 23 (Jan. 1978): 358-361; and Ronald Burt and M.J. Minor, eds., *Applied Network Analysis: A Methodological Introduction* (Beverly Hills, 1983).

of the companies in our database, 60% of the Mexican firms and banks had two or more interlocks, while 65% of the Brazilian businesses shared only one interlock.<sup>30</sup>

[TABLE 1 AROUND HERE]

Sector averages do not reflect structural differences between the two countries, which are better revealed when the network densities are compared. *Table 2* shows the Mexican and Brazilian network densities compared. We find that out of the total set of possible connections between Brazilian enterprises, 2% were made. For Mexico, the percentage was five times higher: 10% to 15% of possible interlocks were made. This effectively demonstrates that the members of boards of directors in Mexico were much more likely to join another board than their Brazilian counterparts.

[TABLE 2 AROUND HERE]

The network of banks and manufacturing firms for the two countries were structurally different. Fairly large clusters appear for Rio de Janeiro and São Paulo firms, but these groups are relatively independent. Many additional clusters represent firms from other states such as Rio Grande do Sul, Maranhão, and Bahia. For example, Progresso Industrial, a firm that produced textile manufactures in Rio Grande do Sul, is connected to two banks in that state. Interestingly, banks do not play a central role in these clusters, perhaps because, as some have claimed, banks did not participate actively in the funding of Brazil's industrialization during this period.<sup>31</sup>

In Mexico, manufacturing companies worked closely with banks. Of the 12 manufacturing and textile firms represented in the Mexican network, eight are closely tied to multiple banks, and four firms are located on the periphery of the main core cluster. There is a strong cluster of large Mexico City banks at the center of our network. It includes most of the banks with privileges to branch nationally such as Banco Nacional de Mexico, Banco de Londres y Mexico, Caja de Prestamos, and the Banco Central. There was a core structure of elites connected, through Banco Central, to a smaller

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<sup>30</sup> For Mexico, 28 banks shared directors (82% of total), 23 mining operations (68%), and 18 railroad companies (90%). Thirty Brazilian banks shared directors (70% of total), 14 mining operations (45%), and 23 railroad companies.

<sup>31</sup> See for instance Gail Triner, *Banking and Economic Development: Brazil, 1889-1930* (Palgrave Press 2000).

cluster of banks and manufacturers that included Banco Minero and the Compañía Industrial la Laguna. Other banks from the interior, Banco de Querétaro, the Banco Internacional Hipotecario, and the Banco de Hidalgo, were linked to the core group of Mexico City bankers through the cigarette manufacturer El Buen Tono.

[FIGURES 1 AND 2 AROUND HERE]

Another way of looking at the networks is to construct a web of connections among the directors instead of among firms. While this may give less information on how the network across economic sectors organized, the central figures in these networks are distinguishable. *Figures 1 and 2* show total elite networks of Brazil and Mexico connected by directors. For the sake of clarity, we have excluded names from these graphs to emphasize structural differences. These two graphs show the striking differences in network structure between Mexico and Brazil. Both graphs repeat the results of the interfirm networks in that the Mexican core network is dense while the Brazilian network is clustered. The small cluster protruding from the Mexican core in *Figure 1* is a group of English financiers who invested heavily in Mexican railroads and mines.

To make these graphs manageable, *Figures 3 and 4* exclude all directors from the networks who serve on one or two boards. The men who served on more than two boards remain, assisting us to identify the most active businessmen, bankers, and politicians in Brazil and Mexico. These networks are smaller, but still reflect the same clustered patterns for Brazil and core network for Mexico. Looking closely at the individuals who composed these networks, we find a few surprises. In *Figure 3*, there are far more politicians in the Mexican core elite than in the Brazilian network, and these results are overwhelming. The rank of Mexican personalities according to their centrality is listed in *Table 3*.

[FIGURES 3 AND 4 AROUND HERE]

*Table 3* shows the most connected Mexican directors according to eigenvalue centrality. It is important to notice that the most central company directors were also important politicians. Many were congressmen and top authorities in Mexico City. In fact, most of these personalities were congressmen who had participated in drafting important financial laws, such as the banking law of 1897. Some, such

as Pablo Macedo and Joaquín Casasús, were lawyers who offered legal advice to the firms they represented. These lawyers were so connected to the companies they interacted with that they automatically became important brokers of privileged information on many sectors of the economy. Furthermore, given they helped to draft most of the commercial laws issued during the *porfiriato*, they guaranteed excellent lobbying possibilities for firms. Other personalities found in our list of top directors were the financial representatives of banks and companies who offered financial information, served as monitors for the banks, and offered connections to the firms for credit. For example, the Banco de Londres y México and the Banco Nacional de México (Banamex) were the only banks with the right to issue notes used as legal tender nationwide. Banco de Londres y Mexico was legally represented by Joaquín Casasús, who fought a stiff political and legal battle against Banamex to win this privilege. Casasús, Pablo Macedo, Guillermo Landa y Escandón, Hugo Scherer, and Fernando Pimentel y Fagoaga (our top directors in *Table 3*) led the Monetary Commission, which between 1903 and 1905 had to decide whether to place Mexico on the gold standard.

[TABLE 3 AROUND HERE]

Friendship and kinship ties were also important in determining the structure of the Mexican network. For instance, Pablo Macedo and Hugo Scherer Jr. were partners of the minister of finance, Jose Yves Limantour, in several businesses. The Limantour family had important interests in many of the companies that appear at the core of our network, such as the Banco de Londres y México, the San Rafael Paper Company (an industrial monopoly), the cigarette manufacturer El Buen Tono, and others. Close friends of the minister of finance were also business associates including Pablo Macedo, who directed a newspaper sponsored by Limantour, and Hugo Scherer Jr., who together with Julio Limantour—brother of the finance minister, were partners in an investment bank in Mexico City.<sup>32</sup>

Perhaps the best example of the union of politics and business in Mexico was Porfirio Díaz Jr., the son of the long-ruling dictator Porfirio Díaz. Díaz Jr. served on the boards of many important companies, including two banks, El Buen Tono, the Mexican Eagle Oil Company, one railroad

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<sup>32</sup> Ludlow and Salmerón, *La emisión de papel moneda en México*, 62-64.

company, and the biggest utility company in Mexico. Interestingly, Díaz Jr. also sat on the board of the Banco Internacional e Hipotecario de México with Minister of finance Limantour. Finally, the vice-minister of finance, Roberto Nuñez, who appears with Diaz Jr. on the board of El Buen Tono, worked for Banco Nacional de Mexico and Caja de Préstamos, two of the biggest financial institutions at this time. There are many more examples that reflect the finely meshing gears of finance and politics in Mexico.

