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Industrial Concentration and the Capital Markets: A Comparative Study of Brazil, Mexico, and the United States, 1830–1930

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This article examines the relationship between capital market development and industrial structure during the early stages of industrialization, contrasting the experiences of Brazil, Mexico, and the United States. It argues that constraints placed on the formation of credit intermediaries in Latin America by poorly defined property rights and government regulatory policies produced greater concentration in the Mexican and Brazilian cotton textile industries than that which developed in the United States.

The relationship between the efficiency with which an economy mobilizes capital funds and the industrial structure that an economy develops has long been of interest to economic historians, development economists, and organizational theorists.[1] Surprisingly, almost all of the research to date has focused on countries that had, by world standards, fairly well developed capital markets. Little work has been done on the relationship between capital market integration and the degree of intraindustry concentration in economies with truly underdeveloped capital markets such as are found in Latin America and Africa. Moreover, the studies on developed economies have largely focused on the very recent past: lack of data has prevented researchers from developing systematic, cross-national estimates of concentration for the period prior to the Great Depression.[2]

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[1] Interest among economic historians began with the seminal articles by Lance Davis and Alexander Gerschenkron in the 1960s. See Davis, "Capital Markets"; Davis, "Capital Immobilities"; and Gerschenkron, *Economic Backwardness*, chap. 1.

[2] See, for example, Davis, "Capital Markets," p. 271; Pryor, "An International Comparison,"

This article proposes to add breadth to the literature on this topic by analyzing the relationship between the development of capital markets and changes in industrial concentration in the cotton textile industry. It further departs from tradition by treating the period prior to the Great Depression, from 1840 to 1930. Even more important, it covers not only the developed world—in this case the United States—but also two countries with truly primitive capital markets—Brazil and Mexico.

I have chosen the cotton textile industry as my focus because the usual mechanisms by which firms obtain market control were lacking in the production of cotton goods. In the first place, the capital equipment was easily divisible, and minimum-efficient scales were small in cotton textiles. Thus, economies of scale were exhausted at small firm sizes. Second, no significant barriers to entry existed in cotton textile production in my time frame: no important patents covering the industry's technology, no tight controls over the supply of raw materials, and little product differentiation through advertising.[3] The only significant barrier to entry was access to capital; the industry therefore makes an excellent test case of the relationship between capital market development and industrial concentration.

The argument advanced in this article proceeds in the following terms: Although mobilization problems were experienced in all three countries studied, they were far more significant in Mexico and Brazil than in the United States. A variety of institutional innovations in corporate ownership, banking, and the stock market provided U.S. textile manufacturers with relatively easy access to capital funds. In Brazil and Mexico, on the other hand, such institutional innovations were blocked until the last decade of the nineteenth century. Without access to securities markets or bank loans throughout most of the nineteenth century, Latin American firms' sizes corresponded directly to their owners' ability to accumulate and mobilize capital through their extended network of wealthy family members. Because some entrepreneurs were members of better-endowed kinship networks, their firms were able to outgrow those of their less fortunate competitors. Thus, throughout the period under study but especially in the early period of Latin American industrialization (1840–1880), levels of concentration were significantly higher than they were in the United States.

I further argue that with the creation of modern financial intermedi-

p. 136; Adelman, "Monopoly and Concentration," p. 19; and Atack, "Firm Size and Industrial Structure," p. 465.

[3] Reynolds, "Cut Throat Competition," p. 739; and Mann, "Entry Barriers," pp. 75–76. This does not mean that scale economies were insignificant in cotton textile production. Indeed, had economies of scale been negligible, access to capital could not have served as a barrier to entry, and the argument developed here would not hold. It does mean, however, that scale economies in textiles were exhausted at relatively small firm sizes compared to such industries as steel, cement, and chemicals. In these industries, scale economies were so large that they precluded more than a few firms from operating at the optimal level of production.

aries and the development of stock-and-bond markets during the last decade of the nineteenth century, the absolute levels of concentration in the Latin American textile industry declined. Owing to the more complete liberalization of the regulations governing Brazilian financial markets, however, Brazil developed a much larger capital market than did Mexico. The upshot was that the decline in concentration in Brazilian industry proceeded much more rapidly and completely than it did in Mexico. By 1930 the structure of Brazilian textile manufacturing was approaching that of the United States, while the structure of the Mexican industry had barely changed at all. Indeed, the opening of the capital market in Mexico was so limited that only a few well-connected financial capitalists could make use of it. Thus, a small number of firms were able to use their privileged access to impersonal sources of capital to maintain their dominant positions. The same firms that dominated the market in 1900 therefore dominated it in 1930.

The reason for these differences between Mexico and Brazil was largely political. The overthrow of the Brazilian monarchy in 1889 and the formation of the First Republic brought about a liberalization of the policies regulating financial markets, which spurred the growth of the banking sector and the stock market. In addition, the new government also appears to have provided for a less arbitrary legal and institutional environment than had existed under the monarchy, with obvious implications for the spread of the corporate form of ownership. Mexico did not undergo such a transformation: it continued to be ruled by the Porfirio Díaz dictatorship (1877–1911), which relied on the financial and political support of a small in-group of powerful financial capitalists. This financial elite was able to use its political power to erect legal barriers to entry in the banking industry. Moreover, the politicized nature of doing business in Mexico made it virtually impossible to sell equity in an enterprise without the participation of members of the Porfirian elite on the board of directors. The corporate form of ownership therefore spread slowly.

The first section of this article will compare the institutional history of credit intermediaries in the three countries under study over the period from 1830 to 1930, paying particular attention to the history of textile mill financing. The second section will then develop four-firm concentration ratios to measure the level of industrial concentration in each country over time and will assess changes in the degree of concentration in light of institutional innovations in textile financing. The third section concludes.

