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**CIDE**

**NÚMERO 107**

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**INDUSTRIAL DEVELOPMENT IN TIME  
UNDER INSTITUTIONAL FRAILTY: THE MEXICAN  
COTTON TEXTILE INDUSTRY IN THE 19TH. CENTURY**

## *Abstract*

Modern textile manufacture appeared early in Mexico and grew continuously through the 19<sup>th</sup> century. Yet, it did not translate into a successful industrialization process as a result of naturally endowed high transportation costs and institutional frailty. Institutional frailty, a concept that encompasses institutional uncertainty, weakness and fragmentation, generated: a captured tariff policy that gave low effective protection to the industry, a backward financial market that limited resources available for industrial growth, and increased transportation costs through inter-state tariff barriers. High transportation costs fragmented the national market and as a result the textile industry grew geographically dispersed.

## *Introduction\**

Economic literature divides countries by the timing of onset of their industrialization processes. According to it, Mexico is a late-comer, a “newly industrialized country”. Yet, industrial development did not come late to Mexico. Rather, it appears to have taken a different less prosperous path. Mexico's first steps towards industrialization occurred earlier than in any other country outside of Europe and British North America, except Egypt<sup>1</sup>. Mexico's “industrialists”, as they called themselves, established the first mechanized mills in the 1830s; around the same time that the Lowell mills were built, and only twenty years after the first mechanized mill was established in the United States. Brazil, the other precocious industrializer in Latin America, established its first mills in the 1840s. Yet by 1853 it only had 8 mills with 4500 spindles<sup>2</sup> while ten years earlier Mexico's textile manufacture included 59 mills with more than 100,000 spindles.<sup>3</sup> In Japan, the government built that country's first modern cotton spinning mill in 1867 but it failed. The first successful private mills did not appear until a decade later.<sup>4</sup> The Mexican textile industry grew in the 19<sup>th</sup> century and adopted new technologies of production. Mechanized factories that used water and steam power replaced

\* The author benefitted from comments on an earlier draft of this paper by Nancy Kochn, Noel Maurer and Aldo Musacchio. All errors are my own.

<sup>1</sup> Egypt had 400,000 spindles by 1834. Batou (1991).

<sup>2</sup> Stein (1957, 191).

<sup>3</sup> Alamán (1843).

<sup>4</sup> Rosovsky (1966).

animal powered artisanal shops. However, this precocious industrialization did not prosper. Mexico's textile industry fell behind those of North America and Europe early in the 19<sup>th</sup> century, and by century's end it was even behind those of some "underdeveloped" nations. By 1890 Japan's textile industry had almost twice as many spindles of its Mexican counterpart, and by 1905 the Brazilian textile industry counted more spindles than Mexico's.<sup>5</sup> The Mexican textile industry did not become internationally competitive until the last decade of the 20th century. It thus appears that during the 19th century Mexico missed the chance to join the group of nations that profited from early industrialization.

"Institutions are the rules of the game in a society, or more formally, are the humanly devised constraints that shape human interaction."<sup>6</sup> This paper explores the factors that inhibited a more prosperous industrial development: institutional frailty—cause and consequence of political instability—, and high transportation costs. I define institutional frailty as an inefficient institutional framework "that favor activities that promote redistributive rather than productive activity, that create monopolies rather than competitive conditions, and that restrict opportunities rather than expand them"<sup>7</sup>, that has three dimensions: institutional uncertainty, institutional weakness and institutional fragmentation.

Institutional uncertainty is institutional frailty in terms of time: the rules of the game continually change, and thus, there does not exist a reliable set of expectations about which present courses of actions will be rewarded or punished in the future. It is a product of the lack of permanence of governments in power and the lack of continuity of policies. It produces a risky environment that considerably reduces the time-span individuals and organizations take into account to act.

Institutional weakness is institutional frailty in terms of strength: the rules of the game are not enforced and discretionary benefit powerful players. Weak rulers are unable to carry on policies from which society would gain at the cost of particular interest groups of which they are easy preys.

Institutional fragmentation, is institutional frailty in terms of scope: the rules of the game are not homogeneous throughout the nation. This is a kind institutional weakness, but has a specifically territorial dimension. Weak governments are unable to set rules and policies over the whole national territory from which the country would benefit at the cost of regional interests. Institutional fragmentation, together with high transportation costs, cut the nation into several regional economies, drastically limiting the size of markets businessmen can count on.

Through this paper I will explore these concepts grounding them on concrete historical events. The purpose of this paper is to analyze the causes and the nature of

<sup>5</sup> Takajusa, (1990, 94), Haber (1997, 162-163).

<sup>6</sup> North, (1990, 3).

<sup>7</sup> North (1990, 9).

Mexico's textile industry growth and retardation from 1839 to 1879 and particularly between 1843 and 1879, a period for which very few historical knowledge exists. It deals with the questions of why modern textile manufacturing appeared so early in Mexico, and why it continued growing in such an unpropitious economic environment. This paper argues that these factors not only limited textile industry's growth, but that the way in which Mexico's early textile entrepreneurs overcame the obstacles they faced shaped the industry's growth making it structurally different from its counterparts in the industrialized world. Mexican textile industry grew geographically dispersed, a characteristic that by itself could hinder Mexico's long term industrialization process.

### ***The Origins of the Mexican Textile Industry***

Three conditions explain Mexico's early industrial growth. First, its relatively high population, that provided the market necessary for industry to develop. Second, a tradition in the artisan textile production that generated political support for protectionist policies. And third, a historical juncture between 1830 and 1840 when government, under the influence of statesmen such as Lucas Alamán, and industrialists such as Estevan de Antuñano, provided both tariff protection and means of finance through a development bank, the Banco de Avío.

In 1835 Estevan de Antuñano established La Constancia Mexicana, the first mechanized textile mill to operate in Mexico.<sup>8</sup> The Banco de Avío<sup>9</sup>, a government owned development bank ran by Lucas Alamán, financed it. Lucas Alamán became the Minister of Interior and Foreign Affairs in 1830. In that year he organized the creation of a bank for the promotion of industrialization: the "Banco de Avío para Fomento de la Industria Nacional". Alamán was also an entrepreneur, he was the owner of textile mills in Orizaba and Celaya; and the first foundry to exist in Mexico. His goals were to promote a mechanized industry that could produce at a price and quality equal to foreign competitors, not merely to protect the inefficient artisanal production of colonial times. It was clear to him that more than mere tariff protection would be necessary to promote industrialization. He wrote: "The purely prohibitive systems cannot by themselves make factories flourish; other elements are needed such as an abundant population, capital, and adequate machinery".<sup>10</sup> Alamán believed that by itself the "invisible hand" was not going to lead to industrialization:

... Inexpensive cotton, linen, and wool textiles needed to clothe the most numerous class of the population are the things which should be promoted by encouraging Mexican and foreign capitalists to establish factories with the necessary machinery so that the goods will be available at a moderate price, a goal which will never be obtained without this [government] assistance....<sup>11</sup>

<sup>8</sup> Technically "La Aurora Yucateca" was built first, in 1833, by Pedro Sainz de Baranda. However, its small size and the lack of reports of it in the Ministerio de Fomento documents, have made it to be rarely mentioned when talking of Mexico's industrial development as Keremitsis points out. Keremitsis (1973, 18). See Cline (1947, 30-31).

<sup>9</sup> For an excellent study on the Banco de Avío see Potash (1983)

<sup>10</sup> Memoria de la secretaría de estado y del despacho de relaciones interiores y exteriores, 1830: 29-30, in Potash (1983, 42).

<sup>11</sup> Potash (1983, 29).

He devised a plan by which the total prohibition of textile imports would be replaced by tariffs. One fifth of the total duties accrued would go to form the capital of the Banco de Avío until one million pesos had been accumulated. The bank would lend money at low interest rates to those who wished to establish modern factories.

Alamán's Banco de Avío was a clever way to get around the vicious circle in which Mexican textile production was trapped. Low revenues led to low investment, while low investment led to low revenues and the inability to compete with foreign manufacturers. Free trade would have lowered revenues even more and inhibited the possibility of national textile production, but protection without investment became a heavy burden on the consumer without any compensation in terms of economic development. The bank tried to square the circle by translating lower protection into capital for investment. While the bank was never able to accumulate the planned capital of one million pesos, it was able to finance several industrial projects until 1840 when the bank ceased to function as an industrial loan agency (see Table 1).

**Table 1**  
Loans Granted by the Banco de Avío to Textile Mills

Year	Borrower	Factory Name	Location	Net total loaned	Capital Invested	Operating in		
						1845	1879	1893
1831	E. Antuñano and Co.	Constancia Mexicana	Puebla, Pue.	146,000	183,916	*	*	*
1832	Mexico Industrial Co.	Tlalpan	Tlalpan, Mex.	91,000	145,945	*		
1832	Celaya Industrial Co.		Celaya, Gto.	10,000	12,275	*		
1835	Santiago Aldazorro		Entrada del Paseo			*		
1835	Victoriano Roa	Paseo Nuevo	Nuevo Mexico	50,000	50,000			
1835	Lucas Alamán	Cocolapan	Orizaba, Ver.	50,000	50,000	*	*	*
1835	Ramón Pardo	Calle del Apartado	Calle del Apartado, Mex	20,808	20,808			
1835	Tlalpan Co.							
1835	Luis Ruiz							
1835	Mariano Dominguez	Batan	Querétaro, Qro.	1,200	1,200	*		
1835	Ignacio Leal							
1835	Carlos Sodi							
1835	M. Miranda and A Padilla							
1837	Welch and Co.	Industrial Jalapeña	Jalapa, Ver	56,000	145,945	*	*	*
1840	J.I. Guerrero			6,000	6,000			

Source: Potash (1983); Alamán (1843, 1845); Busto (1880), México (1894).

Despite the haphazard way the bank functioned in those unstable years, it carried out a machine-purchasing program. In 1830 it bought five cotton mills and two paper mills from New England tool manufacturers.<sup>12</sup> In addition to these special purchase programs, the most important activity of the bank was lending money to private entrepreneurs. The Board of Directors of the Banco de Avío evaluated the projects submitted by the entrepreneurs and assigned funds accordingly. From 1830 to 1840 the bank gave forty loans of which thirteen went to cotton textile factories, while the rest financed paper mills and iron foundries. Half of the cotton textile mills opened with Banco de Avío credit still operated in 1845.<sup>13</sup> Three of those mills: La

<sup>12</sup> Potash (1983, 55).

<sup>13</sup> Potash (1983, 124).