The role of these politicians in the elite network was very important since information and concessions, or privileges, were passed mostly from politicians to the companies they represented. Without these top political figures, economic survival could have been quite difficult during *Porfirian Mexico*.<sup>33</sup> Thirty-seven percent of the total firms were represented by at least one of the top 15 directors included in *Table 3*, and this group of top political elite also worked for firms that controlled 50% of the total capital of joint-stock companies in our sample for Mexico. If the foreign firms were excluded, this figure would be much higher. The top political elite also had the largest presence in banking and manufacturing. In banking they controlled 35% of banks, accounting for 65% of total commercial and mortgage bank capital in Mexico. In manufactures they controlled nine of the 12 firms in our database, accounting for 80% of total manufacturing capital.

The top political elite also personally influenced business when foreign firms were involved. Many of the foreign firms, such as the big railroad companies, were legally required to have an overseeing board in Mexico. A majority of foreign firms (chartered and managed abroad) also included these top personalities in their overseeing boards in Mexico. For foreign companies, having these “top directors” seated on their boards lowered the costs of dealing with the government. In turn, the Mexican political elites were able to control important business and financial information, even when they were originally foreign owned. The Mexican Eagle Oil Company exemplifies this arrangement. It was incorporated in Mexico by Sir Weetman D. Pearson, who later became an oil tycoon and one of the richest British investors. Pearson later sold the company to a new group of entrepreneurs but

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<sup>33</sup> Haber, *Industry and Underdevelopment*: 69-83.

maintained a stake in the company. A new board was formed, which included Guillermo de Landa y Escandón, John B. Body, Enrique Creel, Porfirio Díaz Jr., Luis Elguero, Pablo Macedo, Fernando Pimentel y Fagoaga, Luis Riba, Enrique Tron, and Pearson himself. All of these directors are in the top 15 list we present, while Pearson was the 16<sup>th</sup>-most-central figure. The Mexican Eagle Oil Company later became one of the two largest oil companies during Mexico's oil boom from 1910 to 1925.

Turning now to Brazil, we see far less evidence of political participation. No single Brazilian family or individual was able to attain the same level of business and political power or the same independence and influence over the national government as the Mexican elite during the same period. This is not to say there were no powerful businessmen who used connections with politicians to advance their goals, but rather that power, at least in terms of resources exchanged via interlocking boards of directors, was far more separated into semi-independent political and business spheres and reinforced by a less personal institutional finance system.

For the case of Brazil, we find an overall low level of direct political involvement in business. When lists of directors are compared with comprehensive lists of all federal and state Congress members as well as with lists of top cabinet members, only four directors were involved in politics.<sup>34</sup> First, we found Antônio Carlos Ribeiro de Andrada, who was minister of finance of the state of Minas Gerais (1902-1905) and mayor of Belo Horizonte (1905-1906) and was elected for the state senate in 1907. In 1909, he served on the board of the Companhia Mineira de Eletricidade, a utilities company in the state of Minas Gerais. Second, Antonio Maia served on the Congress and as Secretary of Agriculture of Brazil in 1892. Maia was a director of the Textile Mill Santo Aleixo, one of the most important mills in Rio de Janeiro. Third, Manuel Py served on the 2<sup>nd</sup> National Legislature (1892-1896) for Rio Grande do Sul. Py was a prominent politician in Rio Grande do Sul, where he also served on the boards of a textile mill, Fiação e Tecidos Porto Alegre; a shipping company, the Companhia

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<sup>34</sup> We mainly used the appendices with state political figures from Wirth, *Minas Gerais*; Levine, *Pernambuco*; and Love, *São Paulo*. We also had to look through comprehensive lists of congressmen such as Brasil. Congresso Nacional. Câmara dos Deputados. *Mesa da Câmara dos Deputados, 1826–1982: composição e relação de membros* (Brasília, 1983) and the lists of public officials available in the *Brazilian Yearbook 1909* and the *Almanak Administrativo, Mercantil e Industrial* ("Almanak Laemmert") (Rio de Janeiro, 1889-1914).

Fluvial; and an insurance company, the Sociedade de Seguros Marítimos e Terrestres Porto Alegre. Py appears in the upper section of *Figure 4* as one of the top directors. Finally, Possidonio Manso da Cunha, Jr. also served this state on the 3<sup>rd</sup> National Legislature (1897-1899). Manso da Cunha was on the boards of the utilities company Força e Luz Porto Alegre; the Real Estate and Development Company, Companhia Predial e Agricola; and two insurance companies, Seguros Marítimos e Terrestres "Phenix de Porto Alegre" and Seguros Providencia. Overall, we found very few politicians represented on the boards of directors.

At the national level, we see differences in divisions of labor within the elite between Mexico and Brazil. Many of the strong regional political elite from the northern states of Mexico were also businessmen and served on numerous boards of directors. Mexican politicians on boards are exemplified by Juan Terrazas in Chihuahua, Ernesto Madero in Nuevo Leon, and Lorenzo Torres in Sonora. In general, Mexico has more national politicians that also served as company directors in regions distant from the capital, while Brazilian politicians serving at the federal level were less likely to serve on company boards in states far from Rio. A stronger political career tradition developed in Brazil, in which men dedicated their entire working lives to politics. Possibly because Mexico experienced greater political instability during the nineteenth century, the civil service career tradition was less developed.<sup>35</sup>

Turning to our most central actors, *Figure 4* presents the ties between directors who had more than two board interlocks. The most central actors from within the top directors' network are mostly railroad and port entrepreneurs linked to Brazilian engineer Teixeira Soares (shown in *Figure 2 and 4*) or to American Percival Farquhar, a railroad and port tycoon (*Figure 4*).