I. CAPITAL MARKETS AND TEXTILE FINANCE

The United States

Of the three countries examined in this study, the United States experienced the least severe problems in mobilizing capital for the textile industry. Though the United States did not develop a truly national capital market until the 1890s, the U.S. cotton textile industry was somewhat of an anomaly in its ability to attract both equity participation and long-term loans early in the nineteenth century.[4]

Unlike the vast majority of American manufacturing companies of the nineteenth century, which were sole proprietorships or partnerships, the large, vertically integrated cotton textile producers of New England were organized as publicly held, joint stock corporations from their very beginnings in the 1820s. The market for these securities was rudimentary during most of the century; the shares of most companies were very closely held, and their often high par values (frequently $1,000) meant they could not be bought by the typical small investor. In addition, these companies appear to have been able to raise capital on a regional scale only; out-of-state shareholders were so scarce as to be virtually nonexistent. Yet these stocks were deemed of investment quality, and their holders knew that a market, however circumscribed, did exist for their sale. As early as 1835, 14 textile issues were traded on the Boston Stock Exchange. This grew to 32 by 1850 and to 40 in 1865. This was not yet a well-developed securities market, but it did provide for a wider distribution of ownership than more traditional forms of business organization would have. Indeed, one of the striking aspects of the large, Massachusetts-type companies was the pattern of widely dispersed ownership of shares among individuals and institutions.[5]

The percentage of firms capitalizing themselves through the sale of equity was, of course, small during the nineteenth century. Far more important to the capitalization of the early textile mills was the ability of manufacturers, even small and midsized ones, to obtain loans from banks and other institutions. These loans came from a wide range of sources, including commercial banks, savings banks, trust companies, insurance companies, mercantile houses, manufacturing concerns (including other textile mills), and private individuals.

This kind of institutional lending to manufacturers appears to have been confined to the northeast, which quickly developed a large banking system. In 1800 New England had 17 banks, whose combined capital totaled only $5.5 million. By 1819 it had 84 banks with a capital of $16.5 million. This swelled to 172 banks with $34.7 million in capital in 1830, and to 505 banks boasting $123.6 million in capital by 1860. Moreover, not only did the number of banks and their average capitalization increase, but also their loan portfolios slowly broadened to include industrial companies. Banks also decreased the stringency of their

[4] Davis, "Capital Immobilities"; and Davis, "Capital Markets."

[5] Davis, "Stock Ownership," pp. 207–14; Martin, *A Century of Finance*, pp. 126–31; and Navin and Sears, "Rise of a Market," p. 110.

lending requirements and increased the effective length of loan terms to periods of as long as ten years.[6]

The large number of bank loans to textile manufacturers is not surprising when you consider that the owners of mills tended to be the same people that owned the banks. New England's banks, as Naomi Lamoreaux has shown, were not the independent credit intermediaries of economic theory.[7] Rather, they were the financial arms of kinship groups whose investments spread across a wide number of economic sectors and a wide number of enterprises. Basically, kinship groups tapped the local supply of investable funds by founding a bank and selling its equity to both individual and institutional investors. The founding kinship groups then lent those funds to the various enterprises under their control, including their own textile mills. In fact, insider lending was the rule rather than the exception. Bank resources were therefore monopolized by the families that founded them, leaving little in the way of credit for applicants outside of the kinship group.

Had legal restrictions been placed on the founding of banks, these insider arrangements would have concentrated capital in the hands of a small number of kinship groups. As we shall see from the Latin American experience, this would in turn have led to a similar concentration in textile manufacturing. The fact that entry in banking was essentially free, however, meant that it was difficult to restrict entry into the textile industry by controlling access to capital. The U.S. system did not provide for a completely equal distribution of investable funds, but it did allow a large number of players to enter the game.

This regionally based capital market was gradually transformed into a national capital market in the second half of the century, thanks to the passage of the National Banking Act, which created a network of nationally chartered banks, and the widespread sale of government bonds to the public. The practical effects of these institutional developments were far-reaching. In the first place, the number of banks mushroomed throughout the second half of the century. Second, because of a peculiarity of the Civil War banking laws prohibiting nationally chartered banks from making loans on the basis of real estate collateral, national banks in rural areas of the country deposited their funds in the reserve city and central reserve city banks in urban areas. This not only directly increased the supply of funds for industrial loans, but also increased the supply of funds available for stock market speculation. Finally, the public's experience with canal company, railroad, and government securities slowly convinced small investors

[6] Davis, "New England Textile Mills," pp. 2, 5; Davis, "Sources of Industrial Finance," p. 192; and Lamoreaux, "Banks, Kinship, and Economic Development," p. 651.

[7] Lamoreaux, "Banks, Kinship, and Economic Development."

that paper securities were "as secure an investment as a house, a farm, or a factory."[8]

By the end of World War I the textile industry was awash in finance and many companies took advantage of the swollen credit markets to float numerous securities issues.[9] In fact, as I shall discuss when I examine industry concentration ratios, some textile companies utilized the financial markets to pursue aggressive merger strategies.

In short, access to finance was never a major constraint to the founding of the U.S. textile industry. From its very beginning the industry was able to tap into regional credit and investment markets. Over the course of the century, its access to capital improved as institutional innovations in financial markets provided it with expanded sources of equity and loans.

Mexico

The experience of the United States stands in stark contrast to that of Mexico, where impersonal sources of finance were virtually nonexistent until the 1890s. Mexican textile entrepreneurs could neither raise equity financing through the open market nor obtain loans from credit intermediaries, for Mexico had neither a stock exchange nor banks. When institutional innovations finally created these sources of finance at the end of the century, their use was reserved for the enterprises of a few well-connected financiers. As late as 1930 most of Mexico's textile industry was being financed through the same kinship networks of merchants that had established the industry 100 years earlier.