Constancia Mexicana, Cocolapan and Industrial Jalapeña still functioned in 1893.<sup>14</sup> Viewed from this perspective the impact of the Banco de Avío on Mexican industrialization seems important. However, the bank's role in the promotion of industry must not be exaggerated: of the fifty-nine companies Alamán (1843) lists, only six received a bank loan. Nevertheless, it is possible that the establishment of the first firms -which received loans from the bank- had a positive externality over the creation of the ones that came later and gave a clear signal on government's commitment to industrialization. Moreover these mills had a larger scale than the median throughout the period.

Estevan de Antuñano, Mexico's major industrialist of the time, wrote numerous pamphlets to promote the policies he considered the most appropriate for the growth of the textile industry. De Antuñano (1837) pondered over the possibility that some day the mechanical arts of Mexico would reach those of the "illustrated nations". He said:

It is not only possible, but [it is certain that ] our factories, one day can become more productive for us than their factories [of the illustrated nations] are for them, since we will work at a lower cost than they do, because of the advantage that nature gives us in an immense and exuberant land with a benign climate (...) We are also farther from the disturbances that originate in Europe and that very often jeopardize the progress of their industry(...) but (...) we are still far from the day when all this comes true!(...) We still have to remove many obstacles, and a great perseverance to prove, to achieve the apogee of happiness I have imagined.. however, there is nothing impossible for men when the means are provided!<sup>15</sup>

Antuñano's optimism about the future of Mexican industry was not totally unfounded. He envisioned for Mexico the economic development that actually took place in the United States. The abundance of natural resources, together with the protection that the Atlantic offered from European wars were certainly an asset for development in the Western Hemisphere. In 1837, when the territory that today is Texas, California, Nevada and New Mexico still belonged to Mexico, and when Mexico still remembered its past as the most prosperous Spanish colony, Antuñano's hopes were not illusory.

At that time Mexico had the biggest population in the Western Hemisphere, after the United States. In 1820 Mexico's population was of 6.5 million inhabitants, only 32% of that of the United States which was of 9.6 million. Brazil had only 4.5 million, Perú and Colombia a little more than one million inhabitants, and the rest of the countries less than one million.<sup>16</sup> For the textile industry, this meant a large market if protectionist policies were undertaken.

Antuñano called for government intervention to assist industry against those who:

<sup>14</sup> México (1894). See regression results in Appendix 2.

<sup>15</sup> De Antuñano (1837, 21).

<sup>16</sup> Maddison (1995, 106-112).

...after having occupied their memory in learning the principles and precepts of political economy, reading overseas authors, these theories have impassioned them so much that they are not only persuaded that it is possible to achieve a manufacturing economy in Mexico (...), but they believe that this can be obtained, without the support of national laws that support the first steps of the industry; they expect that this will be created by itself, without more impulse than scarcity; and since unfortunately this is abundant in Mexico, they deduct from this fact its possibility.<sup>17</sup>

He was a perfect partner for Lucas Alamán in the promotion of industrial development, and the two frequently exchanged correspondence. When Alamán was in an important position he helped Antuñano. Meanwhile, Antuñano helped translate Alamán's policies into actual factories.

Alamán's industrial policy, as Bernecker (1992) has pointed out, required stable political conditions on the long run, established over a basis of well organized public finances, a working tax collection system, and a gradual transition to an era of steady economic growth.<sup>18</sup> Unfortunately, political instability<sup>19</sup>, cause and consequence of a permanent disorder in public finances, made these requirements impossible to attain in Mexico during most part of the 19th century.

Constant wars put the federal government in permanent fiscal deficits which it financed through indebtedment with private money lenders (*agiotistas*) and the church. From the fiscal perspective 19th century Mexico was more a loose confederation than a federal regime. Tax collection was basically in the hands of the states that took control of the Patronato Real de la Nueva España and charged indirect taxes through inter-state tariff barriers. The federal government had very few fiscal sources except some monopolies and foreign trade taxes. Given that Mexico City is far away from ports, its control over foreign trade taxes depended more of state governments than of the federal one.<sup>20</sup> This situation generated weak federal governments. State governments were ran by regional *caciques* (war-lords) , such as Santiago Vidaurri, with a commitment to the federation that depended on the party in power.<sup>21</sup>

<sup>17</sup> De Antuñano (1837, 12).

<sup>18</sup> Bernecker (1992, 254).

<sup>19</sup> In the 55 years between independence and the Porfiriato the presidency changed hands 75 times. Thomson (1978), and Walter Bernecker (1992, 43-109).

<sup>20</sup> Díaz Cayeros (1995, 29).

<sup>21</sup> Tyler (1973).



### **The Mexican Cotton Textile Industry from 1836 to 1843.**

The existence in early 19<sup>th</sup> century of a large artisan textile production sector gave protectionism an important political support.<sup>22</sup> Since 1829 Mexican governments set tariff policies that protected textile manufactures. However, these protectionist measures were not part of an industrialization program. They can be understood as the accumulation of privileges granted to several interest groups, which many times contradicted to each other. In 1836, representatives of the cotton-growing regions of Veracruz and Oaxaca successfully introduced a bill to ban the entry of raw cotton. The textile manufacturers did not oppose the bill since domestic cotton production was sufficient to supply the small cotton textile industry. However, prohibition of raw cotton imports very soon produced terrible consequences. It made no economic sense to impose tariffs both on the products and on the inputs of the textile industry.<sup>23</sup> Three years later Antuñano wrote several letters to President Santa Anna, explaining the problems that the ban on raw cotton caused the textile industry, trying to convince him to ease the prohibition.<sup>24</sup> Antuñano asked Santa Anna not to provide partial permits to import cotton, since this would give an unequal advantage to the certain factories in purchasing the necessary cotton.<sup>25</sup>

Santa Anna did not listen. In 1843 he gave an exclusive privilege to the Sres. Agüero González y Cia. to import 60,000 quintales. The company had to pay the government six pesos per quintal, or \$360,000 pesos in cash, within two months. Later in the same year a second permit was issued for 20,000 quintales under similar terms. Both permits were transferred to Cayetano Rubio, the owner of the Hércules mill, a merchant and a well known agiotista.<sup>26</sup> Santa Anna, a political chief of a major cotton growing region, had too many commitments with cotton growers to relax their protection. Santa Anna himself may have been in the cotton business, thus having personal interests in the protection of raw cotton.<sup>27</sup> Governments may have given import permits to agiotistas as part of their negotiations in order to obtain further credits from them.<sup>28</sup>

<sup>22</sup> Thomson (1978) and Bernecker (1992, 43-109).

<sup>23</sup> Illades (1989, 39).

<sup>24</sup> Letter from Antuñano to Santa Anna, Puebla, January 22, 1843; Illades (1989, 12).

<sup>25</sup> Letter from Antuñano to Santa Anna, n.d.; in Illades (1989, 43).

<sup>26</sup> Decree of April 12, 1843, El Observador judicial y de legislación, 3:366-67; Memoria que el Secretario de Hacienda.. presentó, 1844,:15 in Potash ( 1983, 142).

<sup>27</sup> Illades (1989, 41).

<sup>28</sup> Bernecker (1992, 226, 265).

Lucas Alamán, then chairman of the Dirección General de la Industria Nacional (Bureau of Industry), extensively criticized the prohibition of raw cotton imports in the 1843 Memoire of the Bureau. He wrote:

Contrary to what those interested in the monopoly of cotton have said, it is evident that the national cotton crop is not sufficient to provide the actual consumption for the established factories (...). In the most favorable scenarios, the crops of none of the previous years has been more than 60 to 70 thousand quintales, (...) This seventy thousand quintales are not enough not even for the production of mantas, (...) From 1838 onwards cotton started to become scarce; and its price, which at that time was only 16 or 17 pesos per quintal, has increased to sell at 40 pesos cash (...) There has never been a surplus from one year to another, and very far from this, the manufacturers have had to stop production, or to shorten daily production in order not to stop, waiting anxiously for the arrivals of the new crop.<sup>29</sup>

To Alamán, the cotton import permits that Santa Anna issued were better than nothing since in their absence "the factories would have closed and the industry would have collapsed. (...) However," he said: "... that has been only a temporary remedy, and it is always of a dangerous nature, since a privilege is never more than a monopoly, and as the etymology of that word explains, it means richness for one and damage for all".<sup>30</sup>

Raw cotton made up a very important percentage of production costs for textile mills. The data presented by Alamán (1843) in Table V suggests that cotton represented from fifty to sixty percent of production costs, while labor embodied about 30% of total costs. More complete data from 1893 indicate a share of raw cotton in total costs of 72%. (See Appendix 2 ).

Textiles not only had to suffer from special cotton import licenses arbitrarily granted government to a privileged few. It also had to withstand the granting of licenses for the importation of manufactured textiles. The precarious fiscal situation of the Mexican governments made their commitment to protect textile manufactures very vulnerable. In 1841, for example, in order to finance the war against Texas, General Mariano Arista authorized the sale of special import licenses for textile manufactures. Guillermo Drusina and Cayetano Rubio purchased them over the harsh opposition of other textile producers.<sup>31</sup> During the war with the United States (1846-48), North Americans eliminated all prohibitions and established liberal import tariffs for raw cotton and all textile products in all ports under their control.<sup>32</sup>

<sup>29</sup> Alamán. (1843, 22-23).

<sup>30</sup> Alamán. (1843, 24).

<sup>31</sup> Walker (1991, 200).

<sup>32</sup> Bernecker (1992, 264).

Furthermore, textile manufactures often complained of the prevalence of smuggling which further limited their markets.<sup>33</sup>

We can blame the nature of protectionism undertaken by Mexican governments in this period to institutional frailty. Their fiscal and military weakness and the concomitant constant change of government in power made it incapable of undertaking a trade policy focused on the promotion of industry. The weakness of national governments, both in terms of their strength to implement policies, and in terms of their lack of control of the regional governments, made smuggling unavoidable. Institutional uncertainty generated by the constant change of governments in power made tariff policy unpredictable. For governments in this period short term objectives always reigned over long term ones. Given the precarious situations government faced, they were not in the situation to foster policies that would increase government revenues in the long run, such as promoting industry and economic growth. They needed immediate resources in order to survive, and they tried to obtain them at whatever cost was necessary.

Another problem textile industry faced in this period was the backwardness of financial institutions. Apart from the Banco de Avío, that closed its doors in 1840, there was no institutional lending to industry until the 1880s. Only after 1864 a rudimentary banking system with specialized institutions and stable practices began to develop in Mexico. By 1884 only 8 banks were in operation in Mexico. Stephen Haber has studied the pernicious effect that the poor development of banking had over textile's industry growth and structure during the porfiriato, when a financial system began to develop.<sup>34</sup> The limits it set over industrial growth before 1880 must have been even larger.