[TABLE 4 AROUND HERE]

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<sup>35</sup> Hewlett and Wienert make a similar argument for the impact of 19<sup>th</sup> century political instability on the economic development of these two countries. "The first historical contrast centers on Mexico's constant crisis—corrupt governments, civil wars, the loss of national territory, and frequent humiliation at the hands of foreign invaders. Brazil, on the other hand, preserved a stable political legitimacy following independence under the rule of a branch of the Portuguese royal family," Ann Hewlett and Richard S. Weinert, *Brazil and Mexico: patterns in late development* (Philadelphia, 1992), 14.

*Table 4* shows the top 15 directors of the network that contains directors with more than two interlocking boards. The most central actor is João Teixeira Soares, an engineer from the state of Minas Gerais, who began to profit from railroad development since 1890. In 1909, Teixeira Soares appears on the board of directors of the railroad companies Compagnie Auxiliere des Chemins de Fer du Bresil, Estrada de Ferro de Goias, Estrada de Ferro Noroeste do Brasil, Estrada de Ferro Vitoria a Minas, the São Paulo-Rio Grande Railway, and the Sorocabana Railway. He was also on the board of the Companhia Força e Luz Cataguazes (utilities) and the Companhia Paulista Fabril (textile mill in São Paulo). He became famous for developing the railroad that linked the port of Santos to the city of São Paulo, a railroad that was a technological marvel of its day because it used three stationary engines to pull locomotives over 3,000 feet with tracks at a very steep slope. He was also a pioneer railroad promoter in the financial circles of France and Belgium. His record as an engineer also contained mixed results, given that he was famous for developing a zigzagging segment for the railway line between São Paulo and Rio Grande do Sul (the zigzagging tracks increased the length of the railway line and with it government subsidies). After 1905 he was closely linked to the railroad empire of Percival Farquhar, our second-most-connected director.<sup>36</sup>

Percival Farquhar was an American who engaged in a string of railroad investments in Cuba and Guatemala before turning to railroads, ports, and utilities in Brazil. He got his first big break in 1904 when he created the Rio de Janeiro Tramway, Light and Power Company. In this venture Farquhar established a long lasting-partnership with F.S. Pearson (the tenth most central actor) and Alexander Mackenzie (fourth most central actor), both of whom were from Toronto, Canada (see *Figure 4*). Pearson and Mackenzie had opened the São Paulo Tramway Company in 1899 and helped Farquhar to enter the Brazilian market. Mackenzie was also an influential lawyer with connections to the government. This small network, which relied on informal connections with politicians who were not board members, opened resources to Farquhar, such as additional concessions to build ports,

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<sup>36</sup> Charles Gauld, *The Last Titan: American Entrepreneur in Latin America* (Stanford, 1964), 162-164, 361.

railroads, and utility companies. Farquhar, Pearson, and Mackenzie together controlled the Bahia Tramway Light and Power Company; the Rio de Janeiro Tramway, Light and Power Co.; the Brazil Railway Company; the Sorocabana Railway; the São Paulo-Rio Grande Railway; the Port of Para (in the Amazon); and the Compagnie Francaise du Port do Rio Grande (port of Rio Grande, in Rio Grande do Sul).

Farquhar's business empire in Brazil centered on railroads. He created a railroad holding company, the Brazil Railway Company, that he used to buy other concessions (like the São Paulo-Rio Grande Railway), to lease railways from the government (such as the Sorocabana Railway leased from the state of São Paulo), or to buy large equity stakes in other railroads (such as the Estrada de Ferro Paulista and the Estrada de Ferro Mojiana). His idea was to create a national railroad network that would link the South of Brazil to the state of Bahia and the Bolivian border to Rio de Janeiro.<sup>37</sup>

Ports were also one of the central developments of the clique of entrepreneurs linked to Farquhar. Port works were usually too expensive for local or national financing and required capital from abroad. Farquhar bought the concession to build a port in Belém, in the northern state of Pará, on the delta of the Amazon River. Pará was famous worldwide because the provincial rubber was the most profitable kind of natural rubber well into the twentieth century. For Farquhar's Amazonian Port, money was raised by selling bonds in Paris, Brussels, London, Toronto and New York. His bankers in Paris included Hector Legru (the ninth most central actor), who gathered a great deal of money to finance Farquhar's projects. Legru lent the money and also sat on the board of directors of some of Farquhar's companies to guarantee close monitoring of the projects. Another top director in our network is William L. Bull (the fifteenth most central director). Bull was a New York financier who worked closely with Farquhar and his associates to find Wall Street financing.<sup>38</sup> As was common for investment bankers of the time, Bull also sat on the board of directors of many of Farquhar's companies.

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<sup>37</sup> Gould, *The Last Titan*, 164, 176-178.

<sup>38</sup> Gould, *The Last Titan*, 18, 67, 75, 90, 93, 190-193.

The projects promoted by Farquhar, Pearson, and Mackenzie had to include engineers their investors trusted. For instance, Teixeira Soares became a close ally of Farquhar, shared many board interlocks with his clique, and served an important role as the chief engineer. For the Rio Grande do Sul port works, French bankers suggested engineer Eduard Quellenec, to lead the project. Quellenec also became a director of many companies in Brazil (he is the eleventh-most central director in the Brazilian network).

The port at Belém, state of Bahia, exemplifies many of the large utility, mining, and railroad projects in Brazil, all of which generally followed three stages. First, the federal government issued concessions that were not always immediately bought because of high capital requirements.<sup>39</sup> When they were purchased, many of the buyers were not local elite but businessmen with connections to European or American capital who lived in Rio or São Paulo. These wealthy entrepreneurs only occasionally visited the projects, preferring the luxuries and comfort found only in the richest Brazilian cities. Men such as Percival Farquhar had connections to the federal elite but almost never invited these politicians to sit on the board of directors of their companies. Therefore, the projects these wealthy entrepreneurs built often faced great opposition by local elites, who could interact with some local governments more closely. For instance, the Guinle brothers, famous for the development of the port of Santos (the main coffee-exporting port in the state of São Paulo), ably used their political connections against Farquhar to drive him out of the tramway business in the state of Bahia.<sup>40</sup> Eduardo Guinle (shown in *Figure 3*) was the 44<sup>th</sup>-most-central director in our network of top directors.