Equity financing through the creation of a joint stock company was virtually unknown in the Mexican textile industry until the end of the nineteenth century. From the 1830s, when the first modern factories were erected, until the late 1870s no Mexican textile firms were organized as joint stock companies. Even as late as 1889 a survey of the industry turned up only 5 joint stock companies out of 107 enterprises operating 115 mills—and none of those companies was publicly traded.[10] Beginning in 1896 the first industrial companies appeared on the Mexico City stock exchange, but even then the use of the exchange to raise equity capital remained limited. By 1908 only 14 industrials were traded

[8] Davis, "Capital Immobilities," p. 96; and Sylla, *American Capital Market*, pp. 12, 14, 26, 52, 209.

[9] Temporary National Economic Committee, *Investigation of Concentration*, p. 255; and Kennedy, *Profits and Losses*, chaps. 2, 10.

[10] For discussions of the nature of textile ownership, see Walker, *Kinship, Business, and Politics*, pp. 137–64; Beato, "La casa Martínez del Río"; Cerutti, "Patricio Milmo"; Hernández Elizondo, "Comercio y industria textil"; Gamboa Ojeda, "La trayectoria de una familia"; Keremetsis, *La industria textil*, pp. 59–64; and Colón Reyes, *Los orígenes de la burguesía*, pp. 159–61. For information on the legal form of the enterprises, see the textile industry censuses in Secretaría de Hacienda y Crédito Público, *Documentos*, p. 81; Ministerio de Fomento, *Estadística del Departamento*, table 2; Ministerio de Fomento, *Memoria*, pp. 438–40; Secretaría de Hacienda, *Estadística de la República*, table 2; and Secretaría de Fomento, *Boletín semestral*.

on the exchange: no new firms joined their ranks until the late 1930s. Of those few industrial companies only four were cotton manufacturers. Thus, of Mexico's 128 cotton textile firms (controlling 148 mills), only 3 percent represented publicly traded, joint stock companies.[11]

Obtaining capital through the acquisition of debt was almost as difficult as obtaining it through the sale of equity. In fact, until 1864 Mexico had no banks in the formal sense of the word; only in the 1880s did it begin to develop even a limited banking system. Throughout most of the nineteenth century, commercial transactions were handled by large merchant houses that issued letters of credit and banker's acceptances. These same merchant houses also financed the government debt, earning extremely high rates of interest (often in excess of 100 percent per year) for their services; they also provided short-term loans to the various enterprises operated by their business associates. These short-term, hypothecated business loans were generally restricted to entrepreneurs linked by kinship ties or long-standing business arrangements. They carried an interest rate that usually fluctuated between 12 and 40 percent per year, though at times they could reach 10 percent *per month*.[12]

The Mexican government was well aware of the limitations that this state of the credit market imposed on industrial development, and it made an attempt to rectify the problem through the creation of an industrial finance bank, the Banco de Avío, in 1830. This experiment, designed to support the country's fledgling textile industry, ended in failure just 12 years after it began. A liberal estimate of its contribution to the capitalization of Mexico's textile firms indicates that it provided but 6 percent of the industry's invested capital.[13]

A rudimentary banking system with specialized institutions and stable practices began to develop only in 1864, with the opening of the Banco de Londres y México (a branch of the London Bank of Mexico and South America, Ltd.); it then proceeded very slowly. By 1884 only 7 other banks were in operation, and as late as 1911 Mexico had but 47 banks, only 10 of which were legally able to lend for terms of more than a year. The few banks able to make long-term loans existed primarily to

[11] The activity of the Mexico City stock exchange was followed by Mexico's major financial weeklies: *La Semana Mercantil*, 1894–1914; *El Economista Mexicano*, 1896–1914; *Boletín Financiero y Minero*, 1916–1938. The behavior of the shares of these firms is analyzed in Haber, *Industry and Underdevelopment*, chap. 7. The total number of firms is from textile manuscript censuses in Archivo General de la Nación, Ramo de Trabajo, caja 5, legajo 4 (also see caja 31, legajo 2).

[12] Meyer Cosío, "Empresarios, crédito y especulación," pp. 103, 111; Bátiz V., "Trayectoria de la banca," p. 274; Tenenbaum, *Politics of Penury*, chap. 6; and Walker, *Kinship, Business, and Politics*, chaps. 7, 8.

[13] For an institutional history of this bank see Potash, *Mexican Government*; the bank's contribution to the textile industry is estimated in Haber, "La economía mexicana," p. 89.

finance urban and rural real estate transactions; in fact, they had a great deal of difficulty generating their own capital.[14]

Not only were there few banks, but the level of concentration within this small sector was very high. In 1895 three banks—the Banco Nacional de México, the Banco de Londres y México, and the Banco Internacional Hipotecario accounted for two-thirds of the capital invested in the banking system. The first two banks issued 80 percent of the bank notes in circulation. Even as late as 1910 the same two banks dominated the credit market, accounting for 75 percent of the deposits in Mexico's nine largest banks and roughly one-half of all bank notes in circulation.[15] If anything, the years after 1910 saw an increase in concentration, as the Mexican Revolution in that year threw capital markets into disarray, destroyed the public's faith in paper money, and put a brake on the development of the banking sector until the late 1920s.[16]

The result of Mexico's slow and unequal development of credit intermediaries was that most manufacturers could not obtain bank financing. Even those that could only succeeded in getting short-term loans to cover working capital costs. Thus, the Banco Nacional de México provided credit to a number of large industrial establishments in which its directors had interests. These included five of the nation's largest cotton textile producers, its largest wool textile mill, and the two firms that held monopolies on the production of newsprint and explosives. But even these insider loans constituted an extremely small part of the total capital of those manufacturing firms. An analysis of the debt-to-equity ratios of three of the country's largest cotton textile producers during the period from 1895 to 1910 indicates that their debt (including accounts payable) often made up as little as 3 percent of their capital. In no year did it exceed 12 percent. An analysis of other manufacturing companies—steel, wool textile, beer, and cigarette industries—indicates a similarly low level of loan financing.[17]

The reason that capital markets were so late in developing in Mexico and then grew in such a limited way was largely owing to three factors. The first was the small size of the Mexican economy. Mexico's per capita income was extremely low (roughly one-seventh of that of the United States throughout most of the nineteenth century) and unequally distributed, meaning there was probably very little to capture in the way of investable funds outside of a relatively small group of wealthy

[14] Marichal, "El nacimiento," p. 251; Sánchez Martínez, "El sistema monetario," pp. 60, 76–77; and Haber, *Industry and Underdevelopment*, p. 65.