Interest rates were exorbitantly high and fluctuated unpredictably, there were no banking institutions and there was no formal stock market. Industrialists had to rely on informal mechanisms of raising capital, in most cases based on kinship networks of credit.<sup>35</sup> Studies of particular mills during this era tell on the serious difficulties businessmen faced in order to obtain credits, which frequently took them to bankruptcy.<sup>36</sup> Successful entrepreneurs were those who undertook speculative activities as part of their businesses, such as moneylending to the government. Agiotistas, such as Cayetano Rubio, Pedro Berges de Zúñiga and Manuel Escandón, became the major textile mill owners by mid-nineteenth century. Their position as money lenders gave them two major assets other businessmen lacked: liquidity and a privileged position to negotiate concessions from the government, such as raw

<sup>33</sup> Bernecker (1992, 200, 215, 221).

<sup>34</sup> Haber (1997)

<sup>35</sup> Marichal (1997, 118).

<sup>36</sup> Trujillo (1997) and Carlos Illades (1989).

cotton import permits.<sup>37</sup> With these two aces in their hands they were able, to liquidate other competitors, and later, to buy their mills at cheap prices, or simply to obtain them when they defaulted their debts. We can understand this situation as one in which the rules of the game rewarded courses of action that were not those from which society benefited the most. As Douglass North (1990, 9) points out, the organizations that develop in an inefficient institutional framework are efficient, but efficient “at making the society even more unproductive and the basic institutional structure even less conducive to productive activity”.

Mexico’s financial system, lagged behind not only to those of developed countries such as the United States, but also to those of other Latin American countries such as Brazil, Argentina, or Chile. Institutional frailty explains this relative backwardness. According to Carlos Marichal (1997, 119), the instability of Mexican financial markets, and the difficulties in the development of modern capital markets during the greater part of the nineteenth century was mainly the result of the state’s fiscal and credit policies. Two basic preconditions for the development of capital markets were not present in nineteenth century Mexico: the stabilization and broadening of short-term money-markets and the creation of a relatively open, internal market for public securities. These two conditions could not exist until Mexican governments’ fiscal resources allowed them to pay their debts regularly. Political instability, prevalent through this period played against governments’ fiscal health, and was also a result of it. Further work needs to be undertaken in order to evaluate the impact of financial backwardness on the textile industry during the pre-porfirian 19<sup>th</sup> century.

In spite of these problems the cotton industry was able to grow during this period. In 1843 Alamán could say about the progress of cotton textiles since 1837:

If we look back and we consider the state of devastation in which the Mexican industry was some years ago, its complete ruin and the lack of hope there existed about its future possibilities of prosperity, its actual state will appear as a kind of magical transformation, a creation, that had its beginning in the void, and that has generated a gigantic being, that with a rapid and prodigious growth, has filled in a few years the immense space that lies between a weak origin and a vigorous and productive maturity.<sup>38</sup>

Table 2 presents some of the data given by Alamán to prove his point, and shows a pattern of continuous growth in the textile industry throughout the period considered.

Jan Bazant’s calculations prove that the Mexican textile industry of those years compared relatively well in terms of efficiency with the British and American industries. According to the *Semanario de la Industria Mexicana*, between 1841 and 1842 capital-labor ratios in the Mexican textile industry were 20 spindles per

<sup>37</sup> Bernecker (1992, 183-190).

<sup>38</sup> Alamán (1843, 3).

worker, around the same as for American workers in 1830.<sup>39</sup> Nonetheless, the prices of the products were very different from those of the United States. A report on Mexico published in 1846 expressed that: "cotton goods which sell in the United States for six cents per yard, are worth thirty cents in Mexico."<sup>40</sup> According to the author of that report, "this results from the high price of the raw material, which sells from forty to fifty cents per pound, and from the circumstance that all the machinery is imported and transported by land at an enormous costs; and also to the difficulty and delay of repairing it, when it gets out of order."<sup>41</sup>

**Table 2**  
Growth of the Mexican Cotton Textile Industry

Year	No. of Factories	No. of Spindles	Yarn Lbs.	Cloth Pieces
1837				44,929
1838			63,122	109,305
1839			32,564	124,948
1840			557,590	88,096
1841			1,014,004	195,758
1842			777,115	217,851
1843	59	106,708	8,380,000	414,951
1845	55	135,538	2,861,571	656,512
1853			7,274,779	875,224
1862	57	133,122	7,853,779	1,258,963
1870		154,686		3,087,808
1878	89	253,594	6,449,381	3,529,968
1893	121	370,250	2,363,331	4,944,125

Sources: Bazant (1964, 37); México (1857); Keremitsis (1973, 57); Pérez Hernández (1862, 18); México (1894).

Bazant's calculations present the cotton industry as a profitable one. They show that in 1843 the profit rates for the industry as a whole were 10% per piece of cloth produced, while for La Constancia they were of 20% per piece of cloth.<sup>42</sup> However, Walker's study of Miraflores suggests, the prosperity of a textile mill depended more on the ability of its owners to speculate in the cotton business than on the productivity of the mill.<sup>43</sup>

<sup>39</sup> By 1840 each American worker handled 31 spindles on average, and 38 spindles in 1850. Bazant (1964, 55-56).

<sup>40</sup> Farnham (1846, 29).

<sup>41</sup> Farnham (1846, 29).

<sup>42</sup> Bazant (1964, 64-72). Interest rates in the period were around 10 - 12 per cent.

<sup>43</sup> Walker (1991, 183-219).

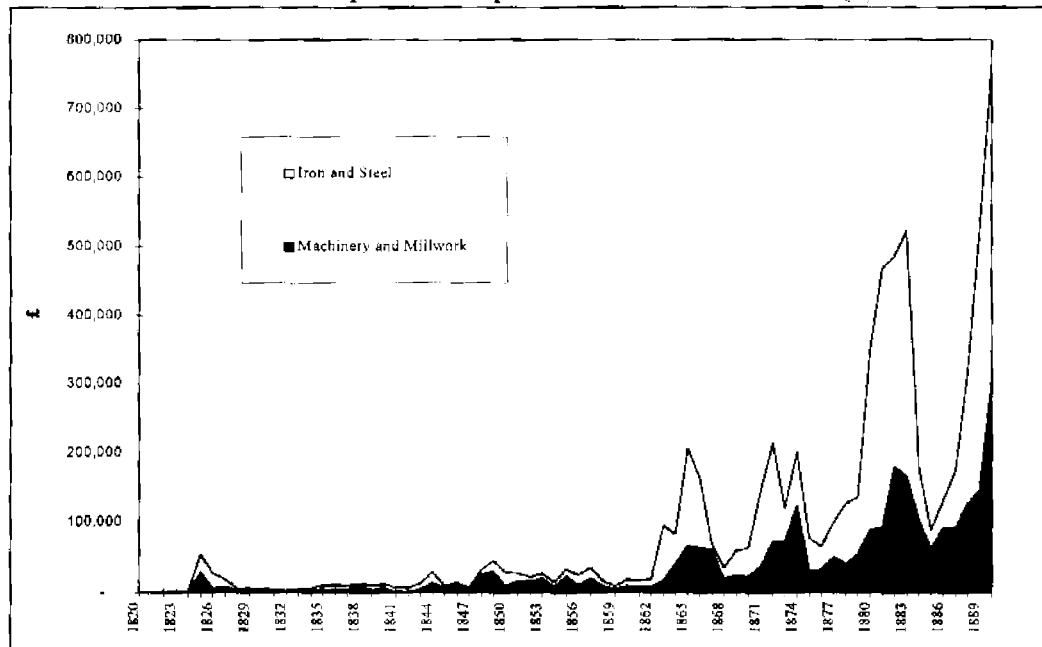
### **Growth of Mexican Textile Industry from 1843 to 1879**

The period between 1846 and 1867 was a particular difficult one for Mexico. Even the country's survival came into question. In 1846 Mexico lost half of its territory to the United States. Furthermore, in 1847 a secessionist civil war broke out in the state of Yucatán that was not quelled until the 1850s. Then, from 1857 to 1860 the so called "Three Years War" between Liberals and Conservatives caused much destruction. A year later, Napoleon III's troops landed in Veracruz. In 1864 the French gave Maximilian the throne of Mexico, and conflict continued until 1867 when the Liberals deposed Maximilian. From 1867 peace was more or less reestablished, though not entirely. In 1876 Porfirio Díaz seized power and ruled the country until 1910.

The commonly held view of the economic history of Mexico is that growth only took place after 1880 when Díaz was able to pacify the country and renegotiate the foreign debt. The nineteenth century is seen as a time of chaos and stagnation, in which industry lingered until 1880, following the brief period in which industry flourished with the presence of the Banco de Avío.

**Figure 1**

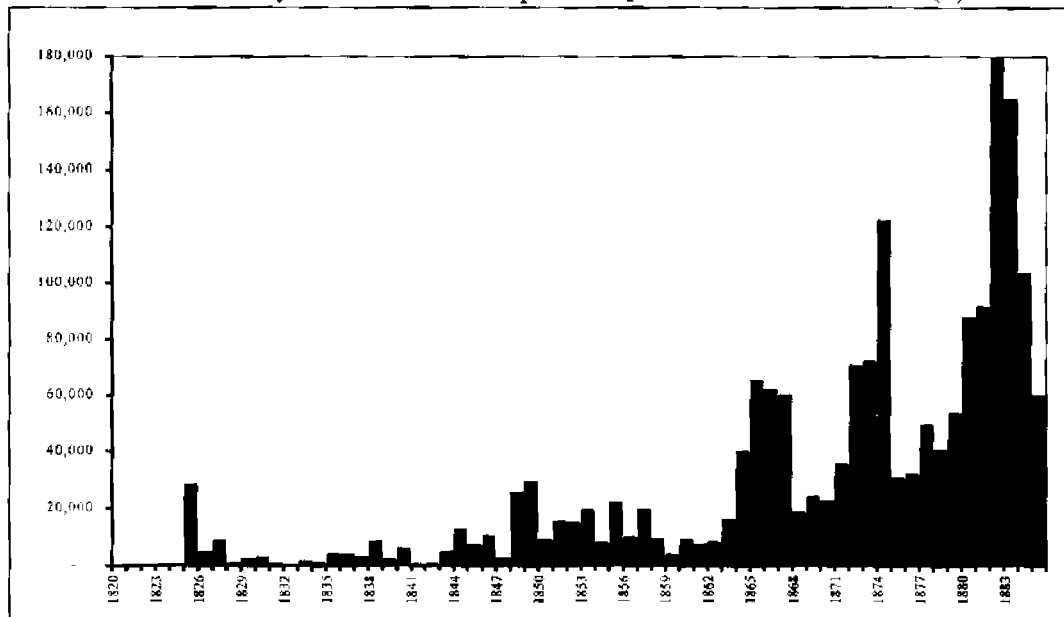
**Mexican Imports of Capital Goods from the U.K. (£)**



Source: U.K. Parliamentary Documents, Return to an Order of the Honourable The House of Commons. Several Issues.