Businesses in Brazil did not directly recruit politicians for their boards as often as in Mexico. Instead, company boards included able lobbying entrepreneurs and lawyers. From our top list of

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<sup>39</sup> This again points to the lack of national sources of credit available for entrepreneurs. In Santos, local elite bought the first port works concession but could not begin construction because they lacked capital. Only when Guinle and Gaffrey, two elites from Rio with contacts with British financiers, bought the concession did construction begin. Interestingly, the port at Santos (by then the second busiest in the republic) was not completed until 30 years after a railway scaled the enormous coastal escarpment to connect the port city to São Paulo and the coffee-fertile interior. This lag seemed to be endemic to most Brazilian ports, and there is evidence that ports, modernized long after the railroads had been laid, caused considerable congestion throughout Latin America.

<sup>40</sup> Gould, *The Last Titan*, 84.

directors, at least three of such lobbying directors were helping Farquhar and his clique deal with the Brazilian government. First, Alexander Mackenzie was well connected in Rio de Janeiro and proved very able when it came to acquiring new concessions or securing government approval for new projects. For example, the Rio de Janeiro Tramway Company was finally approved thanks to his negotiations with the mayor of Rio de Janeiro. Second, Carlos Sampaio (the third-most-central director in our network) represented the Bahia Tramway Light and Power company in the capital of the country, Rio de Janeiro, and was also a director of the Brazil Railway Company, The Port of Para, the São Paulo-Rio Grande Railway, and the Sorocabana Railway. In 1910, he was in charge of mobilizing a legal team to sue the state of Bahia for damages done to the property of the Tramway Company. Finally, Alfredo Maia (the seventh most central director) was active in lobbying and protecting Farquhar's business in the press. He was also a director of the Brazil Railway Company, the Sorocabana Railway, and the Rio de Janeiro Tramway, Light and Power Co.

Another group of highly connected Brazilian board members included Nicola Puglisi Carbone, Rodolfo Crespi, Emgídio Falchi, and Edward Wysard (shown in *Figures 2 and 4*). These men served on multiple boards of directors, including the Internacional de Armazens Geraes (warehouses), Fabrica de Cimento Italo-Brazileira (cement), the Tecelagem de Seda Italo-Brazileira (silk weaving), and the Banco Commerciale Italo-Brasiliano (banking). Nicola Puglisi Carbone also was part of the board of the Refinadora Paulista and the Banco Francês e Italiano. The most influential of this group was Edward William Wysard, who represented European interests in many businesses such as the Companhia de Industria e Comercio, the Societé Financiere et Commerciale Franco-Bresilienne, the Companhia Internacional de Armazens Geraes, the Refinadora Paulista (wheat mill), the Sao Paulo and Minas Railway Company Ltd., and the São Paulo Match Factory.

Nicola Carbone and his brother Giuseppe imported wheat flour until they built their own mills in São Paulo that could substitute flour at a higher profit. This was a successful venture, and they were able to expand into other areas such as silk weaving, hat manufacturing, sugar refining, and banking. In

1906, they took the helm of the Banco Francês e Italiano, a bank founded by Francisco Matarazzo,<sup>41</sup> another powerful early Brazilian industrialist and fellow Italian. The Carbone found additional investors in Italy willing to grant the bank a sizable transfusion of funds. By 1909, the two Carbone brothers had already created several of the crucial connections that would serve in attaining these goals. The next year, the Banco Francês e Italiano formed a partnership with the Banque de Paris et des Pays-Bas, effectively increasing the bank's capital more than fourfold. Sitting on the board was Emgidio Falchi (a biscuit manufacturer), Alexandre Siciliano (a machinery maker), while Edward Wysard represented the European interests. Historian Warren Dean claims that the bank was "clearly well connected politically" because it won a concession to lend the municipality of São Paulo \$3 million at a profitable 7% interest "with an option on all future loans until it was repaid."<sup>42</sup> Nonetheless, this lending right was obtained without the need for local or national politicians to serve on its board of directors.

In sum, our results have shown 1) that interlocking boards were denser and more common in Mexico, 2) that politicians were more active in the Mexican networks and were largely absent in Brazil, and 3) that in Brazil there is a surprisingly low proportion of politicians playing a part in the network of company directors. These results allow us to conclude that the institutional differences coincided with different network layouts. In Mexico, networks were substitutes for some of the formal institutions available in Brazil.

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<sup>41</sup> Francisco Matarazzo is to many the most prominent and influential of Brazilian entrepreneurs in the last 200 years. He does not figure as a top director in our network because many of his businesses were kept as private companies or partnerships. Our database only looks at corporations that were publicly traded. Matarazzo became a central figure in the business world of Brazil and dominated the business world during most of the twentieth century. See for example Warren Dean, *The Industrialization of São Paulo* (University of Texas, 1969), 31-32, 61-64, 219-221.

<sup>42</sup> Dean, *The Industrialization of São Paulo*, 1969: 57-58. Dean also describes the relationship between the Puglisi Carbone brothers and Matarazzo, see pages 31, 57-58.

### The Role of Geography

One factor that could be important to determine the differences in corporate networks in Brazil and Mexico is how spread geographically was the population in these two countries. In the United States, geographical factors have been identified as important factors shaping networks of interlocking boards of directors.<sup>43</sup> In 1908, approximately 20.5 million Brazilians lived in a country of 8.6 million square kilometers. This same year, the Mexican population numbered 15.2 million within an area of 2.0 million square kilometers. Clearly, population densities varied widely between the two countries: 2.39 people per kilometer in Brazil, and 7.63 per kilometer in Mexico.

If the concentration of population in the most important cities of Brazil and Mexico were to determine the density of corporate networks, than we would expect to find Brazil had more dense networks than Mexico. The most important Mexican elite lived, did business, and campaigned for political office in the capital of the country, Mexico City. The population of this city was close to half a million people around 1910. In contrast, Rio de Janeiro, the Federal District of Brazil, had a population of over 750,000 people during the same period. Brazil's second largest metropolis, São Paulo, was not a prominent city until the end of the nineteenth century when it began to attract settlers and the lucrative coffee trade. By 1920, it had over 600,000 inhabitants and was rivaling Rio de Janeiro in exports. Other relatively large cities in northeastern Brazil such as Recife and Salvador had similar populations as northern Mexican cities such as Monterrey and Chihuahua but were nearly twice as far from Brazil's capital as those Mexican cities were from theirs.

If the determining factor were geographical distance we would expect to find a Brazilian network with clear clusters of regional boards of directors largely disconnected from one another and a Mexican network with a more cohesive set of relationships between regional and Mexico City elites.