[15] Sánchez Martínez, "El sistema monetario," pp. 81–82; and Marichal, "El nacimiento," p. 258.

[16] Sánchez Martínez, "La política bancaria;" Kemmerer, *Inflation and Revolution*; Cárdenas and Manns, "Inflación y estabilización."

[17] Sánchez Martínez, "El sistema monetario," p. 86; and Haber, *Industry and Underdevelopment*, pp. 65–67.

merchants, miners, and landowners. The kind of de facto investment pools that New England's banks constituted would therefore have found scant resources to tap in mid-nineteenth-century Mexico.

The second factor was the politicized nature of defending property rights and enforcing contracts. Personal ties to members of the government were essential for entrepreneurs to obtain the rights to official monopolies, trade protection, government subsidies, or favorable judicial rulings. Indeed, it was almost impossible to do business without resorting to political machinations.[18] This problem was most severe during the early and mid-nineteenth century, when the government changed hands on an almost semiannual basis; access to those wielding the political power necessary to defend property rights thus constantly shifted. But it was equally a problem during the *Porfiriato*, when only well-established financiers with clear ties to the Díaz regime appear to have been successful in floating equity issues. The inclusion of important political actors on the boards of the major joint stock industrial companies (including the brother of the treasury secretary, the minister of war, the president of congress, the undersecretary of the treasury, and even the son of the president) suggests the importance of those ties to the investment community. Further cementing (and demonstrating) those ties was the fact that many of Mexico's most successful financial capitalists not only served on various government commissions and represented the government in international financial markets, but also organized rallies for Porfirio Díaz's (always successful) election campaigns.[19]

The third factor slowing the development of impersonal sources of finance was Mexico's regulatory environment. Throughout the early and mid-nineteenth century, the lack of modern commercial and incorporation laws retarded the development of banks and joint stock companies. No body of mortgage credit laws was written until 1884, and it was not until 1889 that a general incorporation law was established. Thus, for most of the century it was extremely difficult to enforce loan contracts and establish joint stock companies.

Even when those laws were in place, however, new restrictive banking regulations prevented the widespread development of credit institutions. Instead of allowing essentially free entry into banking, as the U.S. government did, the Mexican government favored the nation's largest bank, the Banco Nacional de México, with all kinds of special rights and privileges. These included reserve requirements that were half that demanded of other banks, the sole right to serve as the

[18] Coatsworth, "Obstacles to Economic Growth," p. 98; for a discussion of the politicized nature of the legal system see Walker, *Kinship, Business, and Politics*, chaps. 1, 4, 5, 7, 8.

[19] Porfirio Díaz held power from 1877 to 1911. For a discussion of these entrepreneurs and how they profited by their ties with the government, see Haber, *Industry and Underdevelopment*, chaps. 5, 6.

government's intermediary in all its financial transactions, a monopoly for its notes for the payment of taxes or other fees to the government, an exemption from taxes, and the sole right to establish branch banks. At the same time that the government created this privileged, semiofficial institution, it erected significant barriers to entry for competing banks, including extremely high minimum capital requirements (originally 500,000 pesos, later raised to 1,000,000), high reserve requirements (banks were required to hold one-third the value of their bank notes in metallic currency in their vaults and an additional third in the treasury), a prohibition on creating new banks without the authorization of the secretary of the treasury *and* the Congress, a prohibition on foreign branch banks from issuing bank notes, a 5 percent tax on the issue of bank notes, and the restriction of bank notes to the region in which the bank operated.[20] Making the situation even more problematic was the revision of these banking laws every few years. The result was a legal environment that was not only restrictive but arbitrary as well.

The motivation behind these restrictive banking policies was essentially twofold. First, the Mexican government was more concerned about establishing a secure, stable source of finance for itself than it was in creating large numbers of institutions designed to funnel credit to manufacturers. Credit-short throughout its history, the government structured the credit market so as to ensure its own financial stability. Second, the group of financiers that controlled the Banco Nacional de México also happened to belong to the inner clique of the Díaz regime and had used their political influence to obtain a special concession that restricted market entry.

The tight regulation of banking had two important ramifications. The first was that the number of banks and the extent of their operations remained small: industrial companies could not therefore generally rely on them as a source of finance. The second was that the credit market could not serve as a source of finance for speculation on the stock exchange as it had in the United States (and as it would in Brazil). This served to further impede the growth of the Mexico City stock exchange.

In short, throughout its first 100 years of existence, the Mexican cotton textile industry had to rely on kinship networks for its financing. When institutional innovations in the capital market created new opportunities for firms to obtain impersonal sources of finance, only a small group of entrepreneurs was able to benefit. The result, as we shall

[20] When the first minimum was established in 1897, it was equal to $233,973. The increase in 1908 brought the minimum capital requirement up to $497,265, roughly five times the minimum for nationally chartered banks in the United States. For a discussion of these various privileges and barriers to entry, as well as changes in banking laws, see Sánchez Martínez, "El sistema monetario," pp. 43, 61–62, 67; Ludlow, "La construcción de un banco," pp. 334–36; and Bátiz V., "Trayectoria de la banca," pp. 286, 287, 293.

see in the following section, was an extremely high level of concentration.