In his work on the Mexican textile industry Jan Bazant wrote that "the modern textile cotton industry was formed in only approximately fifteen years, between 1830-1845; after that, progress became slower and slower, stopping before the end of the decade and restarting again in 1880."<sup>44</sup> On her part, Dawn Keremitsis says: "The steady decrease in production and investment continued [from 1846] until the Porfiriato and probably served to eliminate the least efficient operations."<sup>45</sup>

**Figure 2**  
Machinery and Millwork imported by Mexico from the UK (£)



Source: U.K. Parliamentary Documents, Return to an Order of the Honourable The House of Commons. Several Issues.

According to Keremitsis (1973, 40) "by 1853 (the year Alamán died, and shortly before the fall of Santa Anna) most of the textile machinery which had been ordered in the previous decade had been installed, not to be replaced until the end of the century." Walter Bernecker (1992, 251) wrote that "...in the mid 1850s the highest point of industrial expansion was reached, and from then on, and for the rest of the century, the modern sector lost relative importance.." Yet, Mexican imports of capital goods and machinery from 1845 to 1879, as shown in Figure 1 and 2, tell a story of more industrialization during this period than in the supposed heyday of the industry between 1839 and 1845.<sup>46</sup>

<sup>44</sup> Walker (1991, 31).

<sup>45</sup> Keremitsis (1973, 36).

<sup>46</sup> In 1862 Mexican imports of British products accounted for 43% of total imports. (Imports from the U.S. and France were each of them 17% of total imports). Pérez Hernández (1862, 154). Imports from the U.K. must have represented more than 43% of total imports of iron and machinery

**Table 3**  
Regional Distribution of the Textile Industry

	Firms		Spindles		Looms		1862	
	1843	1879	1843	1879	1843	1879	Firms	Spindles
Aguascalientes		1		750		25		
Chihuahua		3		4,600		340	2	
Coahuila		7		6,550		210	8	14,500
Colima		2		3,750		170		
D.F. and Mexico	17	10	23,894	51,226	1,187	1,943	6	27,998
Durango	5	7	5,560	5,030	140	305	5	5,600
Guanajuato	1	4	500	6,668		287	1	900
Guerrero		1		2,500		80		
Hidalgo		1		1,040		48		
Jalisco	4	10	8,904	24,800	220	780	5	23,292
Michoacán		3		7,200		175		
Nuevo León		3		3,100		95	1	
Oaxaca		2		19,000		580		
Puebla	21	20	37,396	65,880	530	1,972	14	40,376
Querétaro	2	1	5,400	10,000	112	600	1	7500
Sinaloa		3		6,200		400	1	3500
San Luis Potosí		1		2,500		126		
Sonora	1	1	2,198	900	54	30	1	1924
Tlaxcala		2		4,500		75		
Veracruz	8	5	22,856	26,200	366	609	6	22,032
Yucatán		1		700		20		
Zacatecas		1		500		15		
Total	59	89	106,708	253,594	2,609	8,885	51	147,622
% Change		51%		138%		241%		
Machines per firm			1,808.6	2,849.4	44.2	99.8		2894.5
% Change				58%		126%		

Sources: Alamán (1843); Busto (1879); Pérez Hernández (1862).

For Keremtisis (1973, 36) "the survival of the textile industry during these years of foreign invasions, a major civil war and several minor disturbances, and the slow growth in population ... was in itself remarkable." It is even more remarkable that the industry actually grew. Between 1843 and 1879, the number of cotton textile mills grew by more than 50% (see Table 3). The number of spindles grew by 138%, the number of looms by 241%, growth took place both before and after 1862. The greater growth in the number of looms than in the number of spindles in this period shows that, in Mexico, as in the industrialized nations, the mechanization of weaving took place after that of spinning. In 1843 there were still many factories that did only

early in the century since the United States and France were not competitive then relative to the U.K, in these products. Yet, as the century advanced the share of imports of these kinds that came from the United States and Germany grew. In 1888-89, 54% of the iron and steel imported by Mexico came from the U.S., 22% from Great Britain, 15% from Germany and 7% from France. García Cubas (1893, 62-65).



spinning or weaving but not both. Yet by 1879 all the factories had vertically integrated both processes.

The average firm grew between 1843 and 1879, increasing its number of spindles by 58% and its number of looms by 126%. Since those figures are smaller than the growth in the total number of looms and spindles, we know that the Mexican textile industry grew more because the number of firms grew, rather than because of growth in the size of firms. The fact that the average number of looms per firm grew more than that of spindles again shows that vertical integration was taking place in this era, leaving behind the time when spinning factories sold yarn to artisanal weaving shops.

**Table 4**  
Number of Spindles in Specific Factories

Factory	State	1843	1862	1879
Cocolapan	Veracruz	11,500	10,336	13,000
Magdalena	México	8,400	8,472	6,768
La Constanca	Puebla	7,680	7,608	7,000
Hércules	Querétaro	4,200	7,500	10,000
Jauja	Jalisco	3,744	4,768	6,000
Ind. Jalapeña	Veracruz	3,000	4,028	3,000
Escoba	Jalisco	2,112	8,300	6,000
Lucas Martín	Veracruz	2,200	3,984	3,000
El Tunal	Durango	1,296	2,064	2,000
Providencia	Puebla	1,254	1,770	3,500
Guadalupe	Durango	480	1,176	1000

Sources: Alamán (1843); Pérez Hernández (1862); Busto (1880); Tyler (1973,110).

Table 4 shows the number of spindles in several individual factories through the period studied. As we can see, factories that were already very large in 1843 such as La Constanca, Cocolapan and Magdalena, either remained about the same size throughout the period, or shrank. On the other hand, smaller companies in 1843 grew relatively more and some achieved a size comparable to that of the big three firms. Nevertheless, the average size of Mexican mills fell below their American counterparts. In 1843, Mexican mills were not much smaller than U.S. firms in 1831, but by 1927, the average size of your typical Mexican factory was equal to a U.S. factory of the 1880's. However, if one compares Mexican mills to factories in the South and West of the U.S., the differences are less pronounced. (See Tables A1 and A2 in the appendix).

### **Technological Progress.**

The cotton textile industry not only grew between 1843 and 1879, but it also modernized. As we have seen, the industry successfully vertically integrated spinning and weaving. Even more important was the complete transformation in the

sources of power used. Table 5 shows that in 1843, 38% of the firms used men or mules as their source of power. By 1879 no textile mills operated with animal power. Instead, 61% of the factories employed steam power, from only 3% in 1843. Of the total manta produced, only 2% were made using steam in 1843, 70% were in 1879.

To have some measure of the different efficiency of the various sources of power, I calculated the average value of production per peso of labor in 1843. Human-powered mills produced 2.75 pesos, steam-powered 3.05 pesos, mulc-powered 3.43 and water-powered 4.27, per peso of labor.<sup>47</sup> Using steam as a sole source of power was prohibitly expensive since the lack of coal forced firms to burn wood. These cost estimates explain why the transformation of power sources that took place in the textile industry went from the use of several sources of power in 1843 into the prevalent use of a combination of water and steam in 1879.

**Table 5**  
Mexican Textile Industry Energy Sources

	Firms	Spindles	Looms	Cloth	Yarn
<b>1843</b>					
<b>As a percentage of total</b>					
Men	14%	0%	31%	28%	0%
Mules	24%	7%	17%	23%	7.3%
Water	56%	86%	49%	47%	86.6%
Steam	3%	2%	2%	2%	3.1%
Water & steam	0%	0%	0%	0%	0%
N/A	3%	5%	2%	0%	2.9%
Total	100%	100%	100%	100%	100%
<b>1879</b>					
<b>As a percentage of total</b>					
Men	0%	0%	0%	0%	0%
Mules	0%	0%	0%	0%	0%
Water	36%	24%	28%	30%	55%
Steam	16%	21%	22%	21%	14%
Water & steam	48%	54%	50%	50%	31%
Total	100%	100%	100%	100%	100%

Sources: Alamán (1843) and Busto (1880).

The general trend was to replace old plants for new ones rather than modernize existing ones. Of the twenty-two factories that used men or mules as a source of power, only three of them were able to survive and to transform their source of power to steam and water: La Fama, La Abeja, and San Antonio.<sup>48</sup>

<sup>47</sup> The calculation for steam is not very reliable because there was only one observation.

<sup>48</sup> The change from animal power into water and steam might have been even more radical than I have suggested. Table VI of the Memoire of 1843, which gives data on the production of coarse cloth, presents many more manta producers than those shown in Table V, which I used to build Table 7. Although Table VI does not give much information on the additional producers, the

### **Explaining growth between 1843 and 1879.**

There are many reasons why the textile industry should not have grown in this period. Perhaps this is the reason why historians have generally considered that between these years the Mexican textile industry stagnated. Institutional weakness, institutional uncertainty and institutional fragmentation were prevalent.

The lack of central government control and its inability to guarantee security even in the most important roads greatly increased transportation costs. Institutional uncertainty prevented private entrepreneurs to invest in railroads while institutional weakness disabled governments to do it. Roads were bandit-infested. Accounts of the period tell for example that in one single day, in 1861, the stagecoach from Mexico City to Puebla was robbed three times. In 1865, in a two weeks period there were four major robberies along the highway from Orizaba, Veracruz, to Mexico City. Apparently, members of the army themselves robbed like bandits.<sup>49</sup>

Government's inability to provide security forced firms to assume considerable costs in protecting their property by themselves. From 1869 to 1870 Col. Albert S. Evans traveled through Mexico and visited several textile factories. According to his account La Purísima Concepción and Hércules, both in the state of Querétaro, stood in an "enclosure, with high walls ... and ... guarded all the time by watchmen in full military uniform, armed and drilled in the best modern style."<sup>50</sup>

Additionally, it has been considered that tariff policy changed for the worse. "The friendly attitude of the Mexican government toward industry which characterized the period from 1830 to 1845 also was considerably modified between 1850 and 1880."<sup>51</sup> From 1855 on, the country was mostly under Liberal rule. The Liberals advocated freedom of trade and the promotion of the interests of the merchant and the capitalist agricultural class, decentralization and limitation of the national government, and the elimination of the "feudal" privileges of the church and the military.<sup>52</sup> Daniel Cosío Villegas (1932, 13, 42, 92) pointed out that the Liberals supported lower tariffs when they came to power. Table 6 shows that a reduction in the tariffs of cotton manufactures indeed took place in 1856. However, the effect of this reduction was not unambiguously negative for the textile industry, as Keremitsis

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fact that they had a small output and were only known by the name of their owner or by the street in which they operated makes me think that they were artisanal shops. For Puebla, Table VI includes 58 instead of 21 producers and for Mexico 41, instead of 17 producers. Considering the sizes of these additional producers, it is very probable that these were animal powered shops. None of them appeared in the statistics for 1879.