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<sup>43</sup> Kono, Palmer, Friedland, and Zafonte tested whether the composition of interlocking boards of directors correlated with spatial variables for the United States. Among Fortune 500 firms in 1964, they found a fairly strong connection between the quantity and type of interlocks and the location of corporations' headquarters and elite social clubs. Clifford Kono, Donald Palmer, Roger Friedland, and Matthew Zafonte, "Lost in Space: The Geography of Corporate Interlocking Directorates," *The American Journal of Sociology* 103 (January 1998): 863-911.

But, if population densities are the determining factor, then we would actually expect to find a denser network in Brazil than in Mexico.

We do not believe geography is the main determinant of network structure in these two countries. According to our analysis, the Mexican network was significantly denser than its Brazilian counterpart (see *Table 2*). Therefore, we discard population density as the main determinant of network structure. Also, geographic distance does not seem to have created a dispersed structure for the Brazilian network of corporate interlocks. We find that clusters with companies from the state of Minas Gerais (central part of Brazil) are adjacent and connected to the clusters that included firms and banks from Rio Grande do Sul (far south) and Rio de Janeiro (southeast). In a similar pattern, we find companies of Rio de Janeiro with connections to clusters of firms of northern states, such as Pernambuco and Bahia. Banks were, in many instances, important bridges between the companies of these different regions. One of the top central actors was the Banco de Credito Rural e Internacional, a bank from Rio de Janeiro that played an important role linking a large group of São Paulo companies with the web of interlocks of the rest of the country. Still, many clusters from distant states like Maranhão tended to be isolated from the rest of the country. Since the clusters are not always grouped by region, geography cannot be the only factor influencing the network structure.

## **V. Conclusion**

This paper has looked at the interaction of networks and institutions at the national level of two large Latin American societies during their initial stage of industrialization. Business networks are shown to be more important for entrepreneurs, bankers, and politicians in Mexico. Indeed, the network seemed to supplant formal institutions to the great benefit of connected Mexican elite. These businessmen and politicians could access information and capital despite the absence of many formal mechanisms such as a stock market. In other words, when informal monitoring and enforcement were superseded by a relatively weak rule of law, networks compensated.

Beyond a basic confirmation of our hypothesis, our results gave us two additional surprises. Politicians were numerous in the Mexican elite network but uncommon in the Brazilian network. And while that finding fits nicely with the state/business codependence model that has been theorized in the historiography of Mexico, it contradicts some interpretations of Brazil's political economy. The second surprise was the degree to which Mexican elite personalities participated in a core pattern of relationships. These patterns repeated themselves in the network of every sector of the economy.

This paper avoids theorizing about a strong causal relationship between networks and institutions because our results cannot conclusively show whether the absence of institutions led to stronger economic reliance on networks or if the long tradition of economic agents operating through informal networks weakened the establishment of formal institutions.<sup>44</sup> The line between these two systems of human organization is never clear, as we found to be the case in Mexico. Institutional frameworks that support strong informal interaction via networks benefited those in a position to rewrite laws. Mexican lawmakers were often those who were most embedded in the networks and who profited most from those networks, and they designed laws that could perpetuate a weak formal institutional structure.

Finally, it is important to note that Mexico and Brazil actually grew at a very similar pace between the 1880s and 1910. Therefore, what this paper shows is that at low levels of development there may be basically no difference in how a country grows, either through strong formal institutions or by substituting for some of those institutions with networks. Politically and socially, on the other hand, the Brazilian model may be preferred. In 1910, revolution erupted in Mexico largely because several strong and militant groups that had long felt excluded from the porfiriato resorted to violence in

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<sup>44</sup> Paul Windolf, in his recent comparison of corporate networks in Europe and the United States (2002), argues that national corporate networks were products "of an adaptation process to social and political institutions." Thus, institutional changes influenced by cultural variables caused networks to alter their structure. Paul Windolf, *Corporate Networks in Europe and the United States* (Oxford, 2002). This theoretical model does not fit our results, since changes in networks probably altered institutions. For example, several of the top elite in Mexico worked together to change banking and finance laws. If this core corporate network had been clustered and competing groups, one might speculate that different finance laws—and consequently institutions—would have emerged.

order to oust the small group of elite that had brought the country prosperity with social disruption and dislocation. In Brazil, when Getúlio Vargas ousted President Washington Luís and his heir-apparent Júlio Prestes in 1930, he also drew strength from groups that had felt excluded from the republican coalition. In Mexico, over one million people died in the revolution. The Brazilian coup brought about by Vargas and his supporters was relatively bloodless.

## V. Tables and Figures

**Table 1. Average number of interlocks per firm by sector**

	MEXICO		BRAZIL	
	Average number of interlocks	Number of firms with interlocks	Average number of interlocks	Number of firms with interlocks
Agriculture			1.2	7
Banks	3.8	34	2	31
Capital goods	10	1	0.8	3
Coffee			2.4	6
Consumption goods			2	8
Foods	1	1	1.2	5
Import/export			0.3	1
Insurance			2	25
Manufacturing	3.2	5	1.3	21
Mining	1.6	34	1.3	14
Oil	3.3	3		
Ports	7	1	3.1	7
Railroads	4.2	20	2.2	24
Rubber			0.4	4
Services			0.4	3
Shipping			1.9	10
Telegraph/telephones	0.5	2	0.8	2
Textiles	3	7	1.7	51
Utilities	4.3	8	1.7	25
<b>Totals</b>	<b>3.2</b>	<b>116</b>	<b>1.7</b>	<b>247</b>

Source: Estimated by the authors with data from the *Brazilian Yearbook 1909* and the *Mexican Yearbook 1909*.

**Table 2. Density of the corporate network of interlocks (percent)**

	Mexico (1909)	Brazil (1909)
Binary	9.53%	1.35%
All Interlocks	14.41%	1.79%
Total Number of Interlocks	(N=1206 )	(N=1039 )

Source: estimated using data from the *Brazilian Yearbook 1909* and the *Mexican Yearbook 1909*. Computation performed by the UCINET network centrality function. S.P. Borgatti, M.G. Everett, and L.C. Freeman, *UCINET 6.0 Version 1.00*, (Natick: Analytic Technologies, 1999). Density is estimated as the total number of interlocks over the total number of directorships in two ways. First, binary density restricts the possible number of connections between companies to one interlock. In other words, if two companies share two directions, binary density considers this to be only one connection. Second, nonbinary density (i.e., "all interlocks") count two directors shared by two companies as two connections.