Brazil

Brazil's experience in financing its cotton textile industry fell in between that of the United States and Mexico. During the early years of its existence, the Brazilian cotton industry faced the same constraints as Mexico's did. Brazilian firms could neither sell equity on the stock exchange nor appeal to the banking system for loans; industrialists therefore had to rely on their extended kinship groups in their search for finance. Beginning in the last decade of the nineteenth century, however, Brazil's capital markets, prompted by changes in the regulatory environment, underwent a long process of expansion and maturation. The result was that impersonal sources of finance became widely available to Brazilian manufacturers.

Throughout most of the nineteenth century, institutions designed to mobilize impersonal sources of capital were largely absent in Brazil. An organized stock exchange had functioned in Rio de Janeiro since early in the century, but it was seldom used to finance industrial companies. During the period from 1850 to 1885 only one manufacturing company was listed on the exchange, and its shares traded hands in only 3 of those 36 years. Neither could Brazil's mill owners appeal to the banking system to provide them with capital. In fact, formal banks were so scarce as to be virtually nonexistent. As late as 1888 Brazil had but 26 banks, whose combined capital totaled only 145,000 *contos*—roughly \$48 million. Only 7 of the country's 20 states had any banks at all, and half of all deposits were held by a few banks in Rio de Janeiro.[21]

The slow development of these institutions can be traced to basically the same factors that impeded their growth in Mexico: A small and unevenly distributed national income meant there was little in the way of investable funds to coax out of small- and medium-sized savers. Poorly defined property rights discouraged people from investing in enterprises of which they lacked direct knowledge or control, thereby discouraging the spread of the corporate form of ownership. And finally, public policies designed to restrict entry into banking so as to create a secure source of government finance prevented the widespread establishment of banking institutions.[22]

As was the case in Mexico, the last years of the century saw an expansion of credit markets in Brazil. Unlike in Mexico, however, the growth of impersonal sources of capital in Brazil was far more dramatic

[21] Topik, *Political Economy of the Brazilian State*, p. 28; Peláez and Suzigan, *História monetária do Brasil*, chaps. 2–5; Saes, *Crédito e bancos*, p. 73; Levy, *História da Bolsa*, pp. 109–12; and Stein, *Brazilian Cotton Textile Manufacture*, pp. 25, 27.

[22] Levy, *História da Bolsa*, p. 117; Peláez and Suzigan, *História monetária do Brasil*, pp. 78–83, 96–97; and Saes, *Crédito e bancos*, pp. 22, 86.

and sustained. The result was a fairly well developed capital market by the early years of the twentieth century.

Driving the expansion of the credit system were public policies carried out by the newly formed republican government after the overthrow of the Brazilian monarchy in 1889. These policies, designed to speed Brazil's transition from an agrarian economy run with slave labor to a modern industrial and commercial economy, basically deregulated the banking industry: banks could now engage in whatever kind of financial transactions they wished. Other reforms eased the formation of limited-liability joint stock companies and encouraged securities trading by permitting purchases on margin. Finally, new industrial ventures were exempted from taxes and customs duties.

The results of the 1890 reforms, which came to be known as the *Encilhamento*, were dramatic. The nation's newly formed banks, flush with investable funds and free to employ them without restrictions, plunged into the Rio de Janeiro stock exchange, purchasing large numbers of corporate securities. The Rio exchange, which had been a staid and sleepy affair throughout the nineteenth century, now saw wild securities trading as well as an expansion of the number of firms listed. In the first year of the Encilhamento alone, it saw almost as much trading as it had in the previous 60 years.[23]

The speculative bubble created by the Encilhamento had two important effects. Over the short term, it created large numbers of banks. In 1888 there were but 13 banks listed on the Rio exchange; by 1894 there were 39.[24] Though many of these enterprises failed during the collapse of the bubble and the recurrent financial crises over the following decade, in the short run they provided loans to Brazil's textile industry.

The second and more important effect of the Encilhamento was that it financed the creation of large numbers of joint stock manufacturing companies. In 1888 only 3 cotton textile enterprises were listed on the Rio stock exchange; by 1894 there were 18.[25] The collapse of the Encilhamento in 1892 did not bring down most of these newly formed industrial companies, as it did many of the banks.[26] The result was that many of the mills erected during the Encilhamento became going concerns. Even after the burst of the financial bubble, new firms were financed by the stock exchange. Thus, the number of cotton manufacturers listed on the Rio exchange grew from 18 in 1894 to 25 in 1904 and to 54 in 1914, when it leveled off. Thus, in 1914, 54 of Brazil's 191 cotton

[23] Topik, *Political Economy of the Brazilian State*, pp. 28–31; Peláez and Suzigan, *História monetária do Brasil*, p. 143; and Stein, *Brazilian Cotton Textile Manufacture*, p. 86.

[24] Levy, *História da Bolsa*, pp. 117, 245.

[25] Ibid., pp. 109–112, 245.

[26] The reasons for this have largely to do with intervention by the Brazilian government to save the newly formed manufacturing enterprises. For details see Stein, *Brazilian Cotton Textile Manufacture*, pp. 87–88; and Topik, *Political Economy of the Brazilian State*, pp. 134–37.

textile companies (28 percent) were publicly traded, joint stock limited-liability corporations.[27] Compared to Mexico, where only 4 of the nation's 128 cotton manufacturers (3 percent) were public corporations, this was an extremely high percentage of firms financed through the sale of equity.

The Encilhamento did not, however, have similar long-term effects on the growth of banking institutions. Once the speculative bubble burst, the government reverted to its old, restrictive banking policies of the past. In 1896 it once again restricted the right to issue currency to a single bank acting as the agent of the treasury. These more restrictive regulations, coupled with the already shaky financial situation of many of the country's banks (exacerbated by a significant amount of foreign exchange speculation) produced an almost complete collapse of the banking sector. In 1891 68 banks were operating in Brazil; by 1906 there were but 10, and their capital was only one-ninth that of the 1891 banks. The banking sector then began to expand again, led and controlled by a semiofficial superbank, the third Banco do Brasil. By 1918 the system had expanded to 51 banks. In addition, the Banco do Brasil opened over 80 branches throughout the country.[28] By international standards this was an extremely modest banking system, but it was still larger than Mexico's.