<sup>49</sup> Haber (1989, 21-22).

<sup>50</sup> Evans (1870, 222).

<sup>51</sup> Keremitsis (1973).

<sup>52</sup> Keremitsis (1973, 38).

(1973) seems to believe, since the government also removed the prohibition on the imports of raw cotton.

A raw estimate of the effects of the Liberal's reduction on tariffs from 1855 to 1856 shows its net effect was positive. In order to estimate the effect generated by the tariff change we need to calculate the difference between the drop in prices of manufactured goods, and the fall in production costs that the decrease in the tariff generated. In 1843 the price of a piece of manta (of 30 varas) was of \$7.00. Therefore, the reduction in duty from \$0.10 to \$0.03 per vara implied a reduction from 50% to 15% of the ad valorem duty on a piece of cotton cloth. If the reduction in the duty lowered the price of the Mexican product by the same amount, prices dropped 23% on average. In 1843, a year when raw cotton imports were prohibited, the average price of a quintal of cotton was \$34, and the price of a quintal of foreign cotton with no duty in Veracruz was of \$13.37.<sup>53</sup> Replacing prohibition with a tariff of \$1.50 per quintal of raw cotton would reduce its price from \$34 to \$14.87; this implies a drop of 56% in the price of cotton.

**Table 6.** Duties on Textile Imports (in pesos)

Denomination of Merchandise	Weight	Tarif of 1837	1842	1845	1855	1856	1878	1891
-Raw Cotton (clean)	100 pounds (quintal)	Prohibited	Prohibited	\$ 3.00	Prohibited	\$ 1.5		\$1.38 - \$3.68
-Plain brown or white cottons bleached and unbleached cloths (less than 30 threads, under one vara wide)	Vara	\$ 0.13	\$ 0.13	\$ 0.05	\$0.10	\$ 0.03	\$ 0.06	\$0.06
-Idem of more than 30 threads, under one vara wide	Vara	\$ 0.13	\$ 0.10	\$ 0.06	\$0.10	\$ 0.05		\$ 0.07
-Cotton yarn all kinds	Kilo		Prohibited				\$ 0.6	\$ 0.8
-Cotton yarn reels of 275 meters	Doz					\$ 0.07	\$ 0.14	\$ 0.12
-Cotton thread all kinds	Kilo		Prohibited			\$ 0.66	\$ 1.43	\$ 1.2
-Clothing ready made	Ad valorem		Prohibited	Prohibited	Prohibited	60%	132%	\$ 2.5
-Cottons not over ¼ vara wide		\$ 0.96	\$ 0.44					
-Cottons over ¼ vara wide		\$ 0.96	\$ 0.59					
-Handkerchiefs, white or colored up to 42 cms <sup>2</sup>	Doz	\$ 1.5	\$ 0.72	\$ 0.72	\$ 0.11	\$ 0.60	\$ 0.26	\$ 2.4
-Stokings for adults	Doz		\$ 1.25	\$ 1.00	\$ 1.5	\$ 0.45	\$ 1.76	
-Men's cotton socks	Doz		\$ 0.75			\$ 0.45	\$ 1.00	

Source: U.S. Congress and U.K. Parliament. Reports on Mexican tariffs. and México, Ordenanzas de Aduanas Maritimas y Fronterizas, several issues.

In order to calculate an estimate of the effective protection of the two tariff regimes we need to know the percentage that raw cotton had on total production costs of manufactured textile goods. If we consider that cotton accounted for 70% of costs - as the regressions on the 1893 data shows- then the Liberal's tariff change would

<sup>53</sup> Alamán (1845,48)

have generated a 39% reduction in the costs of manufacturing cotton textiles.<sup>54</sup> If we consider Jan Bazant's estimates, in which cotton accounts for 47% of costs, then the tariff reduction would have diminished cotton manufactures costs by 28%. Computing the change in profits as the difference between the change in sale prices and the change in costs of production, then in the first case profits for the textile industry would have increased by 17% and in the second case by 5%. This shows that the rate of effective protection for the textile industry increased with the general reduction in tariffs that the Liberals implemented. This, I believe, was an important source of growth for the industry in this period; and tells that a badly undertaken protectionist policy can be worse for industrial development than a more liberal one. In addition, the American Civil War had a positive effect on the Mexican cotton textile industry by increasing the price of the international cotton manufactures and decreasing the price of raw cotton. The blockade of the South by the Union - effective on Texas in mid 1861- forced the Confederates to channel cotton exports through the Mexican border. From 1861 to 1865 millions of bales of cotton crossed through the Brownsville-Matamoros, Eagle Pass-Piedras Negras and Laredo-Nuevo Laredo border posts.<sup>55</sup> It was then re-exported through the port of Bagdad (near Matamoros). This trade generated enormous profits among Mexican merchants and incredible growth in the Northeast.<sup>56</sup> Monterrey became a "free depot of cotton", meaning that any number of bales could be deposited there, with a duty paid only upon shipment to Matamoros or towards the interior, and oused its future prosperity to its growth in this period.<sup>57</sup>

The increased supply of raw cotton and the increased demand for cotton manufactured textiles from the embattled American South, made it possible for Mexican textile mills to export their products. In 1861-62, the Ibernica factory in Saltillo produced approximately "11,500 pieces of common brown sheeting called manta, which were sold to the Southerners for \$4.50 each."<sup>58</sup>

Figure 3 gives us some notion of the sums I am talking about. From importing almost six million pounds in 1858, Mexico exported to the United States five million pounds in 1861 and even more to the United Kingdom. In 1864 the United States (the North) imported fifteen million pounds of cotton from Mexico, which represented 56% of its total raw cotton imports.

<sup>54</sup> The production function that came out of a regression on the 1893 data showed that capital accounted for 11% of the costs, Labor for 17%, Cotton for 72% and Fuel for 1%.

<sup>55</sup> Tyler (1973, 121).

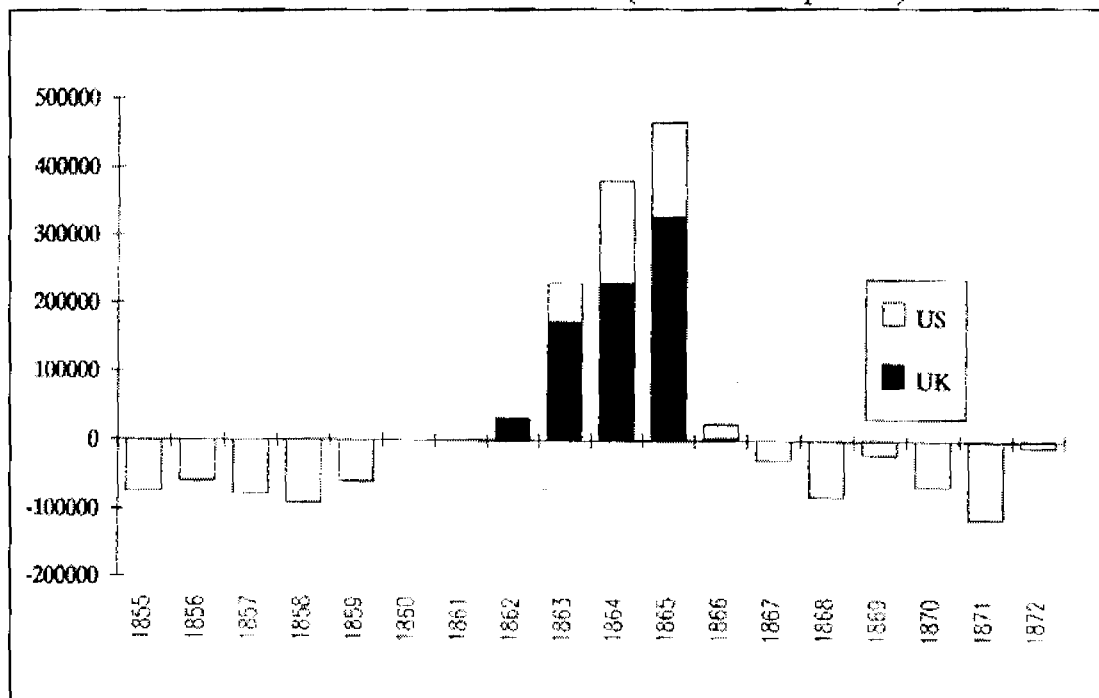
<sup>56</sup> Cerutti (1992, 74-87).

<sup>57</sup> Tyler (1973, 110).

<sup>58</sup> Tyler (1973, 110).

Thomas Schoonover (1992) is right in believing that the American Civil War had positive effects on the Mexican textile industry. However he is wrong in thinking that the cotton exported by Mexico to the United States in this period was cultivated in Mexico.<sup>59</sup> A simple comparison of the figures for cotton exports, with those for cotton production shows that the dramatic growth in cotton production in Mexico that would have been necessary to export such quantities was simply impossible, given that the country was not even self sufficient in cotton by 1860. The difference between Mexico's textile mills raw cotton consumption and the national production was of approximately 4 million pounds in 1845 and 2.5 million pounds in 1859.<sup>60</sup> Furthermore, sufficient information exists to know that Mexico was importing vast amounts of cotton from the South.

**Figure 3**  
Mexican Cotton Trade Balance (Hundreds of pounds)



Source: U.S. Treasury. Commerce and Navigation Reports, Several issues and U.K. Parliamentary Documents, Return to an Order of the Honourable The House of Commons. Several Issues.

The positive impact of the American Civil War to the Mexican textile industry seems to have varied from region to region. Albert Evans account of his visit to the Purísima and Hércules mills in Querétaro during this period tell that they were in very good shape. According to him Hércules “was working at the time, on large

<sup>59</sup> Evans (1870, 64).