**Table 3. Most Central Mexican Directors and Their Political Careers (ranked according to eigenvalue centrality)**

Rank	Name	Political Position	Occupation or Family Tie
1	Pablo Macedo	Congressman	Lawyer
2	Guillermo Landa y Escandón	Senator for 3 states (1878-1911), Mayor and Governor (Mexico City)	Politician
3	Hugo Scherer	Member of Commission drafting monetary and banking laws	Financier
4	Ernesto Brown		
5	Luis Elguero	Mayor of Mexico City and government advisor	Lawyer
6	Fernando Pimentel y Fagoaga	Mayor of Mexico City and member of the Monetary Commission	
7	Jose Signoret		Financier
8	Enrique Creel	Congressman and Governor of Chihuahua, Mexico's ambassador to the US, Minister of Foreign Relations, Pres. Mex. Banker's Assoc, and others	Married to the daughter of Chihuahua's governor: J. Terrazas
9	Luis Riba		Financier
10	J B Body		
11	Carlos Casasús	Congressman for the State of Mexico (brother of Joaquín Casasús, below)	
12	Henri Tron		Industrialist (textiles)
13	Porfirio Díaz Jr.		Son of Dictator
14	Joaquín Casasús	Congressman and Senator (1907-1911). Drafted the code of commerce (1889), banking law (1897), monetary law (1905). Mexico's Ambassador to the U.S.(1905-1906).	Lawyer
15	Roberto Nuñez	Subsecretary of Finance	Lawyer

Sources: Ludlow and Salmerón, *La emisión de papel moneda* 1997, Haber, *Industry and Underdevelopment*, 1986, and Peter Smith [producer], *Political Elites in Mexico, 1900-1971*. Rank given according to eigenvalue centrality. Centrality estimated using UCINET.

**Table 4. Most Central Brazilian Directors  
(ranked according to eigenvalue centrality)**

<b>Rank</b>	<b>Name</b>	<b>Coded as</b>
1	Joao Teixeira Soares	soares_joa
2	Percival Farquhar	farquh_per
3	Carlos Sampaio	sampai_car
4	Alexander Mackenzie	macken_ale
5	Malcom Hubbard	hubbar_mal
6	B. H. Binder	binder_b_h
7	Alfredo Maia	Maia_alf
8	Ernesto Genty	genty_ern
9	Hector Legru	Legru_hec
10	F. S. Pearson	pearso_f_s
11	Eduard Quellenec	quelle_edw
12	Julien Decrais	decrai_jul
13	Comte du Chaylard	chayla_com
14	Rodney Chipp	Chip_rod
15	Will L Bull	bull_wil

Source: Rank given according to eigenvalue centrality. Centrality estimated using UCINET. S.P. Borgatti, M.G. Everett, and L.C. Freeman, *UCINET 6.0 Version 1.00*, (Natick: Analytic Technologies, 1999).

Figure 1. Mexican Network of Directors (dots represent directors)