Despite this growth, the banking system appears to have lent very little of its investable capital to industry.[29] For this reason, Brazil's textile industrialists issued bonds to raise loan capital. By 1911 the bonds of 19 of the country's major textile manufacturers were traded on the Rio exchange.[30] An analysis of the balance sheets of 22 large-scale Rio de Janeiro and Federal District firms in 1915 indicates that they were able to raise significant amounts of capital through public debt issues. Their ratios of bond debt to equity (paid-in capital plus retained earnings) stood at 0.47:1. Recall that the data we have for similar large-scale Mexican firms indicates that their debt-to-equity ratios never exceeded 0.12:1 and often ran in the 0.03:1 range. Even the large-scale U.S. manufacturers in the 1860s did not borrow on the scale that Brazilian firms did: U.S. ratios of loan debt to equity were typically in the 0.20:1 range.[31]

In short, Brazilian firms faced the same kinds of constraints in

[27] Centro Industrial do Brasil, *O Centro Industrial*; and Levy, *História da Bolsa*, pp. 245, 385.

[28] Triner, "Brazilian Banks," pp. 4, 7; Topik, *Political Economy of the Brazilian State*, p. 52; and Neuhaus, *História monetária*, p. 22.

[29] Topik, *Political Economy of the Brazilian State*, p. 52; Cameron, *Banking in the Early Stages of Industrialization*, p. 28; and Triner, "Brazilian Banks," p. 12. The Mexican data were calculated from bank data in Sánchez Martínez, "El sistema monetario" and from population data in Instituto Nacional de Estadística, Geografía e Informática, *Estadísticas históricas*, p. 33.

[30] *Retrospecto Commercial do Jornal do Comercio*, 1911.

[31] Centro Industrial do Brasil, *O Centro Industrial*; and Davis, "Sources of Industrial Finance," pp. 200–2.

obtaining impersonal sources of finance that Mexican firms did during most of the nineteenth century. The last decade of the century, however, brought important innovations in financial intermediation that made the process of textile finance in Brazil more like that of the United States than that of Mexico.

II. LEVELS OF INDUSTRIAL CONCENTRATION

What effects did these different histories of financial intermediation have on the development of the textile industry? One would expect at least two: that the textile industry in Latin America would grow more slowly, and that it would be more highly concentrated than the U.S. industry. Additionally, one would expect the more complete maturation of the Brazilian capital market in the 1890s to have led to a more rapid decline in industry concentration there than in Mexico.

An examination of the development of the textile industry in the three countries bears out these hypotheses. In regard to the rate of growth of the textile industry, Brazil and Mexico lagged way behind the United States. As Table 1 demonstrates, the Mexican and Brazilian textile industries were minuscule compared to that of the United States, and they grew at only a small fraction of the U.S. rate during the mid-nineteenth century. Once capital became more freely available during the 20 years prior to World War I, however, their growth rates picked up and, in the Brazilian case, even outstripped that of the United States. It was also at this point that the Brazilian textile industry, which had been virtually nonexistent until the 1880s, surpassed Mexico's.

This is not to argue that access to capital was the only factor influencing the rate of growth of the Latin American textile industry. There were numerous other constraints to the development of industry in Brazil and Mexico.[32] The data suggest, however, that problems of capital mobilization played an important role in the slow development of industry in nineteenth-century Latin America. First, the fact that the textile industries in both countries witnessed a spurt of growth after impersonal sources of finance became available indicates that their lack was a constraint before 1890. Second, the fact that Brazilian industry was able to outgrow Mexican industry after its capital markets opened up certainly suggests an important role for impersonal sources of finance in a country's rate of industrial growth. By the outbreak of World War I the Brazilian cotton textile industry was nearly twice the size of Mexico's, whereas in the 1860s it had been barely one-tenth Mexico's size.

As for the effects of capital immobilities on industrial concentration,

[32] For a discussion of these constraints in Mexico see Haber, *Industry and Underdevelopment*, chaps. 3–5; for a discussion of the Brazilian case see Stein, *Brazilian Cotton Textile Manufacture*; and Suzigan, *Indústria brasileira*.

TABLE 1
ESTIMATED SIZE OF THE TEXTILE INDUSTRIES OF BRAZIL, MEXICO, AND THE UNITED STATES (1840–1930)

Circa	Country	Active Mills	Spindles	Looms	Workers
1840	Mexico	59	125,362	2,609	—
1850	U.S.	1,094	—	—	92,286
	Mexico	42	145,768	4,107	10,816
	Brazil	8	4,499	178	424
1860	U.S.	1,091	—	—	122,028
	Mexico	47	138,860	3,565	10,912
	Brazil	—	—	—	—
1870	U.S.	956	—	—	135,369
	Mexico	65	157,354	—	—
	Brazil	9	14,875	385	768
1880	U.S.	756	10,653,435	227,383	172,541
	Mexico	—	—	—	—
	Brazil	43	80,420	2,631	3,600
1890	U.S.	905	14,384,180	324,866	218,876
	Mexico	110	411,496	12,335	19,975
	Brazil	—	—	—	—
1900	U.S.	1,055	19,463,984	455,752	302,861
	Mexico	134	588,474	18,069	27,767
	Brazil	110	640,000	26,520	37,159
1910	U.S.	1,324	28,178,862	665,652	378,880
	Mexico	123	702,874	25,017	31,963
	Brazil	161	—	—	45,942
1920	U.S.	1,496	34,603,471	693,064	446,852
	Mexico	120	753,837	27,301	37,936
	Brazil	202	1,572,242	52,254	78,911
1930	U.S.	1,281	33,009,323	653,667	424,916
	Mexico	145	839,109	30,191	39,515
	Brazil	354	2,584,050	78,383	128,613