<sup>60</sup> Evans (1870, 64).

orders largely in advance, and literally 'coining money'.<sup>61</sup> On the other hand, his reports of the situation of mills in Colima are not so positive.<sup>62</sup> The different patterns of growth among individual companies that Evans wrote about is consistent with the diverse growth of the different firms shown in Table 4.

### ***The geographically dispersed nature of industrial growth.***

As we can see in Table 3 the textile industry's growth between 1843 and 1879 was accompanied by regional dispersion. In 1843, 64% of the firms (57% of spindles and 65% of looms) were located in Mexico City, the State of Mexico and Puebla. By 1879 only 33% (46% of spindles, 44% of looms) were located there. In 1843 there were firms in only eight states, while by 1879 almost every state had its own firm. The regional dispersion of the industry was well underway before 1862.

Mexico's geography, devoid of navigable rivers and full of mountains, made transportation very difficult.<sup>63</sup> The relatively high transportation costs in Mexico explains the geographical dispersion of the Mexican textile industry during its early development. Most transportation was carried on by mules and ox-carts until the 1880's. In addition to the problems caused by nature, inter-state tariff barrier--the alcabalas--raised transportation costs even more. It is difficult to exaggerate the importance of alcabalas as an obstacle to economic growth.

When in February 1852 governor of the state of Veracruz reestablished the alcabalas, after they had been abolished in 1847 merchants harshly complained. A letter with more than a hundred signatures sent by the "Merchants of Orizaba" to the Congress of the State of Veracruz said:

...when the Spanish domination ended the system of indirect taxes remained in practice, despite of the considerable expenditures that it demands, and that the arbitrariness and vexations that it brings are very opposed to the liberal system that the Republic adopted; since we were used to it, and since the doctrines of economists had not circulated but among a very few number of Mexicans, the people said nothing and paid the indirect taxes to which it was used to. But later, (...) it started to claim for a reform of the public finance system (...). In effect in the year of 1847 the people of Veracruz not being able to stand the arrogance and haughtiness of the [alcabala] guards, the abuses and frauds of all the employces, and not being able anymore to see with indifference the great cost that demands the collection of the indirect taxes, asked with energy that these were substituted by another system less expensive and more in accordance with the principles of freedom that rule us.

<sup>61</sup> Evans (1870, 64).

<sup>62</sup> Evans (1870).

<sup>63</sup> Mexico's high transportation costs are evident in Coatsworth's measurements of railroad social savings in Mexico, especially when compared to the small effect of railroads that Fogel found for the United States. See Coatsworth (1981) and Fogel (1964).

In effect (...) Don Juan Soto, governor then of the state, had the glory of being the first in destroying the indirect taxes and freeing the people of Veracruz from the burdens of such a costly system. In that period, even though we were experimenting the disturbances that come with a foreign war, as the hindrances to which the commerce was subject ceased, and as the means to trade were facilitated, a great movement was generated, several commercial establishments appeared (...). The war with the United States ended and as the alcabalas to trade were not reestablished it became a source of public richness that prospered day to day, in such a way, that in the localities where before there was only stagnation and misery, later we could see active movement and abundance. With the abolition of the alcabalas (...) the people of Veracruz had the satisfaction of seeing the expenditures of the state reduced to almost half of what they were before (...). But unfortunately when all the Veracruzans looked with satisfaction this gratifying picture that appeared in every town of the state, a new law reestablishing the hated alcabalas, came to throw to the ground trade and to end the hopes of prosperity and growth.<sup>64</sup>

In the questionnaire Emiliano Busto sent to several manufacturing companies in 1878, entrepreneurs replied that alcabalas were the single most damaging policy affecting their firms. The owner of La Estrella mill in Coahuila, for example, wrote: "the alcabalas are a real gangrene to the social body, something even more dangerous than the turbulence to which we are prey so frequently, and if they are not suppressed, they will crush the few industries that some few daring men, who want to see their country full of factories and their fellow citizens employed (...), support."<sup>65</sup> Despite the opposition, the alcabalas were not abolished until 1896. Although it was evident that the existence of inter-state barriers greatly damaged economic growth, governments could not abolish them due to institutional weakness and fragmentation.

In general terms, alcabalas can be seen as a system similar to the Spanish Mesta, analyzed by Douglass North (1991, 10-12), in which government fiscal needs set up a system where the interests of the few prevailed over those of the majority. Alcabalas were an expensive but easy to implement fiscal system from which state governments obtained the greater share of their resources.<sup>66</sup> Their institutional weakness made them unable to establish an alternative tax collection system to replace alcabalas, which would generate them in the long run greater resources, through the economic growth it would allow. Furthermore, states were reluctant to abolish alcabalas, unless other states did accordingly, since they would assume costs without obtaining gains from their action. Institutional fragmentation and weakness, handicapped the federal government to coordinate states in order to surmount the

<sup>64</sup> Archivo Municipal de Orizaba, Box 2-68, 1952. "Exposición que los Comerciantes de Orizaba elevan al H. Congreso del Estado solicitando la extinción del derecho de alcabalas", June 2, 1852.

<sup>65</sup> Busto (1893, II:319).

<sup>66</sup> Vázquez (1993).



“free-rider” problem. This is why inter-state barriers were not abolished in Mexico until 1896.<sup>67</sup>

Transportation costs derived from nature, from insecurity on the roads, and from alcabalas limited the markets accessible to firms, often reducing them to only the state in which they operated. High transportation costs and inter-state tariff barriers meant reduced market size and thus a more dispersed pattern of firms. This is exactly the pattern of industrialization that we find in Mexico (see Figures 4 and 5).<sup>68</sup> In 1843, since there were very few mills, the industry appears more concentrated than later when there were more factories. By 1879 the industry had dispersed in a flat pattern all over the country. As the railroads were built the industry concentrated, but never as much as the American industry did.<sup>69</sup> The geographically scattered nature of Mexico's textile industry development contrasted not only with that of the United States but also to that of Great Britain where the industry also grew in a more regionally concentrated pattern.<sup>70</sup>

Stephen Haber (1997, 1992) has shown that the Mexican textile industry's industrial structure was relatively concentrated from 1893 on compared to the Brazilian and the American industries, as a result of the underdevelopment of the financial system. This makes the regionally dispersed nature of the industry even more remarkable. While in the United States we see a great number of small firms clustered around specific regions in Mexico we find fewer firms geographically scattered.

<sup>67</sup> An in-depth study of alcabalas during this era, their effects on the economy, and the process through which this system was finally ousted, is necessary in order to better understand this process.

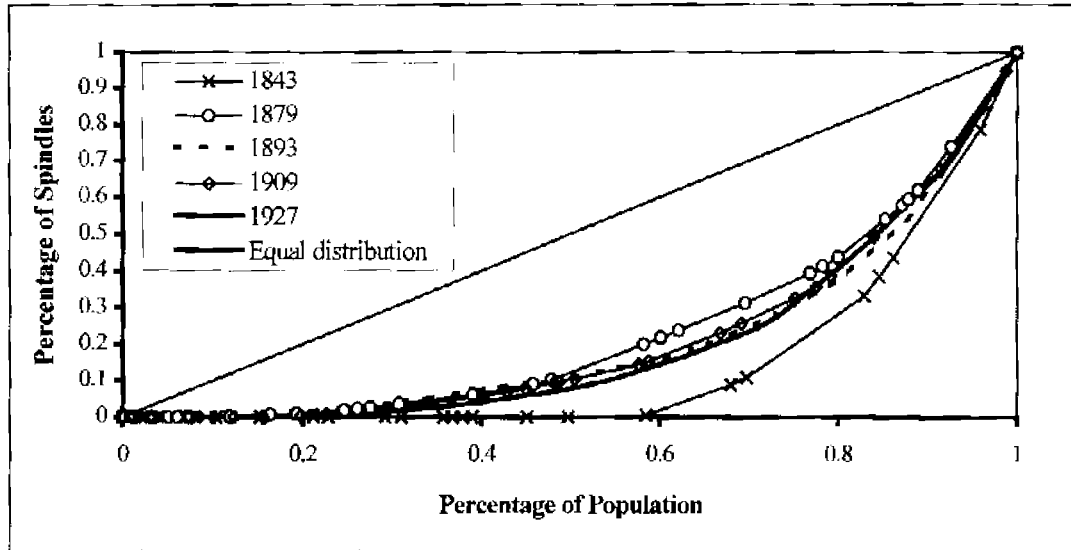
<sup>68</sup> The extraordinary dispersion of the Mexican cotton industry could also have resulted from the type of power sources it most conveniently used. The lack of coal -which was not only a product of nature but also of the low level of industrialization- made water a relatively efficient source of power. The use of water as a source of power generated a dispersed pattern of location, since each factory required a water source. The use of wood as fuel also led to dispersion since factories seek for proximity to forests. However, in the case of Mexico this would have explained the concentration of industry in those states where water power and wood was cheaper. This is not what evidence shows.

<sup>69</sup> From 1880 to 1930 the American industry shifted from New England to the South and appeared to be dispersing, but by 1930 it had concentrated to the 1880 level. See: Kane (1988).

<sup>70</sup> For a long period of time much of the textile industry was concentrated in New England in the United States and in Lancashire in England. Even when the American textile industry moved South it never moved West and generally remained more concentrated than its Mexican counterpart.

Figure 4

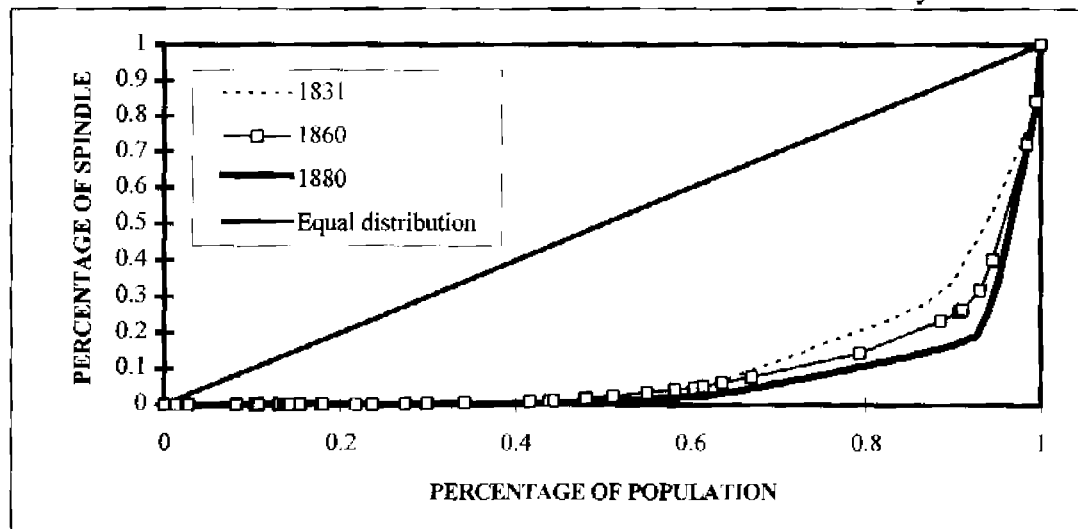
Lorenz curves for the Mexican Cotton Textile Industry



Source: See table 3

Figure 5

Lorenz curves for the United States Cotton Textile Industry.