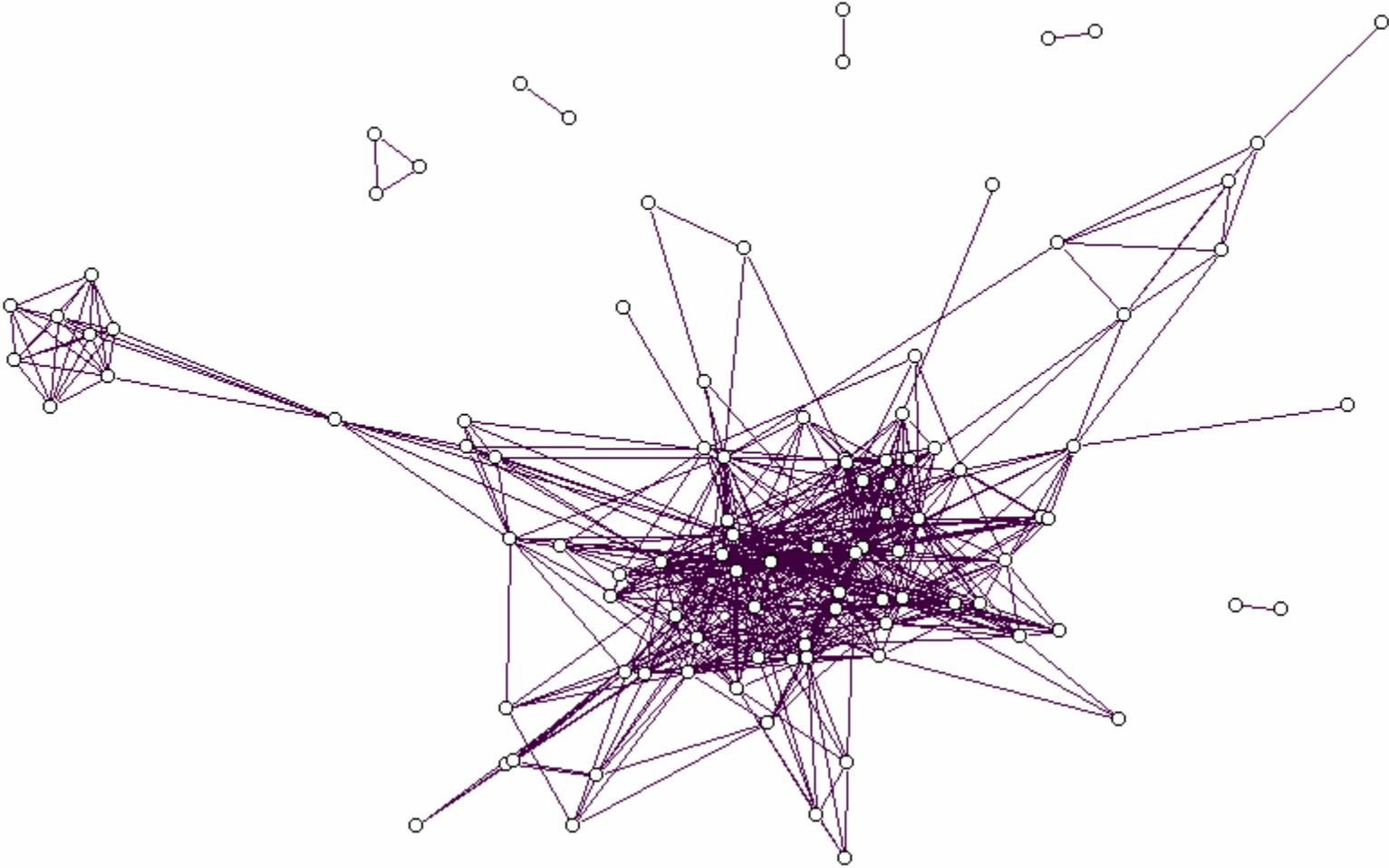
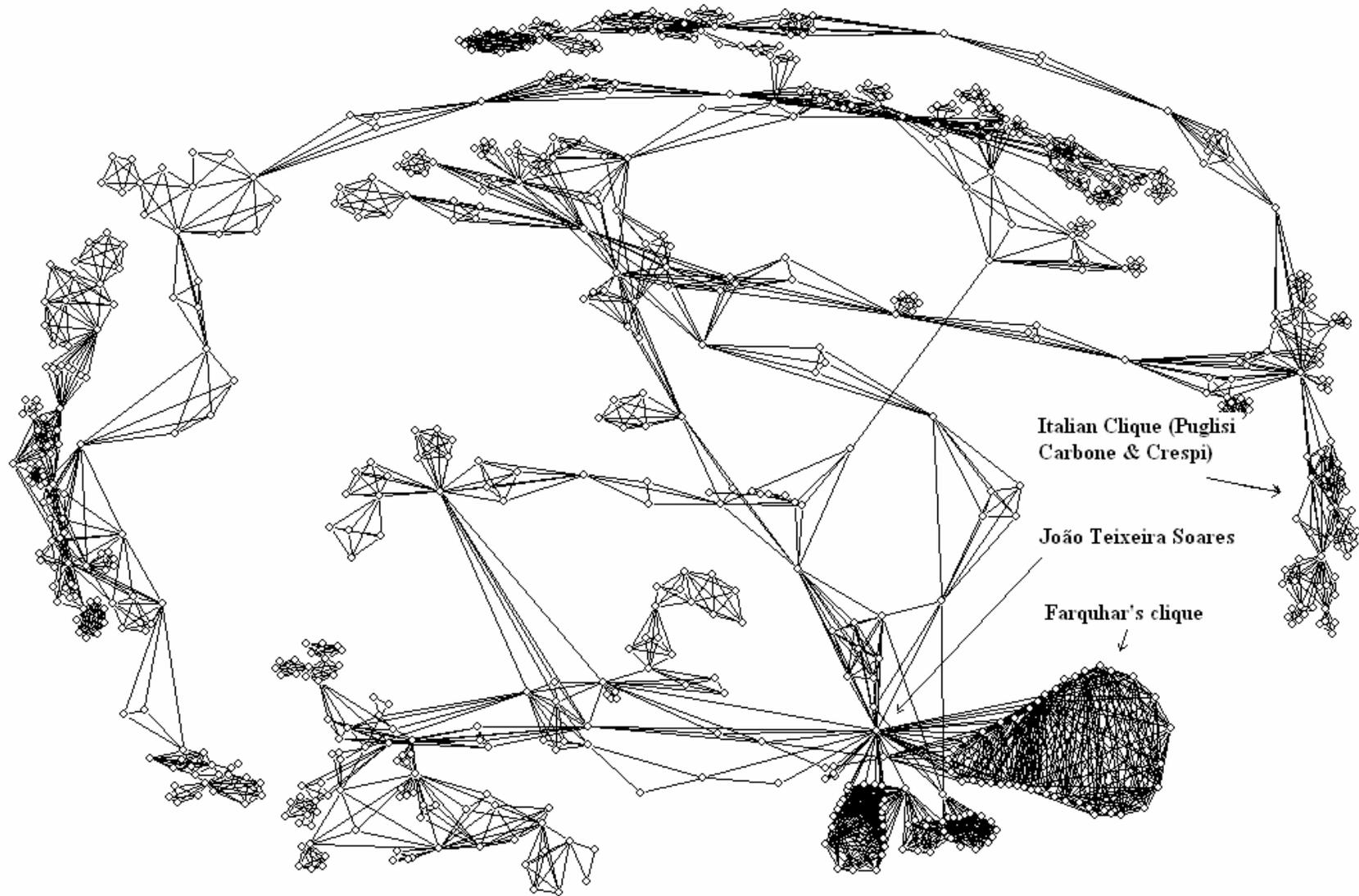


Figure 2. The Brazilian Network of Directors (dots represent directors)



Note: Some dyads and tryads were excluded from this network to make it displayable.

Figure 3. Mexican Network of Top Directors (with more than 2 interlocks)