Sources: The U.S. data are from U.S. Bureau of the Census, *Census of Manufactures*, 1849–1929. The Brazil data are estimated from Borja Castro, "Relatorio do segundo grupo," pp. 3–73; Commissão de Inquerito Industrial, *Relatorio ao Ministerio da Fazenda*; Vasco, "A industria do algodão"; Centro Industrial do Brasil, *O Brasil*; Centro Industrial do Brasil, *O Centro Industrial*; Centro Industrial de Fiação e Tecelagem de Algodão, *Estatísticas da indústria*; and Stein, *Brazilian Cotton Textile Manufacture*, appendix 1. The Mexico data are estimated from Secretaría de Hacienda y Crédito Público, *Documentos*, p. 81; Ministerio de Fomento, *Estadística del Departamento*, table 2; Ministerio de Fomento, *Memoria* (1857), docs. 18-1, 18-2; Ministerio de Fomento, *Memoria* (1865), pp. 438–40; Archivo General de la Nación, Ramo de Trabajo, caja 5, legajo 4; Secretaría de Hacienda, *Boletín*, second semester 1919, first semester 1920, Jan. 1930; and Haber, *Industry and Underdevelopment*, pp. 125, 158.

the data are unequivocal: Latin America's highly imperfect capital markets translated into much higher levels of industrial concentration. The construction of standard four-firm concentration ratios (the percentage of the market controlled by the four largest firms) indicates that Mexico's level of concentration was anywhere from 2.7 to 4.4 times that of the United States, and Brazil's from 1.7 to 7.2 times greater (see Table 2). Both Mexico and Brazil displayed extremely high concentration ratios for textile manufacturing: the average ratio during the period from 1870 to 1930 was 0.372 for Mexico and 0.305 for Brazil. The

TABLE 2
ESTIMATED FOUR-FIRM CONCENTRATION RATIOS: BRAZIL, MEXICO, AND THE UNITED STATES (1840–1930)

Circa	United States	Brazil	Mexico	Mexico/ United States	Brazil/ United States
1840	—	—	.324	—	—
1850	.100	—	.416	4.16	—
1860	.126	—	.484	3.84	—
1870	.107	.766	.394	3.68	7.16
1880	.087	.357	—	—	4.10
1890	.077	—	.274	3.56	—
1900	.070	.224	.282	4.03	3.20
1910	.075	.168	.287	3.83	2.24
1920	.066	.151	.293	4.44	2.29
1930	.095	.161	.261	2.75	1.70

Sources: The Brazilian and Mexican data are estimated from the same sources given for Table 1. The U.S. data are estimated from the Bateman-Weiss large firm sample; *Davison's Blue Book*, *Official American Textile Directory*, *The Textile Manufacturer's Directory*, and *Dockham's American Report* (for years corresponding to census years); and U.S. Bureau of the Census, *Census of Manufactures*, 1849–1929. A detailed discussion of the estimation method may be obtained from the author.

average concentration ratio for the United States during the same period was 0.082.[33]

One might argue that Latin America's higher concentration ratios had little to do with capital immobilities; high levels of concentration were simply produced by the combination of economies of scale and shallow markets. Latin America had higher levels of concentration because fewer firms could operate at the minimum-efficient scale. Clearly, the need to achieve economies of scale played a role in Latin America's higher rates of industrial concentration. Brazil's extremely high rate of concentration in 1866 (1870 in Table 2), for example, without doubt reflected the fact that there were only nine firms in the modern sector of the Brazilian cotton textile industry. Similarly, Brazil's drop in concentration from 1866 to 1881 (1880 in Table 2) was undoubtedly affected by the growth in the size of the domestic market owing to the country's coffee boom.

The increase in market size does not, however, explain all of the observed difference in levels of industrial concentration. Indeed, if high levels of concentration were solely a function of market size, we should see a decrease in concentration concomitant with the growth of the market. Analysis of the data indicates, however, that this did not occur. In the United States, for example, the number of spindles in service (a

[33] These ratios were constructed to bias the results against the hypothesis that Latin America had higher levels of concentration than the United States. A detailed discussion of the method employed is available from the author. One might argue that these differences in concentration would disappear if imports of foreign textiles were accounted for, but that argument does not stand up to the empirical evidence on textile imports. Indeed, both Mexico and Brazil followed highly protectionist policies after 1890.

proxy for output) trebled from 1879 to 1919, but concentration only declined by 24 percent. In Brazil, output trebled from 1905 to 1927, but concentration decreased by only 28 percent. Mexico provides an even stronger example: output (measured in spindles) doubled between 1895 and 1929, but concentration declined by just 5 percent. During some of the intervening years, when output was rising, concentration actually increased.[34]

An analysis centered solely on minimum-efficient scales would run into a number of other problems as well. First, economies of scale in textile manufacturing are exhausted at small firm sizes. Second, the argument is not consistent with data on corporate rates of return for Brazilian and U.S. textile producers. If high levels of concentration were produced by the need to capture economies of scale, there should be a positive correlation between firm size and profitability: instead, the data indicate a negative correlation.[35]

A third—and perhaps the most telling—problem is that the firms dominating the Latin American markets were not only large in a relative sense but large in an absolute sense. Indeed, they were tremendous operations even by U.S. standards. Mexico's largest firm in 1912, for example, the Compañía Industrial de Orizaba (CIDOSA), was a four-mill operation employing 4,284 workers running 92,708 spindles and 3,899 looms. Had it been in the United States, it would have ranked among the 25 largest cotton textile enterprises. Brazil's largest producer, the Companhia America Fabril, was not far behind the CIDOSA operation: it controlled six mills employing 3,100 workers running 85,286 spindles and 2,170 looms. In fact, in 1912 (1910 in Table 1) Mexico's four industry leaders were, on the average, anywhere from 2 (measuring in spindles) to 6.6 (measuring in workers) times the size of the average textile firm in the United States. The same is true of Brazil's four industry leaders in 1915 (1920 in Table 1—the 1910 Brazilian data do not include data on the number of spindles and looms), which were anywhere from 2.4 (spindles) to 7.2 (workers) times the size of the average U.S. enterprise in 1910.[36]

[34] One might naively try to test the minimum-efficient-scale hypothesis by comparing firm sizes between countries. The problem with that sort of approach, however, is that minimum-efficient scales vary from one country to the next because of different market sizes, different levels of market integration, and different relative prices of capital and labor.