Source: Wright (1880, 10-15) and U.S. Department of Commerce, Bureau of the Census (1975, 24-37).

Regional dispersion demonstrates the diffused nature of the national market. Regions with comparative advantages over others in terms of cotton, energy, and labor costs did not concentrate the industry as they did in the U.S. Relatively efficient mills coexisted with very inefficient ones. Furthermore, regional dispersion reduced the externalities of a “big push” sufficiently accumulated in particular

regions at the same level they would have done had the industry developed geographically more concentrated.<sup>71</sup> The regionally dispersed nature of the Mexican industry was long lasting. As it can be seen in Figure 3, in 1927 the industry showed the same degree of dispersion as in 1909 and 1893.<sup>72</sup> Why this structure persisted after railroads were built and *alcabalas* abolished? It seems to me that it was the result of path-dependency and government policies. However, further work needs to be undertaken in order to answer this question fully, something that goes beyond the objectives of this paper.

### **Conclusion**

The early appearance of Mexican cotton textile industry and its steady growth throughout the 19th century, tell us of the possibility of a successful industrialization process in Mexico in that period. Three conditions that were not present in the rest of Latin America explain its earlier industrial growth. First, its relatively large population, that provided the market necessary for industry to develop. Second, a tradition in the artisanal textile production which generated political support for protectionist policies. And third, a historical juncture between 1830 and 1840 when government, under the influence of statesmen such as Lucas Alamán, and industrialists such as Estevan de Antuñano, provided both tariff protection and means of finance for the textile industry through a development bank, the Banco de Avío.

From 1830 to 1879 Mexican textile industry changed from production carried on using hand spindles and looms from the Colonial era, to water and steam powered machinery. Furthermore, the industry vertically integrated the spinning and weaving processes in the decades between 1843 and 1879. Contrary to the commonly held views, the growth of the industry did not end around 1845 but continued through 1879, fostered in part by the effects of the American Civil War on the Mexican economy. Growth occurred even in the tumultuous period from 1843 to 1862. Yet despite this growth, the Mexican textile industry did not profit from its early establishment and fell behind its counterparts in the rest of the world.

Institutional frailty made Mexican governments unable, not only to provide a coherent industrial policy, as that designed by Alamán. Mexican governments could not even provide the basic ingredient for economic development: a "Rule of Law" that set efficient property rights.<sup>73</sup> Mexican governments, in permanent financial

<sup>71</sup> See Murphy, Shleifer and Vishny (1989).

<sup>72</sup> During the 20s and 30s we can attribute this persistent dispersion as product of government's policy focused not on improving the industry's efficiency but on preventing that firms went into bankruptcy.

<sup>73</sup> North (1994).

need, generated an institutional framework in which individual benefits and costs did not equate social ones.<sup>74</sup> Entrepreneurs who succeeded, such as Cayetano Rubio, were those capable of obtaining rents and privileges from the government, not those, as Estevan de Antuñano, who made investments in order to increase productivity levels.

Institutional frailty, in terms of time, strength and scope, prevented government from undertaking a protectionist policy that could foster industrial development. As long as a specific tariff schedule was not reliable in the long run, entrepreneurs could not base their investment decisions on it. Trade policy became an instrument by which governments gave monopoly power to particular groups that would give them political and financial support, such as the *agiotistas*, government lenders to whom the government sold raw cotton import permits. Finally, governments were unable to prevent smuggling, which limited their ability to grant actual protection to industry. Protectionist policy, as it was undertaken by Mexican governments in early 19<sup>th</sup> century, harmed industry more than it helped it. The liberal reduction of import duties on raw cotton and cotton manufactures of 1856, had a positive effect over textile industry, contrary to what historians until now have believed. Since raw cotton accounted for the majority costs for the textile industry, its tariff reduction compensated for the reduction in the duty on cotton manufactures.

There is perhaps no other historical episode better suited to refute the “dependentist” view of the economic history of Latin America than the history of the Mexican textile industry during the early 19<sup>th</sup> century. Mexico did not suffer from a lack of protection to its industry. However, as the history of Mexican textiles shows, a badly undertaken protectionist policy can be as harmful to industrial development as lack of protection can be.

Institutional frailty hindered the development of financial markets in Mexico in the 19<sup>th</sup> century. After the Banco de Avío closed its doors in 1842, there was no institutional lending to industry until the 1880s. Industrialists had to rely on informal mechanisms of raising capital, in most cases based on kinship networks of credit. Successful entrepreneurs were those who undertook speculative activities as part of their business such as money-lending to the government. The instability and underdevelopment of financial markets was the result of the lack of two preconditions the government was not able to meet due to its permanent fiscal deficits and constant debt defaults: the stabilization and broadening of short-term money-markets, and the creation of a relatively open internal market for public securities.<sup>75</sup>

Institutional frailty, limited Mexico’s possibility to diminish its high transportation costs by an earlier introduction of railroads. Institutional uncertainty generated such

<sup>74</sup> North (1991, 11-13).

<sup>75</sup> Marichal (1997).

a risky environment for investment that limited the private sector from undertaking it. Institutional weakness made government unable to actively promote railroad construction. Additionally, it made governments unable to provide security on the roads, widespread banditry further increased transportation costs. We can blame institutional fragmentation for the existence of inter-state tariff barriers that added to those transportation costs that resulted from nature. Even though the nation would gain by abolishing inter-state tariff barriers, federal governments were not strong enough—both fiscally and militarily-- to impose the national benefit over that of regional interest groups that profited from these taxes. They were unable to coordinate a general removal of alcabalas that would help individual states surmount the “free-rider” problem, that would occur if each separately eliminated them. State governments poorly developed tax collection systems could not substitute alcabalas with other taxes that would allow greater economic growth. Alcabalas continued to exist until 1896 severely reducing market sizes accessible to firms.

These factors not only limited the levels of growth and technological change the industry experienced, but also shaped it in a peculiar way: it grew geographically dispersed. By 1879 there existed cotton mills in practically all the states of the Republic. This contrasts with the way the cotton textile industry developed both in the United States and in the United Kingdom. High transportation costs, a product of nature and of insecurity on the roads and alcabalas, generated a fragmented market that inhibited the Mexican textile industry from locating in the region that offered comparative advantages. The geographically dispersed nature of the industry might have also prevented that the externalities that accrue from a “big push” develop as they would have done otherwise.

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***Appendix 1: Size and Productivity Coefficients for the Textile Industry in Mexico and the United States.***

***Appendix 2. Least Squares estimation of a Cobb-Dougllass production function using Mexican data for 1893.***

LS // Dependent Variable is LQ  
 SMPL range: 1 - 89  
 Observations excluded because of missing data.  
 Number of observations: 67

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.8226281	0.2295372	3.5838556	0.0007
LK	0.1167637	0.0245517	4.7558251	0.0000
LL	0.1796365	0.0374412	4.7978344	0.0000
LM	0.7241545	0.0302876	23.909262	0.0000
LF	0.0164836	0.0215436	0.7651268	0.4471
R-squared	0.984308	Mean of dependent var		11.54513
Adjusted R-squared	0.983296	S.D. of dependent var		0.853551
S.E. of regression	0.110317	Sum of squared resid		0.754533
Log likelihood	55.22381	F-statistic		972.2717
Durbin-Watson stat	1.656643	Prob(F-statistic)		0.000000

A Cobb Douglas regression was estimated in order to obtain the share of cotton in total costs: 72.4%. Choosing a Coob Douglas function assumes a factor substitution elasticity equal to 1. A trans-log function could be estimated to avoid this problem but there is insufficient data to do it.

**Table A1. Size and Productivity Coefficients for the Mexican Textile Industry, 1843 and 1879.**

	SPINDLES/FACTORY		LOOMS/FACTORY		COTTON/FACTORY		COTTON/SPINDLES		COT/LABOR		SPIN/LABOR	
	1843	1879	1843	1879	1843	1879	1843	1879	1879	1879	1879	1879
Chihuahua	0	1,533.33	0	113.33	0	87,400	0	57	595.91		10.45	
Coahuila	0	935.71	0	30	0	48,300	0	51.62	1,320.70		25.59	
Nuevo León	0	1,033.33	0	31.67	0	4,998.67	0	48.37	1,006.44		20.81	
Tamaulipas	0	0	0	0	0	0	0	0	0		0	
<b>NORTH</b>	0	1,096.15	0	49.62	0	57,712.31	0	52.65	887.88		16.86	
Baja California	0	0	0	0	0	0	0	0	0		0	
Durango	1,112	718.57	28	43.57	63,940	27,600	57.5	38.41	539.66		14.05	
Sinaloa	0	2,066.67	0	133.33	0	184,000	0	89.03	862.50		9.69	
Sonora	2,198	900	54	30	163,300	59,800	74.29	66.44	1,458.54		21.95	
<b>NORTH WEST</b>	1,293	1,102.73	32.33	66.82	80,500	73,181.82	62.26	66.36	774.78		11.67	
Aguascalientes	0	750	0	25	0	32,200	0	42.93	700		16.3	
Guanajuato	500	1,667	0	71.75	23,000	93,150	46	55.88	518.94		9.29	
San Luis Potosí	0	2,500	0	126	0	172,132	0	68.85	775.37		11.26	
Zacatecas	0	500	0	15	0	18,400	0	36.8	575		15.63	
<b>CENTRAL NORTH</b>	500	1,488.29	0	64.71	23,000	85,047.43	46	57.14	584.81		10.23	
Colima	0	1,875	0	85	0	110,400	0	58.88	1,276.30		21.68	
Jalisco y tepic	2,226	2,480	55	78	131,100	100,096	58.89	40.36	729.03		18.06	
Michoacán	0	2,400	0	58.33	0	142,600	0	59.42	2,516.47		42.35	
<b>CENTRAL WEST</b>	2,226	2,383	55	75	131,100	109,970.67	58.89	46.14	961.28		20.83	
D.F.	0	5,074.67	0	195	0	274,466.67	0	54.09	1,118.75		20.68	
Hidalgo	0	1,040	0	48	0	92,000	0	88.46	38.34		3.6	
Mexico	1,405.53	5,194.50	69.82	193.25	54,252.94	201,250	38.6	38.74	602.54		15.55	
Puebla	1,780.76	3,294	25.24	98.6	75,680.95	118,680	42.5	36.03	873.93		24.26	
Querétaro	2,700	10,000	56	600	158,125	1,012,000	58.56	101.2	2,044.44		20.2	
Tlaxcala	0	2,250	0	37.5	0	213,900	0	95.07	3,889.09		40.91	
<b>CENTRAL</b>	1,667.25	3,901.35	45.73	136.41	70,696.25	186,976.47	42.4	47.93	990.53		20.67	
<b>VERACRUZ</b>	2,857	5,240	45.75	121.8	103,787.5	209,760	36.33	40.03	1,558.40		38.93	
Campeche	0	0	0	0	0	0	0	0	0		0	
Chiapas	0	0	0	0	0	0	0	0	0		0	
Guerrero	0	2,500	0	80	0	36,800	0	14.72	669.09		45.45	
Morelos	0	0	0	0	0	0	0	0	0		0	
Oaxaca	0	9,500	0	290	0	365,500	0	37.53	2,330.07		62.09	
Tabasco	0	0	0	0	0	0	0	0	0		0	
Yucatán	0	700	0	20	0	29,900	0	42.71	622.92		14.58	
<b>SOUTH</b>	0	5,550	0	170	0	194,925	0	35.12	1,906.36		54.28	
<b>TOTAL</b>	<b>1,808.61</b>	<b>2,849.37</b>	<b>44.22</b>	<b>99.83</b>	<b>79,466.95</b>	<b>134,672.49</b>	<b>43.94</b>	<b>47.26</b>	<b>989.09</b>		<b>20.93</b>	