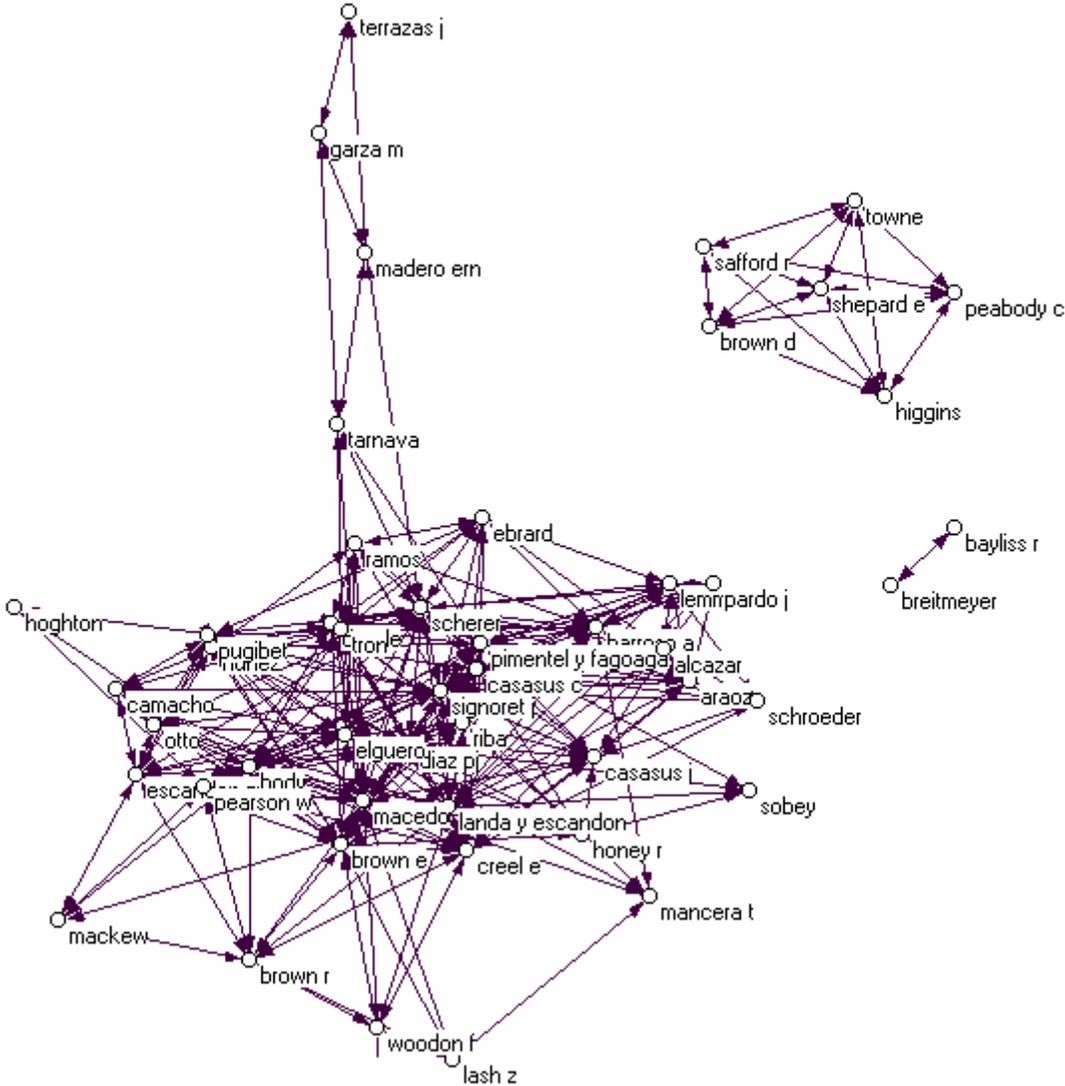
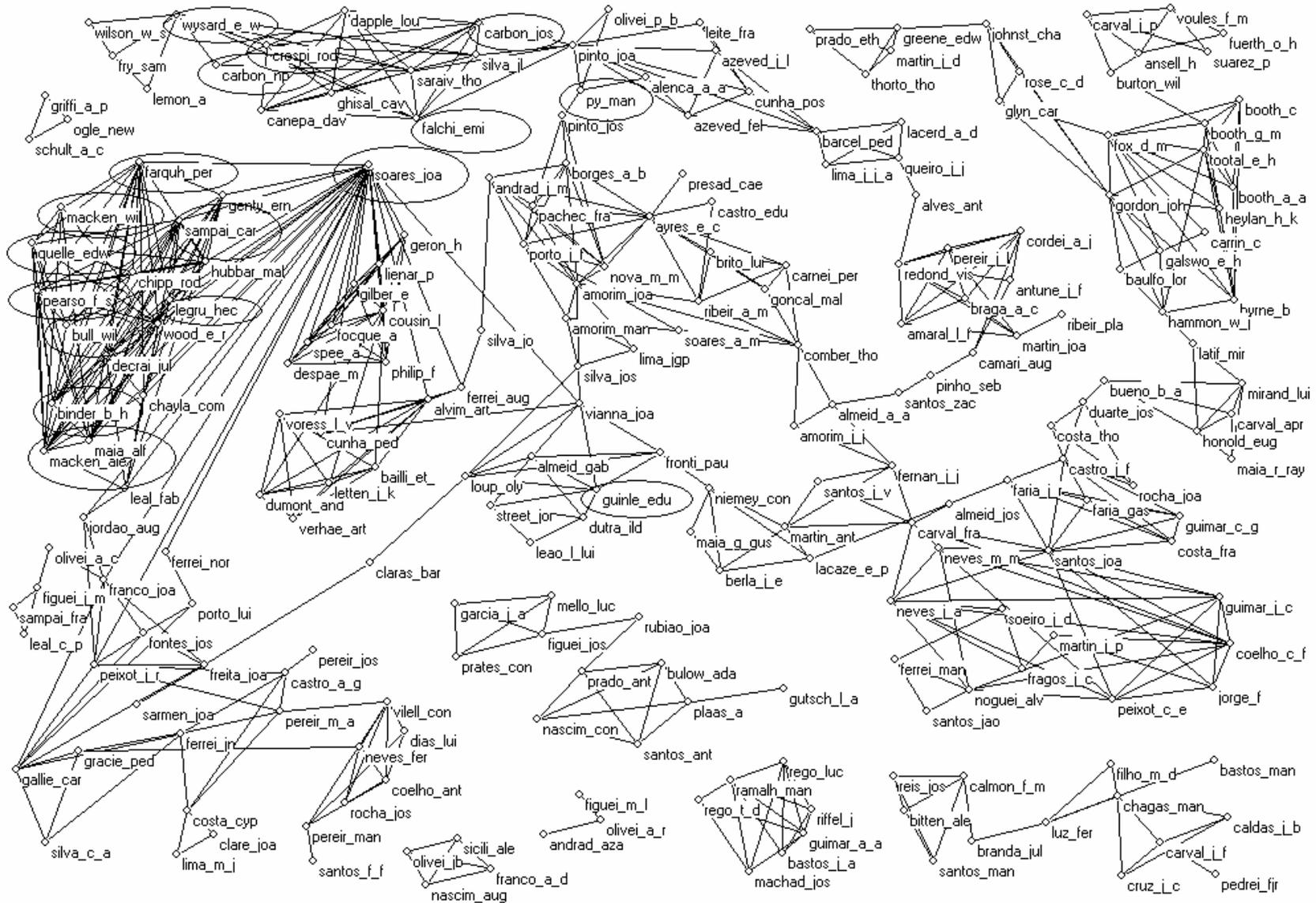


Figure 4. Network of Brazilian Top Directors (those that worked for more than 2 companies)



Note: We have drawn circles around the top directors and those mentioned in the text.