[35] Mann, "Entry Barriers," p. 124; Reynolds, "Cut Throat Competition," p. 742; and Haber, "Manufacturing Profitability," pp. 28–29. Price data indicate that the differences in profitability of the Brazilian firms were not driven by differences in the type of product.

[36] The average size of the four industry leaders in Brazil was 2,263 workers, 55,321 spindles, and 1,713 looms. In Mexico the average of the four leaders was 2,079 workers running 48,397 spindles and 1,967 looms. In the United States the average firm size in 1910 was a mere 313 workers running 23,269 spindles and 550 looms. U.S. data are from U.S. Bureau of the Census, *Thirteenth Census* and from *Davison's Blue Book 1910*. Mexican data are from Archivo General de la Nación, Ramo de Trabajo, caja 5, legajo 4. Brazilian data are from Centro Industrial do Brasil, *O Centro Industrial*.

If it were the case that firms in both the United States and Latin America were larger than was needed to take advantage of economies of scale, and if the effectiveness of the most significant barrier to entry in the textile industry—access to impersonal finance—were declining over time, then the industry leaders should have gradually lost market share. Again, the data are unequivocal: over time, the degree of concentration declined in all three countries. Moreover, the decline in concentration was greatest in Brazil, which went from having an extremely primitive capital market to having a relatively mature one.

In Brazil the decline in concentration once the capital markets opened up in the 1890s was remarkable. The textile industry displayed a concentration ratio of 0.357 in 1880. By the early years of the twentieth century, the concentration ratio had fallen to 0.224. It then continued to decline, reaching 0.168 circa 1910 and 0.161 circa 1930.

Much the same happened in the United States. The already low concentration ratio there (0.126 at its high point in 1860) dropped throughout the latter half of the nineteenth century, reaching 0.087 in 1880, 0.070 in 1900, and 0.066 in 1920. What is especially impressive about the data is that they indicate declining levels of concentration during a period (1898 to 1920) of numerous attempts to control the market through mergers. The increase in concentration in 1930 (to 0.095) resulted from the temporary success of several merger attempts designed to bring the industry's excess capacity under control and end a period of cutthroat competition. Within a few years, however, most of those mergers had failed. Post-1930 evidence indicates that concentration had returned to its 1920 level by 1937.[37]

Only in the Mexican case were there no long-term declines in the level of concentration—a scenario consistent with the institutional history of Mexico's capital markets. The level of concentration underwent a one-time decline from the 1860s (0.484) to the 1890s (0.274). After that it actually increased over the following 30 years, reaching 0.293 in 1920. Even with a decline between 1920 and 1930 (to 0.261), the level of concentration was only 5 percent lower in 1930 than it had been in 1890.

III. CONCLUSIONS

This article has examined the relationship between access to impersonal sources of finance and the degree of concentration in the cotton textile industry. The results of this analysis suggest a clear link between the way a country financed its industrial development and the industrial structure that evolved.

This analysis also suggests that the maturation of capital markets had

[37] Temporary National Economic Committee, *Investigation of Concentration*, pp. 253–54; Reynolds, "Cut Throat Competition," pp. 740–42; Kennedy, *Profits and Losses*, chaps. 2–6; and Wright, "Cheap Labor," p. 606.

significant effects on the structure of industry. As the barrier to entry created by unequal access to finance became less significant in Brazil and the United States, their levels of concentration decreased. In Mexico, the fact that capital markets developed only to a point and were then stifled by both the restrictive policies of the Porfiriato and the Revolution of 1910 meant that the level of concentration barely declined at all from 1890 to 1930.

Another implication of this study is that the banking policies followed by governments made a great deal of difference in the development of credit markets and ultimately in the structure and rate of growth of industry. Contrasting the U.S. case with that of Brazil and Mexico suggests that U.S. economic historians have been correct in arguing that laws that made it relatively easy to obtain a bank charter and that later created national banking systems were crucial in the nation's industrial development. The dramatic impact of changes in Brazilian credit policies after 1890 further underscores the important role played by government regulation.

A surprising finding of this study was the great difference in concentration observed between Brazil and Mexico in the years after 1890. The data suggest that Latin American historians, as well as development economists and organizational theorists, would do well to discriminate between Mexico and Brazil: their financial and industrial histories indicate that financial capitalists and kinship-based financial networks had a larger impact on Mexico's industrial development than on Brazil's.

The reason Brazil and Mexico followed such different paths in the years after 1890 appears to be that political developments not only affected government regulatory policies but also had more subtle effects on the institutional environment in which investors operated. In this regard, the overthrow of the Brazilian monarchy in 1889 and the founding of a limited republic were crucial in shaping the nation's industrial development. Mexico's more closed political economy during the Porfirio Díaz dictatorship prevented the kind of financial market development that occurred in Brazil. The violent and protracted nature of the revolution that overthrew Díaz, as opposed to Brazil's relatively peaceful 1889 revolt, further hampered the development of Mexico's capital markets.[38]

Finally, this study suggests that the forces giving rise to concentrated industrial structures in Latin America (and, most likely, in other parts of the less developed world) differed in both degree and kind from those operating in Western Europe and the United States. Gerschenkron's model for Germany, for example, in which banks encouraged the formation of industrial cartels, does not appear to be a useful model for

[38] Haber, *Industry and Underdevelopment*, chaps. 8–10.

explaining industrial concentration in Latin America. In short, to fully understand industrial organization from a world viewpoint, scholars need to look beyond the U.S. and Western European cases.

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