Source: See Table 3.

Table A2. Size and Productivity Coefficients for the Textile Industry of the United States, 1831, 1860 and 1880.

	SPINDLES/FACTORY			LOOMS/FACTORY			COTTON/FACTORY		
	1831	1860	1880	1831	1860	1880	1831	1860	1880
Maine	812.50	14,792.42	28,996.83	11.38	361.95	665.46	73,562.50	1,249,113.95	2,257,710.88
New Hampshire	2,844.40	14,472.45	26,223.69	88.25	394.00	674.44	196,125.00	1,159,143.73	2,121,844.69
Vermont	728.94	2,200	7,868.71	20.71	45.25	167.14	44,705.88	180,906.25	508,869.71
Massachusetts	1,327.25	7,711.97	24,206.19	35.08	197.14	544.12	97,156.18	617,570.32	1,564,107.94
Rhode Island	2,032.35	5,323.88	15,344.08	49.77	113.17	259.63	89,780.84	271,992.14	705,540.63
Connecticut	1,229.02	3,375.71	11,419.22	27.76	67.25	222.70	72,097.97	247,217.14	638,831.35
New England States	1,551.27	6,770.11	19,663.07	40.18	163.76	420.87	96,529.69	497,721.59	1,233,197.90
New York	1,404.61	4,412.46	15,601.61	32.62	99.81	344.44	68,407.77	303,109.20	879,349.83
New Jersey	1,234.88	2,807.91	13,660.06	15.98	35.61	187.06	114,356.94	206,696.57	585,329.94
Pennsylvania	1,803.13	2,578.26	7,210.02	94.04	70.24	143.86	106,136.93	202,682.18	683,251.00
Delaware	2,480.60	3,543.09	5,773.50	23.50	89.64	102.75	143,500.00	309,363.64	404,523.00
District of Columbia	0	2,560	0	0	1,670.00	0	0	294,117.00	0
Maryland	2,053.13	2,591.75	6,616.11	43.57	1,259.25	127.63	130,782.61	644,005.95	1,271,904.42
Middle States	1,570.85	3,066.12	10,008.37	45.65	0	196.53	95,239.73	256,215.06	786,485.09
Virginia	1,406.29	3,090	5,542.50	13.00	135.00	165.25	164,571.43	471,518.56	635,939.88
North Carolina	0	1,073.95	1,885.41	0	19.51	36.53	0	142,070.21	241,482.47
South Carolina	0	1,817.06	5,881.00	0	30.88	119.71	0	234,003.59	1,114,357.50
Georgia	0	2,581.39	4,966.40	0	61.85	112.33	0	421,451.64	843,929.98
Florida	0	1,600	816.00	0	20.00	0	0	200,000.00	166,250.00
Alabama	0	2,552.86	3,089.50	0	44.50	53.94	0	374,771.43	454,486.94
Mississippi	0	1,586	2,321.00	0	22.50	80.50	0	174,700.00	360,231.63
Louisiana	0	3,362.50	3,048.00	0	75.00	60.00	0	997,850.00	322,000.00
Texas	0	2,700	1,324.00	0	100.00	35.50	0	588,000.00	59,993.00
Kentucky	0	1,365.33	3,007.33	0	12.67	24.33	0	304,333.33	627,411.33
Tennessee	0	995.00	2,233.50	0	8.10	51.13	0	135,757.00	309,017.44
Arkansas	0	0	1,007.50	0	0	14.00	0	93,750.00	170,000.00
Southern States	1,406.29	1,809.40	3,366.76	13.00	41.15	73.90	164,571.43	277,494.00	525,023.34
Ohio	0	2,458	3,332.00	0	67.50	10.50	0	399,062.50	626,545.50
Indiana	0	5,500	8,349.00	0	187.50	194.00	0	906,972.00	1,591,221.75
Iowa	0	0	0	0	0	0	0	0	0
Illinois	0	0	2,430.00	0	0	12.00	0	31,666.67	549,565.00
Missouri	0	2,500	6,437.33	0	40.00	143.67	0	495,000.00	1,027,377.33
Michigan	0	0	5,100.00	0	0	131.00	0	0	300,000.00
Wisconsin	0	0	10,000.00	0	0	400.00	0	0	1,541,797.00
Minnesota	0	0	1,708.00	0	0	24.00	0	0	200,000.00
Utah territory	0	70.00	432.00	0	0	14.00	0	12,000.00	25,788.00
Western States	0	2,233.38	5,184.47	0	62.19	108.35	0	381,465.25	889,406.82
TOTAL	1,556.43	4,799.02	14,091.85	41.74	115.78	298.62	96,700.77	387,447.27	992,518.49

Source: Wright (1880)

Table A2. (Continues...)

	COTTON/SPINDLES			COTTON/LABOR			SPINDLES/LABOR		
	1831	1860	1880	1831	1860	1880	1831	1860	1880
Maine	90.54	84.44	77.86	2,036.33	3,508.75	4,607.97	22.49	41.55	59.18
New Hampshire	68.95	80.09	80.91	1,561.19	4,006.47	4,659.13	22.64	50.02	57.58
Vermont	61.33	82.23	64.67	1,570.25	3,818.60	4,940.48	25.60	46.44	76.40
Massachusetts	73.20	80.08	64.62	1,864.05	3,485.29	4,469.17	25.46	43.52	69.17
Rhode Island	44.18	51.09	45.98	1,225.24	2,956.23	3,831.92	27.74	57.86	83.34
Connecticut	58.66	73.23	55.94	1,570.62	3,542.66	3,616.69	26.77	48.37	64.65
<b>New England Sta</b>	62.23	73.52	62.72	1,604.00	3,485.15	4,304.17	25.78	47.41	68.63
New York	48.70	68.69	56.36	1,390.50	3,126.47	3,430.87	28.55	45.51	60.87
New Jersey	92.61	73.61	42.85	1,072.49	3,589.05	2,381.10	11.58	48.76	55.57
Pennsylvania	58.86	78.61	94.76	477.39	2,500.75	4,080.56	8.11	31.81	43.06
Delaware	57.85	87.31	70.07	1,045.16	3,068.53	4,091.26	18.07	35.14	58.39
<b>District of Colum</b>	0	114.89	0	0	3,095.97	0	0	26.95	0
Maryland	63.70	248.48	192.24	1,149.41	4,793.49	5,978.77	18.04	19.29	31.10
<b>Middle States</b>	60.63	83.56	78.58	839.58	2,995.84	3,887.95	13.85	35.85	49.48
Virginia	117.03	152.60	114.74	2,755.98	5,235.46	4,688.96	23.55	34.31	40.87
North Carolina	0	132.29	128.08	0	3,157.12	3,661.09	0	23.87	28.58
South Carolina	0	128.78	189.48	0	4,464.71	7,730.92	0	34.67	40.80
Georgia	0	163.27	169.93	0	4,944.15	5,431.57	0	30.28	31.96
Florida	0	125.00	203.74	0	3,076.92	5,362.90	0	24.62	26.32
Alabama	0	146.80	147.11	0	3,999.09	5,021.96	0	27.24	34.14
Mississippi	0	110.15	155.21	0	3,250.23	4,146.55	0	29.51	26.72
Louisiana	0	296.76	105.64	0	5,543.61	6,192.31	0	18.68	58.62
Texas	0	217.78	45.31	0	4,523.08	1,817.97	0	20.77	40.12
Kentucky	0	222.90	208.63	0	7,422.76	5,408.72	0	33.30	25.93
Tennessee	0	136.44	138.36	0	4,530.27	4,871.21	0	33.20	35.21
Arkansas	0	0	168.73	0	7,500.00	5,666.67	0	0	33.58
<b>Southern States</b>	117.03	153.36	155.94	2,755.98	4,510.10	5,180.41	23.55	29.41	33.22
Ohio	0	162.35	188.04	0	3,800.60	5,210.36	0	23.41	27.71
Indiana	0	164.90	190.59	0	4,942.63	8,989.95	0	29.97	47.17
Iowa	0	0	0	0	0	0	0	0	0
Illinois	0	0	226.16	0	8,636.36	4,778.83	0	0	21.13
Missouri	0	198.00	159.60	0	5,823.53	6,067.19	0	29.41	38.02
Michigan	0	0	58.82	0	0	3,488.37	0	0	59.30
Wisconsin	0	0	154.18	0	0	5,796.23	0	0	37.59
Minnesota	0	0	117.10	0	0	9,090.91	0	0	77.64
Utah territory	0	171.43	59.69	0	1,714.29	889.24	0	10.00	14.90
<b>Western States</b>	0	170.80	171.55	0	4,375.23	6,489.23	0	25.62	37.83
<b>TOTAL</b>	62.13	80.73	70.43	1,245.13	3,464.00	4,348.71	20.04	42.91	61.74

Source: Wright (1880).